UNIVERSITY OF CALIFORNIA

Santa Barbara

Behavioral Risk in Bisexual Youth:

Comparing First- and Second-order Latent Class Typologies

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

Doctor of Philosophy in Counseling, Clinical, and School Psychology

by

Andrew Young Choi

Committee in charge:

Professor Tania Israel, Chair

Professor Karen Nylund-Gibson

Professor Matthew Quirk

September 2019

The dissertation of Andrew Young Choi is approved.

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Matthew Quirk

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Karen Nylund-Gibson

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Tania Israel, Committee Chair

June 2018

Behavioral Risk in Bisexual Youth:

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ACKNOWLEDGEMENTS

- I thank my ancestors for their spiritual presence and guidance; for bestowing upon me their wisdom; and for inspiring me—through their innumerable visible and invisible contributions, labors, and sacrifices—to do good, defend justice, retain integrity, serve community, and perpetuate my cultural values and familial heritage.
- I thank my parents—Drs. Yong Sun Choi and Eun Young Park—for their unwavering support through the many trials and tribulations we encountered and overcame as a family, and I congratulate them for completing their respective doctorates this year. I also dedicate this dissertation to my brother Eddie Ki Jun Choi.
- I thank my hānai family—including Alexandra Jamora—for sharing with me the gifts of unconditional acceptance and wholehearted living for which I am forever grateful.
- I thank my ever-growing family of choice for its unwavering presence—including Dr. Stephanie E. A. Mendez in particular for being the best fried that I could've asked for. I thank Dr. Oscar Widales-Benitez for helping me to accept and embrace who I am. I thank Mona Shahrebani and Kly Yu for the enduring friendships based on compassion, empathy, understanding, and the gift of witnessing each other grow into who we are.
- I thank my Asian American brothers and sisters in psychology—including soon-to-be Drs. Jennifer Bordon, Eddie S. K. Chong, and Brian Taehyuk Keum; Drs. William Hua, Shinye Kim, and Hotaka Maeda; and Jay Hong—for the grounding and lifelong connections rooted in empowerment, laughter, mutual understanding, and solidarity.
- I thank Dr. Allyson Tanouye and the University of Hawai'i, Mānoa Counseling and Student Development Center staff for being a professional family to me and supporting my growth as a person and a psychologist at the most crucial juncture of my adult life.
- I thank the 'āina for the gift of abundant natural, relational, and spiritual resources that have facilitated my recovery and growth, and those which I am compelled to protect.

- I thank Dr. Karen Nylund-Gibson for teaching me everything I know about structural equation modeling and for impromptu conversations about life that have brought more authenticity, compassion, humility, insight, and levity to my personhood.
- I thank my classmates—including Kelly Edyburn, Kelley Hershman, Krishna Kary, Lindsey Lilles, Sabrina Liu, Danny Meza, Katie Moffa, Stephanie Moore, Ana Romero-Morales, Lia Simon, Ginette Sims, Brian Stevenson, Sruthi Swami, Emily Unzueta, María Vázquez, and Rondy Yu—for the camaraderie, connection, laughter, and support.
- I thank many members of the following communities for their emotional and instrumental advice, camaraderie, guidance, mentorship, and/or support: APA Divisions 17, 44, and 45; Asian American Psychological Association; Korean Psychology Network; LGBTQ Scholars of Color Network; and the APA Minority Fellowship Program.
- I thank my undergraduate mentors—including Drs. Carol Sansone, Kim Korinek, Michelle Taliaferro, Frances Friedrich, and Lisa Aspinwall—for their advice, guidance, and support, and for believing in my potential when I wasn't sure of it myself.
- I thank Dr. Aaron Malark for sharing with me his incredible, hard-won insights and for challenging me to trust myself and always strive toward doing better.
- I thank Dr. Steve Smith for the candid, honest, insightful, meaningful, and often wry conversations about becoming, living, and serving.

- I thank Drs. Matt Quirk and Andrew Maul for their instruction and professional support.
- I thank Dr. Tania Israel for providing me with the opportunity to earn a Ph.D. and to enter the profession of Counseling Psychology, through admission, advising, and mentorship.

- I thank my friends across the world—in Cambodia, Egypt, France, Hong Kong, Japan, Morocco, Taiwan, Thailand, Tunisia, South Korea, and elsewhere—who welcomed me with cross-cultural understanding, hospitality, and engagement, and with whom I shared irreplaceably constructive and meaningful experiences. You helped to shape me into a global citizen, and one that is more aware and appreciative of the incredible diversity in our world and our respective responsibilities to protect, celebrate, and nurture it.
- I thank past and present leaders in Asian American Pacific Islander, LGBTQ+, indigenous, and people of color communities whose collective contribution toward social justice and liberation has enabled me to this academic and professional attainment.
- I thank my former psychoanalyst and psychotherapists.

- Finally, I commend myself for assuming accountability; practicing authenticity and awareness; striving toward growth and connection; preserving honesty and integrity; persevering with resilience; and living courageously and compassionately.

VITA OF ANDREW YOUNG CHOI
September 2019

EDUCATION

University of California, Santa Barbara (UCSB)
2019 Ph.D. Counseling, Clinical, and School Psychology*
Certificate in College and University Teaching
Emphasis in Quantitative Methods in Social Sciences
2018 M.A. Education (Applied Quantitative Methods)
2015 M.A. Counseling Psychology

University of Utah
2013 B.S. Psychology, *with honors*
2013 B.S. Sociology, *with honors*
Certificate in Criminology & Corrections
Certificate in Diversity

REFEREED PUBLICATIONS

Choi, A. Y., & Israel, T. (2019). Affirmative mental health practice with bisexual clients: Evidence-based strategies. In J. E. Pachankis & S. A. Safren (Eds.), *Handbook of evidence-based mental health practice with sexual and gender minorities*. New York, NY: Oxford University Press.

Choi, A. Y., Nylund-Gibson, K., Israel, T., & Mendez, S. E. A. (2019). A latent profile analysis of bisexual identity: Evidence of within-group diversity. *Archives of Sexual Behavior, 48*(1), 113-130.

Israel, T., **Choi, A. Y.**, Goodman, J. A., Matsuno, E., Lin, Y.-J., Kary, K. G., & Merrill, C. R. S. (2019). Reducing internalized binegativity: Development and efficacy of an online intervention. *Psychology of Sexual Orientation and Gender Diversity, 6*(2), 149-159.

Depaoli, S., Agtarap, S., **Choi, A. Y.**, Coburn, C., & Yu, J. (2018). Advances in quantitative research in the psychological sciences. *Translational Issues in Psychological Science, 4*(4), 335-339.

Nylund-Gibson, K., & **Choi, A. Y.** (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science, 4*(4), 440-461.

Choi, A. Y., Israel, T., & Maeda, H. (2017). Development and evaluation of the Internalized Racism in Asian Americans Scale (IRAAS). *Journal of Counseling Psychology, 64*(1), 52-64.

Choi, A. Y., Merrill, C. R. S., & Israel, T. (2017). Factor structure of the Internalized Homonegativity Inventory (IHNI). *Psychology of Sexual Orientation and Gender Diversity, 4*(4), 491-498.

Choi, A. Y., & Israel, T. (2016). Centralizing the psychology of sexual minority Asian and Pacific Islander Americans. *Psychology of Sexual Orientation and Gender Diversity, 3*(3), 345-356.

Choi, A. Y., Israel, T., Nylund-Gibson, K., & Quirk, M. (in preparation). Syndemic behavioral risk and suicidality among bisexual adolescents: A latent class analysis.

Israel, T., Matsuno, E., **Choi, A. Y.**, Goodman, J. A., Lin, Y.-J., Kary, K. G., & Merrill, C. R. S. (in preparation). Development and efficacy of an online intervention to reduce internalized transnegativity.

REFEREED PRESENTATIONS

Choi, A. Y., & Davids, C. M. (Co-chairs) (2019, August). *Affirmations and intersections: Bisexuality, gender, relationships, and representation*. Roundtable conducted at the 127th Annual Meeting of the American Psychological Association (APA), Chicago, IL.

Choi, A. Y., & Watson, L. B. (Co-chairs) (2019, August). *Bipositivity*. Symposium conducted at the 127th Annual Meeting of the American Psychological Association (APA), Chicago, IL.

Choi, A. Y., Israel, T., & Nylund-Gibson, K. (2019, March). *Syndemic behavioral risk and suicidality among bisexual youth: A latent class analysis*. Poster presented at the 2019 International Convention of Psychological Science (ICPS), Paris, France.

Choi, A. Y., & Davids, C. M. (Co-chairs) (2018, August). *Multiple ways of "B-ing:" Diversity of bisexuality*. Symposium conducted at the 126th Annual Meeting of the American Psychological Association (APA), San Francisco, CA.

Choi, A. Y. (2018, July). *Latent classes of behavioral risk among bisexual youth*. Poster presented at the 2018 American Psychological Association (APA) Minority Fellowship Program (MFP) Psychology Summer Institute (PSI), Washington, DC.

Cheng, J., **Choi, A. Y.**, & La Rosa, K. P. (2017, October). *Reclaiming the model minority narrative: The power of E Pluribus Unum*. Difficult dialogue conducted at the Annual Meeting of the Asian American Psychological Association (AAPA), Las Vegas, NV.

Choi, A. Y. (2017, August). *Advancing racial and ethnic diversity with psychoanalysis: New insights, new identities?* In J. Jackson and R. Abreu (Chairs), *Integrating race and ethnicity across different disciplines of psychology: Student perspectives*. Roundtable conducted at the 125th Annual Meeting of the American Psychological Association (APA), Washington, DC.

Choi, A. Y. (2017, August). *Bisexuals and bifactors, and binary indicators, oh my!: A road to affirmation and visibility*. In M. T. Guerrant and M. C. Parent (Chairs), *Innovative approaches to research with diverse LGBTQ+ populations: Graduate student perspectives*. Symposium conducted at the 125th Annual Meeting of the American Psychological Association (APA), Washington, DC.

Choi, A. Y. (2017, August). *Graduate student instructors teaching diversity after the 2016 presidential election*. In M. Charles (Chair), *Walking the walk: Staying engaged in cross-cultural dialogues*. Symposium conducted at the 125th Annual Meeting of the American Psychological Association (APA), Washington, DC.

Choi, A. Y., Israel, T., Goodman, J., Matsuno, E., Lin, Y., Kary, K., & Merrill, C. R. S. (2017, January). *Reducing internalized binegativity: Development and efficacy of an online intervention*. In C. Davids (Chair), *The "B" is not silent: Discrimination, internalization, and bisexuality identity*. Symposium conducted at the Biennial Meeting of the National Multicultural Conference and Summit (NMCS), Portland, OR.

Choi, A. Y., Mendez, S. E. A., & Nylund-Gibson, K. (2017, January). *Diverse expressions of*

bisexual identity: A latent profile analysis. Poster presented at the Biennial Meeting of the National Multicultural Conference and Summit (NMCS), Portland, OR.

Choi, A. Y. (2016, August). *"Good" and "bad" feelings in diversity training: Graduate student perspectives*. In M. Charles (Chair), *Voices from both sides: The multicultural journey of educators and students*. Roundtable conducted at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Choi, A. Y., Israel, T., & Maeda, H. (2016, August). *Construct validation of the Internalized Racism in Asian Americans Scale (IRAAS)*. Poster presented at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Choi, A. Y., Maeda, H., & Bordon, J. J. (2016, August). *Measurement invariance of the Internalized Racism in Asian Americans Scale (IRAAS)*. Poster presented at the Annual Meeting of the Asian American Psychological Association (AAPA), Denver, CO.

Goodman, J. A., Israel, T., Merrill, C. R. S., Lin, Y.-J., Kary, K. G., Matsuno, E., & **Choi, A. Y.** (2016, August). *Refinement and replication of an internet-based intervention for internalized heterosexism*. Poster presented at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Israel, T., Lin, Y.-J., Goodman, J. A., Matsuno, E., **Choi, A. Y.**, Kary, K. G., & Merrill, C. R. S. (2016, August). *Reducing LGBTQ stigma through online interventions*. In H. M. Levitt and B. L. Velez (Co-chairs), *Psychotherapy and intervention research with LGBTQ populations*. Symposium conducted at the 124th Annual Meeting of the American Psychological Association, Denver, CO.

Kary, K. G., Israel, T., Matsuno, E., Goodman, J. A., **Choi, A. Y.**, Lin, Y.-J., & Merrill, C. R. S. (2016, August). *Reducing lesbian internalized stigma: Development and efficacy of an online intervention*. Poster presented at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Matsuno, E., Israel, T., **Choi, A. Y.**, Goodman, J. A., Lin, Y.-J., Kary, K. G., & Merrill, C. R. S. (2016, August). *Reducing transgender internalized stigma: Development and efficacy of an online intervention*. Poster presented at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Unzueta, E., **Choi, A. Y.**, & Bordon, J. J. (2016, August). *Privileged in the academy: Positioning counseling psychology in current student protests*. In E. W. Whiteman and D. Schultheiss (Chairs), *Student voices: Examining the complexities of privilege and power*. Symposium conducted at the 124th Annual Meeting of the American Psychological Association (APA), Denver, CO.

Choi, A. Y. (2015, October). *Ramadan fasting in Africa: My foreignness, intersectionality, and reflections on "leaning in" to professional organizations*. In **A. Y. Choi** (Chair), *Diversity, identities, and psychotherapists-in-training: Troubling borders both personally and professionally?* Roundtable conducted at the Association for Psychoanalysis of Culture and Society (APCS) Annual Conference, New Brunswick, NJ.

Choi, A. Y. (2015, August). *Centralizing LGB Asian and Pacific Islander American Experiences: Insider or Outsider?* In **A. Y. Choi** (Chair), *Self-awareness in research: Students reflect on their ongoing scholarly development*. Symposium conducted at the Annual Meeting of the Asian American Psychological Association (AAPA), Toronto, Canada.

Choi, A. Y., & Israel, T. (2015, August). *Internalized racial oppression in Asian Americans: Measure development and initial psychometric evaluation*. Poster presented at the 123rd Annual Meeting of the American Psychological Association (APA), Toronto, Canada.

Kary, K. G., Israel, T., **Choi, A. Y.**, Lin, Y.-J., Goodman, J. A., & Matsuno, E. (2015, August). *Exposure to, sources of, and rejection of anti-gay messages*. Poster presented at the 123rd Annual Meeting of the American Psychological Association (APA), Toronto, Canada.

Matsuno, E., Israel, T., Goodman, J. A., **Choi, A. Y.**, Lin, Y., & Kary, K. G. (2015, August). *Screening LGBT participants in psychological research*. Poster presented at the 123rd Annual Meeting of the American Psychological Association (APA), Toronto, Canada.

Israel, T., Matsuno, E., Lin, Y.-J., **Choi, A. Y.**, Delucio, K., Bettergarcia, J., Goodman, J. A., & Kashubeck-West, S. (2015, January). *Reducing internalized stigma in LGBT subpopulations: Challenges and strategies*. Symposium conducted at the Biennial Meeting of the National Multicultural Conference and Summit (NMCS), Atlanta, GA.

Kim, S., Robinson, R. G., Dwivedi, K., & **Choi, A. Y.** (2015, January). *Implicit enactments in multicultural psychology training: Four graduate students revisit their experiences with intersectionality, marginalization, and privileg*e. Difficult Dialogue conducted at the Biennial Meeting of the National Multicultural Conference and Summit (NMCS), Atlanta, GA.

Choi, A. Y., & Korinek, K. (2014, August). *Exploring culture, gender, and power through the transnational subjectivities of Filipina migrant wives in South Korea*. Paper presented at the 109th Annual Meeting of the American Sociological Association (ASA), San Francisco, CA.

Choi, A. Y., Sansone, C., Butner, J., & Zachary, J. (2012, July). *Examining off-task behaviors as regulatory mediators of long-term interest and performance online*. Poster presented at the 30th meeting of the International Congress of Psychology (ICP), Cape Town, South Africa.

RESEARCH GRANTS

2017	UCSB Humanities & Social Science Research Grant
2015	Ray E. Hosford Foundation, *Fellowship Grant for Research*
2014	Scattergood Foundation, *Active Minds Emerging Scholars Fellowship*
2012, 2013	University of Utah Undergraduate Research Opportunities Program (UROP), *2x recipient*

RESEARCH EXPERIENCE

UCSB – Department of Counseling, Clinical, and School Psychology (CCSP)

Research & Interventions for Sexual Minority Empowerment (Project RISE)

2017-18 Dissertation Researcher

2013-16 Graduate Student Research Associate

Advisor: Tania Israel, PhD

Activities: Intervention research; randomized controlled trials; "big data" analysis; qualitative content analysis

UCSB – Department Education
Latent Variable Modeling Research Group (LVG)

2016-18	Graduate Student Research Associate	
	Advisor:	Karen Nylund-Gibson, PhD
	Activities:	Conceptual and technical applications of advanced latent variable models to diversity-focused topics

University of Utah – Department of Psychology
Motivation Lab, Regulating Motivation and Performance Online (RMAPO) Project

2012-13	Manager	
2010-12	Research Assistant	
	Advisor:	Carol Sansone, PhD
	Activities:	Data management; implementation and evaluation of experimental protocol; lab personnel management

INSTRUCTIONAL APPOINTMENTS

UCSB – Department of Psychological & Brain Sciences
Teaching Assistant

Winter 2018	Introductory Statistics

UCSB – Department of Education
Teaching Assistant

Spring 2017	Structural Equation Models
Winter 2017	Factor Analysis

UCSB – Department of Counseling, Clinical, and School Psychology (CCSP)
Instructor of Record

Spring 2018	Introduction to Helping Skills: Theory, Research, & Practice
Fall 2017	Introduction to Educational and Vocational Guidance
Summer 2017	Research in Applied Psychology
Fall 2016	Research in Applied Psychology
Summer 2016	Introduction to Helping Skills: Theory, Research, & Practice

Teaching Assistant

Winter 2017	Introduction to Helping Skills: Theory, Research, & Practice
Fall 2016	Introduction to Educational and Vocational Guidance
Spring 2015	Research in Applied Psychology
Winter 2015	Introduction to Helping Skills: Theory, Research, & Practice
Fall 2014	Research in Applied Psychology

University of Utah – Department of Sociology
Teaching Assistant

Fall 2012	Gender and Sexuality

CLINICAL APPOINTMENTS

Harvard Medical School / Cambridge Health Alliance – Department of Psychiatry

2019 – 2021 Postdoctoral Fellow in Clinical Psychology, *Program for Psychotherapy*

Training Director:	Marla Eby, PhD
Location:	Cambridge, MA
Setting:	Academic medical center / public hospital
Population:	Adults of all ages in intensive outpatient treatment
Problems:	Severe and persistent mental illness
Hours:	Approximately 20 contact hours/week for 24 months
Activities:	Intensive, long-term psychodynamic psychotherapy; case management and referrals; interprofessional consultation; risk assessment and crisis intervention; psychotherapy process and outcome research

University of Hawai‘i, Mānoa – Counseling and Student Development Center*

Location: Honolulu, HI

2018-19 Doctoral Intern in Health Service Psychology

Supervisors:	Allyson M. Tanouye, PhD Kristen Tom, PsyD P. Thuy T. Tran, PsyD
Setting:	University counseling center
Population:	Undergraduate and graduate students
Hours:	Approximately 20 contact hours/week for 12 months
Activities:	Career assessment and counseling; individual, couples, and group psychotherapy; intake assessment; case management and referrals; interprofessional consultation; psychoeducational and outreach programming; risk assessment and crisis intervention

2018 – 2019 Counselor-in-residence

Supervisor:	Allyson M. Tanouye, PhD
Setting:	Student housing
Population:	Undergraduate and graduate students
Hours:	Approximately 30 on-call hours/week for 12 months
Activities:	after-hours consultation, crisis intervention, and risk assessment; psychoeducational and outreach programming

UCSB – Counseling and Psychological Services**

2017 – 2018 External Practicum Student

Supervisors:	Juan Riker, PhD Nicholas Jackson, PsyD
Location:	Santa Barbara, CA
Setting:	University counseling center

	Population:	Undergraduate and graduate students
	Hours:	Approximately 5-8 contact hours/week for 9 months
	Activities:	Individual psychotherapy; intake assessment; case management and referrals; risk assessment and crisis intervention

Santa Barbara Cottage Hospital – Department of Psychiatry and Addiction Medicine

2016-17	External Practicum Student	
	Supervisors:	Paul Erickson, MD Layla Farinpour, LMFT
	Location:	Santa Barbara, CA
	Setting:	Inpatient psychiatric and substance abuse treatment
	Population:	Adults in voluntary psychiatric hospitalization
	Hours:	Approximately 5 contact hours/week for 9 months
	Activities:	Individual and group psychotherapy; intake assessment; psychiatric consults; risk assessment and crisis intervention

UCSB – Hosford Counseling and Psychological Services

	Location:	Santa Barbara, CA
	Setting:	Community mental health center
2018	Clinical Supervision Advanced Practicum Student	
	Supervisor:	Heidi Zetzer, PhD
	Population:	1st year professional psychology doctoral students
	Hours:	Approximately 3 contact hours/week for 3 months
	Activities:	Individual and group supervision; didactic training; on-call consultation for risk assessment and crisis intervention
2014-16	Advanced Practicum Student	
	Supervisors:	Heidi Zetzer, PhD Collie Conoley, PhD Maryam Kia-Keating, PhD
	Population:	Children, adolescent, adults, couples, and families
	Hours:	Approximately 3-5 contact hours/week for 18 months
	Activities:	Individual, couples, and family psychotherapy; intake assessment; patient-centered assessment; psychoeducational and outreach programming; psychiatric consults; risk assessment and crisis intervention
2014	Basic Practicum Student	
	Supervisor:	Heidi Zetzer, PhD
	Population:	Undergraduate students
	Hours:	Approximately 1-2 contact hours/week for 6 months

Activities: Individual psychotherapy; intake assessment; patient-centered assessment; psychoeducational and outreach programming; risk assessment and crisis management

University of Utah
2012-13 Peer Advisor, Department of Psychology
2011-12 Student Athlete Peer Mentor, Department of Athletics

PROFESSIONAL SERVICE

Ad hoc reviewer
Cultural Diversity and Ethnic Minority Psychology
Sexual and Relationship Therapy
Sociology Compass
Translational Issues in Psychological Science

Associate editor
Translational Issues in Psychological Science
Special issue: Understanding, Using, and Communicating Quantitative Methods

Convention program reviewer
American Psychological Association (APA)
Asian American Psychological Association (AAPA)
National Multicultural Conference & Summit (NMCS)

2017-19 Programming Chair, APA Div. 44 Committee on Bisexual Issues
2015-17 Editorial Board, *Translational Issues in Psychological Science*
2015-17 APA Graduate Students (APAGS) Science Subcommittee

UCSB – Graduate Student Association (GSA)
2013-16 Counseling & Psychological Services (CAPS) Advisory Committee
2013-16 General Assembly Representative, Department of CCSP

University of Utah
2013 Commencement Speaker Selection Committee
2013 College of Social & Behavioral Science Superior Teaching Award Committee
2012-13 Chair, Psychology Undergraduate Student Advisory Committee
2012-13 My U Signature Experience
2012-13 Honors Think Tank: New American Communities in Utah
2012-13 Student Ambassador, College of Social & Behavioral Science
2011-12 Teaching Awards & Grants Committee

AWARDS, HONORS, AND PRIZES

2019	APA Div. 17 Section for LGBT Issues (SLGBTI) Outstanding Graduate Student Award
2019	APA Div. 45 Barbara Smith & Jewell E. Horvat Graduate Student Award for Research with Queer Individuals of Color
2018	Northwestern University Institute for Sexual and Gender Minority Health and Wellbeing (ISGMH) Data Science & Sexual and Gender Minority Health Equity Paper Competition, *winner*
2018	AAPA Division of Students Clinical Practice Award
2018	APA Div. 17 Section for Ethnic and Racial Diversity (SERD) Outstanding Student Award
2018	APA Div. 45 Distinguished Graduate Student Research Award
2016	AAPA Division of Students Research Award
2014	APA Div. 39 Committee on Sexualities & Gender Identities Scholar Award
2014, 15, 19	APA Div. 44 Students & Early Career Psychologist Engagement Award, *3x recipient*
2012	Psi Chi J. P. Guilford Award, *1st place for best undergraduate paper*

UCSB

2017-19	Academic Senate Outstanding Teaching Assistant Award, *3x nominee*
2017	Department of CCSP Block Grant
2016-18	GSA Excellence in Teaching Award, *3x nominee*
2016	Department of CCSP Research Award
2016	Ray E. Hosford Award for Excellence in Professional Behavior
2015, 16	Hosford Clinic "Hero" Award, *2x recipient*

University of Utah

2013	Alumni Association Outstanding Senior Award, Honors College
2013	J. Willard Marriott Library Honors Thesis Award, honorable mention
2013	Student Leadership Award: Commitment to Service

FELLOWSHIPS AND SCHOLARSHIPS

2019	National Register of Health Service Psychologists Trainee Credentialing Scholarship
2018	APA Minority Fellowship Program (MFP), *Psychology Summer Institute (PSI) Fellowship*
2014	Pi Gamma Mu Graduate Scholarship
2013	Pacific Athletic Conference (PAC-12) Postgraduate Scholarship
2013	University of California Regents Special Fellowship

University of Utah

2013	Honors College Baccalaureate Scholarship
2012	Alumni Association Campus Involvement Scholarship
2012	College of Social Behavioral & Science Honor Roll Award

2012 Janice R. Ugaki & R. Douglas Greally Scholarship
2012 Psychology Departmental Scholarship
2008 George S. & Dolores Doré Eccles Scholarship

TRAVEL AWARDS

2019 APA Div. 17 Student Affiliates of Seventeen (SAS) Travel Award
2018 APA Div. 44 Committee on Racial & Ethnic Diversity (Dr. Richard A. Rodriguez) Student Travel Award
2017 APA Div. 44 Committee on Bisexual Issues Student Travel Award
2016, 19 APA Office of Ethnic Minority Affairs Travel Grant, *2x recipient*
2016 APA Science Directorate Student Travel Award
2015 AAPA Student Travel Award
2014 APA Div. 39 Student Travel Award
2014 APA Div. 45 Student Travel Award
2014 Joint APA Ethics, Div. 44, & APAGS Student Travel Award

UCSB
2018 Academic Senate Doctoral Student Travel Award
2018-19 Gevirtz Graduate School of Education Dean's Travel Grant, *2x recipient*
2015-19 Department of CCSP Travel Grant, *5x recipient*
2014-19 GSA Travel Grant, *6x recipient*

INTERCOLLEGIATE ATHLETICS

University of Utah – Men's Swimming & Diving (NCAA Division I)
2012 Pacific Athletic Conference (PAC-12) All-Academic Team
2009-12 Varsity Letter, *4x recipient*
2009-11 Mountain West Conference All-Academic Team, *3x recipient*
2009-11 Mountain West Conference Student-Athlete Award, *3x recipient*

PROFESSIONAL AFFILIATIONS

Alpha Kappa Delta International Sociology Honor Society
American Psychological Association (APA)
Division 17 (Counseling Psychology)
Division 44 (Psychological Study of Sexual Orientation and Gender Diversity)
Division 45 (Psychological Study of Culture, Ethnicity, and Race)
Asian American Psychological Association (AAPA)
Association for Psychological Science (APS)
Korean Psychology Network (KPN)
LGBTQ Scholars of Color (LGBTQ SOC) Network
Pi Gamma Mu International Honor Society in the Social Sciences
Psi Chi International Honor Society in Psychology

*American Psychological Association (APA)-accredited
**Awarded the UCSB William J. Villa Service to Students Award during the 2017-2018 training year

ABSTRACT

Behavioral Risk in Bisexual Youth:

Comparing First- and Second-order Latent Class Typologies

by

Andrew Young Choi

Bisexuals experience a range of mental and behavioral health disparities compared to monosexuals, yet they are understudied and underserved. Bisexual health disparities may be characterized by a syndemic—interconnected and co-occurring risks in the context of stigma that jointly exacerbate the burden of disease—that emerges with a developmental onset in adolescence. In this project, I used a nationally-derived sample of bisexual youth and latent class modeling to investigate patterns of syndemic processes in this population. I examined the heterogeneity in the patterns of co-occurrence among three domains of high priority risk behaviors: sexual risk behavior, substance use, and victimization experiences. Findings indicated that within-group variation in the syndemic construct is categorical, systematic, and is comprised of *Low Risk*, *Alcohol Use*, *Peer-victimization*, *Sexually Active*, *Syndemic*, and *Risk-taking* classes. The proportions of bisexual identification, sex, and race varied across classes. Class membership was differentially associated with suicidality where the *Syndemic* and *Peer-victimization* classes were particularly elevated. These results reveal that there are multiple and distinctive forms of behavioral risk that confer differential health implications

among bisexual youth; illustrate the utility of LCA for classifying typologies of risky and normative health behavior patterns; and encourage researchers and practitioners to carefully consider the jointly operating nature of behavioral risks in this population. Future directions include conducting replication and multiple-group invariance studies, examining additional antecedents and consequences of class membership, and investigating the plausibility of other mixture techniques to model complex syndemic processes among bisexuals and sexual minorities more broadly.

Keywords: adolescent health, bisexual, latent class analysis, risk behavior, syndemic, YRBS

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Chapter 1: Rationale

Research has confirmed the disproportionate burden of mental (e.g., mood disorders and suicidality) and behavioral (e.g., substance use) health disparities borne by sexual minorities compared to heterosexuals (Institute of Medicine, 2011). However, growth in this literature has not been equally distributed in terms of attention paid to sexual minority subgroups. Specifically, bisexual health, identities, and experiences continue to be understudied in professional psychology although increasing work indicates that this population contends with unique and additional vulnerabilities compared to lesbian and gay men (Feinstein & Dyar, 2017). Indeed, Savin-Williams and Joyner (2014) suggested that bisexuals partially or fully explain some of the health disparities documented among sexual minorities and heterosexuals across multiple studies (Lindley, Walsemann, & Carter, 2012; Loosier & Dittus, 2010). The historical and prevailing practice of combining lesbian, gay, and bisexual data into one homogenous group or excluding bisexuals altogether is thus no longer justified, where doing so may confer risk of distorting or masking meaningful within-group differences in important health outcomes for sexual minority research (Bostwick & Hequembourg, 2013; Kaestle & Ivory, 2012) and psychological practice, by extension.

Bisexual adolescents are an understudied sexual minority subgroup and little is known about their risk behavior patterns and health outcomes (Institute of Medicine, 2011). Available evidence suggests that regardless of sexual orientation, negative health outcomes seen in adulthood are largely attributable to maladaptive and risk behaviors established in adolescence; notably, significant health disparities during this period are already observed between sexual minority and heterosexual youth (Centers for Disease Control and Prevention, 2016a, 2016b). Ancillary research revealing heterogeneous and correlated

patterns of risk behaviors among bisexual youth (e.g., Goodenow, Netherland, & Szalacha, 2002; Robin et al., 2002) further suggests that this population may be encountering a *syndemic*—the interdependent and synergistic co-occurrence of multiple psychosocial problems embedded in structural stigma, where the confluence of multiple risk factors jointly exacerbates the burden of disease (Stall, Friedman, & Catania, 2008; Wright & Carnes, 2016).

Empirical research on syndemic conditions among sexual minorities is not new to public health and psychology. A wealth of studies has documented that generally and indeed, increases in the number of psychosocial risk factors (e.g., mental disorders, substance use, trauma, etc.) are monotonically associated with negative health outcomes (e.g., HIV infection). Most research in this area has operationalized the syndemic construct in an aggregate and linear fashion, where a chosen set of indicators measuring various health problems and/or risk behaviors is combined into a composite score or estimated as a continuous (and assumed to be normally distributed) latent factor (e.g., Coulter, Kinsky, Herrick, Stall, & Bauermeister, 2015) and used to predict mortality-related outcomes, such as HIV-related issues (e.g., Parsons et al., 2017) or suicidality (e.g., Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014). These efforts have accrued crucial information about the frequencies and intercorrelations among risk behaviors (e.g., substance use and sexual risk behaviors) and their impact on sexual minority health outcomes. However, it is empirically unknown whether there are systematically identifiable and predictable *profiles* of simultaneously occurring mental and behavioral risk factors that vary qualitatively above and beyond quantitative differences (e.g., higher or lower incidences and prevalences).

Researchers have called for novel methodological approaches to examining syndemic risk among sexual minorities. For instance, Wright, Carnes, and Cólon-Diaz (2016) called for a syndemic research agenda where the dynamic interplay among disease and adverse psychosocial conditions is modeled in terms of intricate and interconnected relations rather than as linear correlates, as have been traditionally operationalized in contrast to theory. Illuminating the *processes* by which multiple domains of behavioral risk are organized and exert jointly associated effects on health outcomes would contribute to better understanding bisexual health disparities and to informing efforts to alleviate their health-depleting effects.

Given the complexity inherent to a syndemic, I hypothesized that a population subject to structural marginalization may express co-occurring behavioral risks in distinctive and divergent ways that confer differential implications for negative health outcomes. Analytic approaches that are better equipped to model complicated behavior patterns could offer nuanced insights into the nature of comorbid presentations among bisexual adolescents and advance granular information on within-group diversity (Nylund-Gibson & Hart, 2014). Moreover, such evidence would substantiate the assertion that a syndemic may indeed be present in this population and the need for correspondingly sophisticated assessment and intervention efforts for addressing complex systems of behavioral risk.

Study Purpose

In this project, I sought to address some of these unanswered questions by analyzing risk behavior patterns among bisexual adolescents in three domains identified by the Centers for Disease Control and Prevention (CDC) as "high-priority"—sexual risk behaviors, substance use, and victimization experiences—given their consistent links to morbidity and mortality among adolescents (Centers for Disease Control and Prevention, 2016b), and the

elevated and persistent prevalence of these problems among sexual minority youth (Centers for Disease Control and Prevention, 2011, 2016a) and bisexuals specifically (Coker, Austin, & Schuster, 2010) when compared to heterosexuals. I conducted a secondary data analysis of the 2015 Youth Risk Behavior Survey (YRBS)—a publicly-available and nationally representative dataset of high-priority health risk behaviors in secondary school-age American youth—focusing specifically on bisexual adolescents.

Here, I report results from a series of latent class analysis (LCA) models applied to understand the co-occurrence of multiple domains of risk behaviors from a syndemic perspective. LCA is a latent variable modeling technique that is becoming increasingly popular for answering questions about unobserved heterogeneity in a population. Traditional statistical approaches model individual differences with the assumption that their latent structure is continuous, linear, and normally distributed for all members of a population. Furthermore, the assumption is that all members of a sample are derived from a single homogenous population, where any differences observed are randomly scattered around a common mean. In contrast, LCA seeks to empirically uncover "hidden groupings" of people that are typologically and qualitatively distinctive in how they respond to a set of measured variables. Stated differently, LCA treats the construct itself as variable across members of a population, making it appropriate for analyzing unobserved within-group diversity that is hypothesized to be categorical in nature. LCA is a type of mixture model, where individual differences within a population are attributed to the presence of a "mixture" of differing subpopulations. Beyond "level" differences (e.g., more or less of a given construct, such as psychiatric symptoms), LCAs can help to explore "shape" differences, which entail response patterns that reliably and categorically differentiate among subgroups. Using LCA aligned

with my hypothesis that in a syndemic context, a population may simultaneously experience multiple risk factors but in diverging patterns that have differential health implications.

My research questions are organized into two planned studies and are summarized in Table 1. In the first study, I conducted a first-order LCA using all selected indicators to examine the emergent classes of multidimensional behavioral risk in this population. I examined demographic predictors of class membership—bisexual identification (e.g., vs. behaviorally bisexual), sex (female vs. male), race (White vs. person of color)—to determine whether these key variables were associated with class membership in this model. I analyzed a dependent variable of suicidality to study whether class membership in this model predicted variation in this distal outcome. Second, I conducted a second-order or joint LCA. I estimated three separate first-order LCAs with indicators chosen to represent each of the three domains of interest. Then, I estimated a second-order latent class variable that represented the joint (mixture) distribution of the three domain-specific, first-order latent class variables. I analyzed the same predictors and dependent variable in relation to the second-order latent class variable. Finally, I planned to compare the relative utility of the two model solutions qualitatively and quantitatively, including through the use of non-nested model fit statistics and by assessing the strength and direction of associations among the latent class variables and auxiliary variables for the two model solutions.

Significance

This study offers several innovative conceptual and methodological contributions to bisexual health disparities research. First, it examines bisexual people and bisexual adolescents more specifically, which are an understudied, underserved, yet highly vulnerable population. Second, a focus on a secondary-school age population may lend developmental

and preventative implications as behaviors established in this period have been shown to exert persisting effects into adulthood. Third, the use of LCA may advance a novel and holistic view of bisexual adolescents and how they express within-group differences concerning multiple domains of risk behaviors. Fourth, the synergy of theory and method in this application is consistent with adopting a syndemic vantage in seeking a more nuanced understanding of health disparities. Fifth, analysis of large-scale data may yield findings that are more broadly generalizable, advancing compelling evidence to redress structural disparities through policy. Finally, the comparison of multiple LCA modeling approaches may lend guidance on determining appropriate ways to analyze complex systems of behavior in health disparities research.

Chapter 2: Literature Review

Disparities refer to when a subpopulation (in this case sexual minorities) bears a burden of inequity (e.g., disease and psychosocial problems) that significantly exceeds its proportion of the larger population (Adler & Rehkopf, 2008). Research indeed confirms that the prevalence and co-occurrence of disease burden are profound for sexual minorities compared to heterosexuals (Cochran, Sullivan, & Mays, 2003; Coker, Austin, & Schuster, 2010; Conron et al., 2010; Institute of Medicine, 2011). Population-based research and systematic reviews have documented disparities in disabilities (Fredriksen-Goldsen, Kim, & Barkan, 2011); mental disorders, psychological distress, and psychiatric morbidity (Bolton & Sareen, 2011; Bostwick, Boyd, Hughes, & McCabe, 2010; Case et al., 2004; Cochran, 2001; Cochran & Mays, 2000b, 2007, 2009; Cochran et al., 2003; Fergusson, Horwood, Ridder, & Beautrais, 2005; Gilman et al., 2001; Herek & Garnets, 2007; Mays & Cochran, 2001; McNair, Kavanagh, Agius, & Tong, 2005; Meyer, 2003; Oswalt & Wyatt, 2011; Sandfort, de Graaf, Bijl, & Schnabel, 2001); acute and chronic physical health problems (Bränström, Hatzenbuehler, & Pachankis, 2016; Cochran & Mays, 2007; Conron et al., 2010; Lick, Durso, & Johnson, 2013); substance use and related disorders (Burgard, Cochran, & Mays, 2005; Case et al., 2004; Cochran, Ackerman, Mays, & Ross, 2004; Cochran, Keenan, Schober, & Mays, 2000; Cochran & Mays, 2000b, 2009; Drabble, Midanik, & Trocki, 2005; Eisenberg & Wechsler, 2003; Lee, Griffin, & Melvin, 2009; McCabe, Bostwick, Hughes, West, & Boyd, 2010; Russell, Driscoll, & Truong, 2002; Sandfort et al., 2001; Ziyadeh et al., 2007); and self-harm and suicidality (Bolton & Sareen, 2011; Cochran & Mays, 2000a; Haas et al., 2010; McNair et al., 2005; Russell & Joyner, 2001; Silenzio, Pena, Duberstein, Cerel, & Knox, 2007). Sexual minorities experience higher rates of comorbidity (Bolton & Sareen,

2011; Cochran et al., 2003; Conron et al., 2010; Fergusson et al., 2005; Sandfort et al., 2001) and an earlier onset and greater lifetime persistence of certain disorders (Gilman et al., 2001). Given this, U.S. government initiatives have historically identified the alleviation of sexual minority health disparities as a priority for public health (Institute of Medicine, 2011; U.S. Department of Health and Human Services, 2000).

Sexual Minority Youth

As mentioned previously, many of the health disparities discussed here have an early onset. According to population-based studies and systematic reviews, sexual minority youth face a disproportionate risk for multiple poor health outcomes compared to their heterosexual peers (Coker et al., 2010; Saewyc, 2011), including mental health (e.g., depression, psychological distress) and self-image problems (Almeida, Johnson, Corliss, Molnar, & Azrael, 2009; Galliher, Rostosky, & Hughes, 2004; Homma & Saewyc, 2007; Marshal et al., 2011; Saewyc et al., 2007); sexual risk behaviors, including earlier sexual debut and inconsistent condom use (Busseri, Willoughby, Chalmers, & Bogaert, 2008; Coker et al., 2010; Gallart & Saewyc, 2004; Goodenow et al., 2002; Saewyc et al., 2006; Saewyc, Poon, Homma, & Skay, 2008); self-harm, such as cutting (Reisner, Biello, Perry, Gamarel, & Mimiaga, 2014); substance use (Marshal et al., 2008; Marshal, Friedman, Stall, & Thompson, 2009; Russell et al., 2002) and its earlier onset (Coker et al., 2010); and suicidality (Almeida et al., 2009; Haas et al., 2010; Marshal et al., 2011; Peter et al., 2017; Reisner et al., 2014). Elevated suicidality in sexual minority adolescents specifically is a global and extremely problematic phenomenon with remarkable consistency across international population-based research (Borowsky, Ireland, & Resnick, 2001; Eskin, Kaynak-Demir, & Demir, 2005; Fleming, Merry, Robinson, Denny, & Watson, 2007; Pinhey

& Millman, 2004; Wichstrøm & Hegna, 2003). These findings also reflect a nontrivial burden as, statistically, every high school classroom in the U.S. holds at least one LGBTQ student (Fisher et al., 2008), and about one in ten youth report having had same-sex sexual experience (Eisenberg & Resnick, 2006; McFarland & Dupuis, 2003).

Stigma

A strong and expanding literature suggests that these negative health outcomes are a natural consequence of enduring a forced adaptation to dominant expectations, ideologies, and social norms and policies of a heteronormative society (Hatzenbuehler, 2009, 2010, 2014, 2016; Hatzenbuehler & Link, 2014; Meyer, 2003). Historically, the medical and helping professions assumed same-sex sexuality itself as the source of mental illness and behavioral problems until the removal of homosexuality as a diagnosis from the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* in 1973 (American Psychiatric Association, 1973; Bailey, 1999). Much of these health deficits have now been theorized and empirically shown to stem from sexual orientation *stigma* (Herek, 2007; Institute of Medicine, 2011; Major & O'Brien, 2005)—comprised of labeling, stereotyping, marginalization, disempowerment, and discrimination applied to sexual minorities that co-occur as a function of unjust exercise of power in society—which increases exposure to stressful and threatening situations (Meyer, 2003), variously serves to legitimize sexual minorities' devalued social status (Link & Phelan, 2001), and is asserted as a fundamental cause to health disparities at the population level (Hatzenbuehler, Phelan, & Link, 2013; Herek, 2007; Institute of Medicine, 2011; Link & Phelan, 2001; Major & O'Brien, 2005). Stigma is thus a central driver of *minority stress,* the nexus of stressors unique to the sexual minority experience and related psychosocial processes implicated in the disparities

encountered by this population (Meyer, 2003). The influence of minority stress and stigma is chronic and multilevel, operating through biological, psychological, social, and structural mechanisms that exacerbate a host of risk factors, for a range of health outcomes, and across a multitude of contexts (Hatzenbuehler, 2009; Hatzenbuehler & Link, 2014; Hatzenbuehler et al., 2013; Meyer, 2003). See the Appendix for a comprehensive review of theoretical and empirical literature on sexual minority stress and structural stigma and their causal mechanisms in generating and perpetuating health disparities.

Syndemic Theory of Health Disparities

Health disparities and psychosocial problems have been increasingly recognized as co-occurring within larger biopsychosocial contexts rather than existing in isolation as discrete entities, as have been traditionally assumed (Singer, 1994). Indeed, notions of co-occurrence and comorbidity are not new in psychology and a wealth of literature continues to focus on issues of differential diagnosis and nosology (e.g., Franklin, Jamieson, Glenn, & Nock, 2015). Public health and allied fields, however, emphasize more the interdependent relations among health and psychosocial disparities in that the presence of any one condition can and often does exacerbate the deleterious effects of another in a mutually reinforcing manner, ultimately producing an augmented and excess burden of morbidity and mortality (Singer & Clair, 2003). To describe this phenomenon, Singer (1994, 2000) coined the term *syndemic* after observing empirically that multiple disease epidemics (e.g., AIDS, substance use, and violence) tended to cluster, interact, and be concentrated among impoverished urban communities (often populated by people of color) as a function of structural disorganization—including issues of exposure to community and domestic violence, healthcare inequity, and poverty—and other forms of marginalization stemming from the

oppressive structuring of gender, ethnic, racial, sexual orientation relations in society. With qualitative work examining sexually transmitted infections (STI) in urban communities, for example, Singer and colleagues (2006) documented that socioeconomic and political forces—such as class inequality, deprivation, interpersonal and structural violence, racism, and resource scarcity—made safer sex practices difficult to sustain, and in fact propagated risky sexual behaviors by fueling a cultural logic that encouraged the prioritization of immediate emotional, sexual, and material gains rather than long-term consequences and planning. Quantitative research has similarly established the presence of syndemic conditions in predominantly low-income, ethnic/racial minority, urban communities with respect to STI risk (Senn, Carey, & Vanable, 2010). As such, the term syndemic refers collectively to the inextricable and synergistic relations among biopsychosocial health risk factors; ways in which the interconnectedness among disease processes compound and amplify their health-depleting effects; and the interlocking systems of oppression and conditions of inequity that perpetuate, exacerbate, and entrench the burden of disease (Egan et al., 2011; Romero-Daza, Weeks, & Singer, 2003; Singer, 1994, 2000; Singer et al., 2006; Singer & Clair, 2003).

In their theoretical review, Stall and colleagues (2008) observed that despite their relative socioeconomic advantage (compared to the disadvantaged ethnic/racial minority participants in Singer's studies), middle-class White bisexual and gay men commonly recruited and studied in early HIV/AIDS research nevertheless seemed to experience an early onset of a syndemic encompassing HIV risk behaviors, mental health problems, and substance use. To explain these patterns, the authors theorized that early and continuing sexual orientation-related victimization and adversities may predispose sexual minority men with less coping resources in handling life stressors, transitions, and novel social situations.

They further posited that these deficits may drive a developmental cascade of psychosocial maladjustment, maladaptive coping, and depleted social capital that collectively encourages the emergence of multiple epidemics. Using evidence drawn from the psychiatric nosology and affective-cognitive neuroscience literatures, Pachankis (2015) more recently but similarly argued that minority stress may engender syndemic conditions in sexual minority men by disrupting psychological pathways governing affective and stress-related processes relevant to mental health and self-regulation (see Appendix). Multiple reviews (Halkitis, Wolitski, & Millett, 2013; Jeffries IV, 2014) have discussed structural forces—including heterosexist harassment, rejection, victimization, and violence, as well as racist disenfranchisement and stressors for sexual minority people of color—as key drivers of syndemics in sexual minorities beyond biobehavioral mechanisms of HIV transmission. For example, incarceration, poverty, racism, and urban violence-related trauma have been implicated in the disproportionate crisis of the HIV/AIDS syndemic among Black and Latino men (Millett et al., 2012; Wilson et al., 2014).

Indeed, syndemic processes among sexual minorities have been subject to increasing empirical investigation, with specific attention paid to bisexual and gay men in terms of their historical burden of the HIV/AIDS epidemic and associated fatalities (Wright & Carnes, 2016). An early literature review found that substance use and risky sexual behavior (e.g., for HIV infection) frequently co-occurred among bisexual and gay men, with non-injection drug use significantly increasing the likelihood of HIV infection; among behaviorally bisexual men specifically, injection drug use was more strongly associated with HIV risk relative to monosexual men (Stall & Purcell, 2000). A more recent review confirmed that binge drinking and methamphetamine use were consistently linked with risky sexual behaviors in

sexual minority men as well (Vosburgh, Mansergh, Sullivan, & Purcell, 2012). Using a sample of urban sexual minority men drawn from 4 major U.S. cities, Stall and colleagues (2003) reported statistically significant intercorrelations among polysubstance use, depression, intimate partner violence (IPV), and childhood sexual abuse. Furthermore, the authors established that the co-occurrence of these variables exerted an additive effect such that the introduction of each additional risk factor monotonically increased the likelihood of HIV infection and risky sexual behavior.

Numerous studies over time have extensively verified the above patterns—in terms of the frequent co-occurrence of victimization (childhood and/or adult; heterosexist stigma-related discrimination), substance use (e.g., binge drinking; polysubstance use), mental health problems (e.g., depression; post-traumatic stress symptoms), and HIV risk behaviors (e.g., unprotected anal sex)—and their compounding effect in increasing risk for HIV and/or STI infection among sexual minority men of diverse ethnic/racial backgrounds in the U.S. (Halkitis, Moeller, et al., 2013; Halkitis, Wolitski, et al., 2013; Martinez et al., 2016; Muñoz-Laboy, Martinez, Levine, Mattera, & Fernandez, 2017; Parsons et al., 2017) and in international samples (Jie, Ciyong, Xueqing, Hui, & Lingyao, 2012; Santos et al., 2014). Sexual compulsivity (Dyer et al., 2012; Herrick, Lim, et al., 2013; Parsons, Grov, & Golub, 2012; Starks, Millar, Eggleston, & Parsons, 2014) and problematic hypersexuality (Parsons, Rendina, Moody, Ventuneac, & Grov, 2015) have been examined more recently and found to function as part of this syndemic constellation. Finally, Halkitis and colleagues (2015) found that syndemic conditions among sexual minority men exhibited longitudinal stability over 18 months using a prospective study, attesting to their chronicity and entrenched nature.

As theorized, evidence supports the linkage among minority stress experiences across the lifespan and the genesis and maintenance of syndemic burden among sexual minorities. In sexual minority women, heterosexist discrimination predicted the likelihood of experiencing a syndemic of binge drinking, depression, polysubstance use, and STI history (Coulter et al., 2015). Similarly in a qualitative study, bisexual women reported perceiving their mental, reproductive, and sexual health as being interrelated and collectively diminished by binegativity (to be discussed later) and monosexism (Flanders, Gos, Dobinson, & Logie, 2016). Among black sexual minority men, exposure to general and minority stress conditions in childhood, adolescence, and adulthood—including child abuse, sexual orientation-related victimization, internalized heterosexism, perceived failure to attain conventional masculine ideals, and social isolation—heightened the likelihood of experiencing a syndemic comprised of depression, binge drinking, stimulant use, IPV, and psychological stress; this constellation in turn additively predicted risky sexual behavior (Dyer et al., 2012). Using a sample of 1551 sexual minority men, Herrick, Lim, and colleagues (2013) found that childhood and adult victimization, low social connection, perceived failures to attain masculine ideals, and psychological stress increased the likelihood of a syndemic (of IPV, mental health problems, sexual compulsivity, and substance use), which furthermore predicted HIV risk behavior. Analyses of Pacific Northwest population data spanning a decade revealed that the higher rates of sexual abuse history among sexual minority youth (compared to heterosexuals) partially explained HIV risk behaviors—including sex while intoxicated and injection drug use—and the interaction effects among abuse history and HIV risk were more pronounced among sexual minorities (Saewyc et al., 2006). Among youth of all sexual orientations in the 2005 and 2007 YRBS, victimization (e.g., threats, theft, and forced sex) was predictive of a

latent syndemic factor (e.g., IPV, mental health problems, polysubstance use, and sexual risk), which in turn increased the likelihood of a serious suicide attempt needing medical attention. Notably, the levels of and associations among measured variables were highest and strongest, respectively, among bisexuals compared to monosexuals (Mustanski et al., 2014).

Bisexual Health and Binegativity

Bisexuality involves "the potential to be attracted–romantically and/or sexually–to people of more than one sex and/or gender, not necessarily at the same time, not necessarily in the same way, and not necessarily to the same degree" (Ochs, 2005, p.8). Population-based studies have noted that bisexual people represent the largest sexual minority population in the United States (Copen, Chandra, & Febo-Vazquez, 2016; Gates, 2011; Herbenick et al., 2010; Pew Research Center, 2013). Whether defined by attraction, behavior, or identity, findings appear to conclude that there are more bisexuals than lesbians and gay men combined.

Research indicates that compared to lesbians and gay men and/or heterosexuals (e.g., monosexuals), bisexuals experience additional psychosocial health disparities (Conron et al., 2010; Dyer, Regan, Pacek, Acheampong, & Khan, 2015; Feinstein & Dyar, 2017), including in childhood adversity (Jorm, Korten, Rodgers, Jacomb, & Christensen, 2002); chronic illnesses (Conron et al., 2010; Fredriksen-Goldsen, Kim, Barkan, Muraco, & Hoy-Ellis, 2013); disabilities (Fredriksen-Goldsen et al., 2011); incarceration (Dyer et al., 2015); mood disorders (Bolton & Sareen, 2011; Bostwick et al., 2010; Case et al., 2004); substance use (Case et al., 2004; Green & Feinstein, 2012); suicidality (Bolton & Sareen, 2011; Saewyc et al., 2007); victimization (Feinstein & Dyar, 2017; Jeffries IV, 2014); and other mental (Koh & Ross, 2006; McNair et al., 2005), behavioral, and sexual (Dyer et al., 2015; Jeffries IV, 2014; Knight et al., 2007) health problems. Bisexual people report diminished social support

(Jorm et al., 2002) and decreased social well-being, the latter of which impedes perceived community connectedness (Kertzner, Meyer, Frost, & Stirratt, 2009). Research also shows that bisexuals experience increased financial difficulties (Jorm et al., 2002) and socioeconomic status (SES) issues, including a higher likelihood of participating in exchange sex (Dyer et al., 2015; Jeffries IV, 2014). Other notable structural concerns include self-reported unmet healthcare needs (Tjepkema, 2008) and more barriers to healthcare (Conron et al., 2010), including problems accessing affordable and culturally-competent healthcare providers knowledgeable in bisexual issues (MacKay, Robinson, Pinder, & Ross, 2017).

The increased disparities among bisexuals compared to monosexuals are associated with the "double discrimination" encountered from both the larger heterosexist society and mainstream lesbian/gay community (Balsam & Mohr, 2007; Brewster & Moradi, 2010a; Cox, Bimbi, & Parsons, 2013; Dobinson, MacDonnell, Hampson, Clipsham, & Chow, 2005; M. R. Friedman, Dodge, et al., 2014; Helms & Waters, 2016; Herek, 2002; Israel & Mohr, 2004; Li, Dobinson, Scheim, & Ross, 2013; Mulick & Wright Jr., 2002, 2011; Ross, Dobinson, & Eady, 2010; P. C. R. Rust, 2002; Yost & Thomas, 2012). Beyond general forms of sexual minority stress and stigma, bisexuals are exposed to binegativity—the collection of hostility, marginalization, and stigmatization that stereotypes bisexuality as an illegitimate sexual orientation and pathologizes bisexuals as flawed in character, such as by being liars or untrustworthy (Israel & Mohr, 2004). Binegativity is dual-sourced and besets bisexuals with alienation, isolation, misunderstanding, and barriers to supportive relationships and communities vis-à-vis both heterosexuals and lesbians and gay men (Bostwick & Hequembourg, 2014; Brewster & Moradi, 2010a; M. R. Friedman, Dodge, et al., 2014; Helms & Waters, 2016; Herek, 2002; Israel & Mohr, 2004; Mulick & Wright Jr., 2002, 2011;

Ross et al., 2010; P. C. R. Rust, 2002; Weiss, 2003; Welzer-Lang, 2008; Yost & Thomas, 2012). Bisexuals indeed report perceiving interpersonal and structural monosexism and binegativity as significant determinants to their mental health (Dodge et al., 2012; Ross et al., 2010). According to psychotherapists (Dworkin, 2001; Guidry, 1999; Lourea, 1985; Matteson, 1995; Smiley, 1997; Wolf, 1987a, 1987b), bisexual clients commonly present with concerns about invisibility, invalidation, and isolation in heterosexual and mainstream LGBT communities, and with distress about others assuming that all bisexuals have character flaws (e.g., immature; noncommittal) or act as HIV/STI risk vectors. It is worth noting that according to a recent meta-analysis, the stereotype that bisexuals are vectors of disease has been found to lack empirical support (M. R. Friedman, Wei, et al., 2014).

Coming out (e.g., disclosing one's bisexuality) is additionally challenging for bisexuals given the hostility they encounter across multiple social contexts (Dodge et al., 2012). Indeed, bisexual people appear to be less open about their sexual orientation than monosexuals (Balsam & Mohr, 2007), including in healthcare service contexts (Durso & Meyer, 2013). In a mixed-methods study, female bisexual youth reported that negative encounters with previous healthcare providers (e.g., sex-negative and/or heteronormative attitudes), bisexual stigma (discussed below) within families, and concerns about confidentiality deterred open conveyance of their healthcare needs (Arbeit, Fisher, Macapagal, & Mustanski, 2016). Furthermore, bisexuals experience negative disclosure consequences distinct from those of monosexual minorities (Dobinson et al., 2005), including higher distress and mood disturbance after coming out (Koh & Ross, 2006; Pachankis, Cochran, & Mays, 2015). These issues may be particularly marked for some bisexual people of color who are behaviorally bisexual but cannot or do not identify explicitly as bisexual due

to community, cultural, and/or safety issues (Dyer et al., 2015; Jeffries IV, 2014; Malebranche, Arriola, Jenkins, Dauria, & Patel, 2010). Finally, bisexual people may develop internalized binegativity—which can include identity confusion, negative attitudes about one's own bisexuality, and devaluation of self-worth—adopted through chronic exposure to prejudicial messages and discriminatory treatment (Balsam & Mohr, 2007; Paul, Smith, Mohr, & Ross, 2014; Ross et al., 2010; Sarno & Wright, 2013). Internalized sexual minority stigma is associated with numerous negative mental and behavioral health outcomes as discussed and reviewed elsewhere (Berg, Munthe-Kaas, & Ross, 2016; Herek, Gillis, & Cogan, 2009; Newcomb & Mustanski, 2010; Szymanski, Kashubeck-West, & Meyer, 2008b). Conversely, overcoming internalized sexual minority stigma is salubrious in terms of alleviating psychological distress and improving relationship functioning and other psychosocial indices (Herrick, Stall, et al., 2013).

Partly due to coming out issues, lack of established bisexual community networks, and the stigmatized status of having a bisexual identity, this population can be hard to reach and study, as well (Pallotta-Chiarolli, 2006). Indeed, the Institute of Medicine (2011) reported that significantly less research attention has been paid to bisexuals, including bisexual youth specifically (Kaestle & Ivory, 2012). Furthermore, sexual minority health researchers have traditionally combined bisexuals with lesbians and gay men or excluded bisexuals altogether, deterring specificity and generalizability for all sexual minority subgroups and likely biasing and/or suppressing significant within-group variation (Bostwick, 2012; Bostwick & Hequembourg, 2013; Kaestle & Ivory, 2012; Pallotta-Chiarolli, 2006). The continued practice of aggregation is surprising given that multiple disciplinary bodies of literature have long recognized qualitative differences in behavioral,

health-related, and social profiles among bisexuals and monosexual minorities (Ellis, Hoffman, & Burke, 1990; Reiss Jr., 1961; Russell, Seif, & Truong, 2001; Saewyc et al., 2008; Udry & Chantala, 2002; Weinberg, Williams, & Pryor, 1994). Moreover, emerging evidence suggests that bisexuals (e.g., when analyzed simultaneously and separately from monosexuals) often partially or fully explain some of the health disparities documented among sexual minorities and heterosexuals, suggestive of a borne excess burden (Goodenow et al., 2002; Jorm et al., 2002; Lindley et al., 2012; Loosier & Dittus, 2010; Robin et al., 2002; Russell, Seif, et al., 2001; Savin-Williams & Joyner, 2014; Udry & Chantala, 2002).

Bisexual Youth. Evidence suggests that developing a bisexual identity during adolescence may be a particularly vulnerable period given the added and multiple health-related vulnerabilities this population experiences compared to their lesbian and gay counterparts, as noted above. Coker and colleagues' (2010) comprehensive review of LGBT adolescent health research reported that bisexuals are at increased exposure to stigma and consequent disparities in substance use, risky sexual behavior, eating disorder issues, and suicidality relative to lesbian and gay youth. Israel (2010) reported similar review findings and discussed peer-victimization, IPV, and juvenile delinquency as significant risk factors for bisexual youth, as well as increased barriers to accessing supportive adults and community networks. In a respondent-driven sampling study, Ross and colleagues (2014) reported a high weighted prevalence of multiple psychosocial problems in 405 bisexuals—including anxiety, depression, post-traumatic stress, substance use, and suicidality; furthermore, youth (ages 16-24) reported significantly higher rates of depression, post-traumatic stress, and past-year suicide attempts compared to older bisexuals. An analysis of the National Longitudinal Study of Adolescent Health (Add Health) data revealed that bisexual girls were significantly more

depressed compared to monosexual peers (Udry & Chantala, 2002). Population data indicates that bisexual youth experience increased comorbidity of health risk behaviors as well (Robin et al., 2002). The combination of these findings implies that more research is needed to understand the nature of co-occurring risks (e.g., whether there is a syndemic condition) and their developmental onset (e.g., predictors and outcomes) in this population.

Bisexual adolescents seem to experience barriers to social supports and increased isolation. In a study using Add Health data, sexual minority youth reported lower social supports (e.g., positive peer and family relations) compared to heterosexuals, with bisexual girls particularly compromised in teacher relationships and positive family interactions (Russell, Seif, et al., 2001). Similarly, sexual minority youth in Wave II of Add Health reported less school belonging, self-esteem, and higher depression compared to heterosexuals, and the effects were significantly stronger for bisexual girls (Galliher et al., 2004). Using 6 large-scale datasets from Canada and the U.S., Saewyc and colleagues (2009) found that bisexual youth reported less protective factors—such as family and school connectedness—compared to heterosexual peers, with the strongest effects for bisexual girls; furthermore, sexually-active bisexual adolescents were less likely to feel socially connected compared to lesbian and gay peers. Bisexual youth and bisexual girls in particular appear to experience diminished social belonging across family, peer, school, and other contexts, which may relate to their displayed vulnerability for maladaptive coping and risk exposure.

Sexual risk. Research indicates that bisexual youth engage in sexual behavior patterns with known associations with HIV/STI risk. Using data from three waves of the Massachusetts YRBS, Goodenow and colleagues (2002) found that compared to monosexual peers, male bisexual youth exhibited significantly higher rates of four types of sexual risk

behaviors—having multiple partners, STI diagnoses, unprotected sexual intercourse, and using injection drugs—and that, moreover, this pattern was exacerbated by having a history of coerced or forced sex. Similarly, analyses with Add Health data revealed that rates of exchange sex (e.g., for drugs and/or money) were highest among bisexual youth compared to monosexuals (Udry & Chantala, 2002). State and provincial population data have also revealed that bisexual youth engage in levels of sexual risk behavior (e.g., early sexual debut, number of sexual partners, sex while intoxicated, and/or STI history) similar to or higher than their monosexual peers (Saewyc et al., 2006). Notably, the sexual risk factors examined in previous research appear to intersect with other behavioral issues, such as substance use and victimization, reinforcing the need for a syndemic-oriented perspective.

Substance use. Substance use is a significant health problem for bisexual youth across multiple classes of drugs and at varying severities of use. A meta-analysis comparing heterosexual and sexual minority youth revealed generally "large" effect sizes in substance use, with bisexual youth exhibiting a 340% increased odds of use compared to heterosexuals (Marshal et al., 2008). Analyses with multiple state-level YRBS data has suggested that bisexual youth are at increased risk for binge drinking, marijuana use, and stimulant use (e.g., cocaine) compared to monosexuals (Robin et al., 2002). Similarly, research with Add Health data revealed bisexual youth endorsing higher alcohol use, illicit substance use, and smoking compared to monosexuals (Udry & Chantala, 2002). Latent curve modeling with Add Health data demonstrated that compared to monosexuals, initial rates of substance use were significantly higher for bisexuals, and they exhibited steeper growth slopes in alcohol (including binge drinking) and tobacco use over time (Marshal et al., 2009). Analyses with community-based population data from the Growing Up Today Study have likewise found

that bisexually-attracted youth were at higher risk of alcohol (Ziyadeh et al., 2007) and tobacco use (Austin et al. 2004) compared to their heterosexual peers, with sexual minority girls exhibiting notably high prevalence in both domains. It is definitively apparent that polysubstance use is a longitudinally stable and significant health concern for this population, one requiring further investigation in terms of potentially diverging patterns of use.

Victimization. Evidence suggests that bisexual youth are at risk for exposure to victimization and violence. Using two state-level YRBS data, Robin and colleagues (2002) reported that compared to monosexuals, behaviorally bisexual youth were significantly more likely to report harassment (e.g., threatened or injured with a weapon at school) and violence (a physical fight). Research with Add Health data has indicated that bisexual youth are at increased risk of being physically attacked (Russell, Franz, & Driscoll, 2001; Udry & Chantala, 2002). Interestingly, some evidence suggests that bisexual youth are also more likely than monosexual youth to exhibit delinquency, such as petty theft and unruly public behavior (Udry & Chantala, 2002). Research has not examined how such findings correspond with traditional theories (e.g., stigma) related to sexual minority health disparities. Juvenile delinquency may fit within a larger constellation of maladaptive responses (e.g., substance use) or socially learned behaviors (e.g., victimization) vis-à-vis minority stress in this population, an area awaiting empirical investigation.

Suicidality. Research suggests that suicidality in bisexual youth is a persisting and significant health problem. Multiple school-based surveys have suggested that bisexual youth are at high risk for suicidal behavior, especially bisexual boys (Robin et al., 2002; Saewyc et al., 2007). Analysis of Add Health data has, however, suggested significant suicidality risk for bisexual girls compared to monosexuals (Udry & Chantala, 2002). A meta-analysis

revealed that whereas monosexual minorities were twice as likely to express suicidality compared to heterosexual youth, bisexuals were five times as likely (Marshal et al., 2011).

Bisexual youth also seem to present unique longitudinal patterns in suicidality. Nationally-representative prospective research has shown that bisexual youth do not exhibit decreases in suicidality as they progress into young adulthood as is the case with many monosexuals (Cardom, Rostosky, & Danner, 2013). Using longitudinal Canadian school-based population data, Peter and colleagues (2017) likewise reported that generally, sexual minority youth were persistently at greater risk for suicidality across a 15-year period and described particularly concerning patterns for bisexuals. First, about a third of bisexual boys consistently expressed suicidal ideation and an equivalent number of bisexual girls attempted suicide over the studied period. Second, disparities among bisexual and heterosexual youth had widened such that by 2013, bisexuals were six times more likely to express suicidality. As such, further research examining mental and behavioral risk patterns that contribute to this heightened prevalence and endurance of suicidality among bisexual youth is warranted.

Finite Mixture Modeling: Latent Class Analysis, Extensions, and Applications

Latent class analysis (LCA) belongs to a family of latent variable modeling techniques—called finite mixture models—whose goal is to uncover unobserved heterogeneity in a population (Hagenaars & McCutcheon, 2002; Masyn, 2013; McLachlan & Peel, 2000). Mixture models are appropriate for research questions seeking to identify systematic differences among multiple "hidden groupings" or mixtures of subgroups within a larger population with respect to a phenomenon of interest. More technically, mixture techniques are used to model the joint distribution of a set of observed variables as a function of a latent categorical variable, which represents a finite and mutually exclusive and

exhaustive set of unobserved components—a mixture of subpopulations if you will. LCA specifically is used to identify latent classes of people that are substantively meaningful and qualitatively distinct in how they respond to measured variables. These typological patterns of item responses are then used to define and estimate a specified number of subpopulations to which individuals are classified. To note, LCAs concern heterogeneity that is unobservable (e.g., behavior patterns) compared to known group differences, such as treatment vs. no treatment in an intervention context (Nylund-Gibson & Hart, 2014).

There are several attractive features to the LCA model for syndemic research questions such as those in this dissertation. LCA is considered a person-centered, empirically-derived classification method. This contrasts dominant variable-centered approaches (e.g., factor analysis) that generally assume cases to be dispersed along a normally-distributed continuum. If classifying or differentiating among scores or individual cases is desired, a determination of arbitrary cutoffs is usually necessary (Nylund, Bellmore, Nishina, & Graham, 2007). Furthermore, unlike other classification techniques such as cluster analysis, LCA offers a "model-based" mathematical evaluation of how well a proposed LCA model adequately represents or "fits" the data in terms of reproducing the covariation actually observed among the model indicators. Because mixture models are semiparametric techniques requiring only the assumptions of within-class normality and local independence, they can be more appropriate for modeling problem behaviors whose distributions by nature are generally highly skewed (e.g., zero-inflated) and whose data structure is often categorical in population-based study samples (Feldman, Masyn, & Conger, 2009). Finally, it is also possible to link latent classes with external or "auxiliary" variables, including predictors (e.g., gender) and consequences (mental health) of class membership.

Latent "Co-occurrence" Model. An advanced extension of LCA—variously known as joint LCA (JLCA) or a latent "co-occurrence" model (K. Nylund-Gibson, personal communication, June 8, 2018)—permits a higher-order analysis of multiple latent class variables corresponding to multiple substantive domains or attributes (Jeon, Lee, Anthony, & Chung, 2017; Nylund, 2007). Traditional LCAs are generally used to recover unobserved heterogeneity with respect to a single domain of interest (which can be multidimensional); however, they cannot examine the joint association of class memberships across multiple discrete latent class variables (Jeon et al., 2017). Simultaneously entering indicators corresponding to multiple discrete latent class variables into a first-order traditional LCA can incur statistical and theoretical problems and model misspecification if the "true" model is a joint LCA model (Jeon et al., 2017), although the "truth" is rarely known *a priori* in most applications. In this case, disrupted communality estimates for the collective distribution of indicators can lead to under- or over-extraction of latent classes. Moreover, interpreting misspecified standard LCAs can be ambiguous as class solutions contain undifferentiated information related to heterogeneity within each latent class variable and the higher-order associations across them (Jeon et al., 2017).

The latent co-occurrence model is thus appropriate when examining the systematic interrelatedness among multiple discrete latent class variables at the second-order level—in other words, uncovering whether there are combinational patterns by which class memberships across multiple substantive domains "co-occur" within a population. Stated differently, the second-order latent class variable is a mixture of two or more first-order latent class variables. The latent co-occurrence model is, statistically speaking, the cross-sectional counterpart of latent transition analysis (LTA; Nylund, 2007). To date and my

knowledge, however, no study has explored how to decide among a traditional LCA and JLCA in terms of appropriateness (and under what data conditions) when the goal is to simultaneously model multiple substantive domains of a given phenomenon.

Chapter 3: Method

Participants

Data from bisexual youth aged 15 or older were drawn from the 2015 YRBS (N = 1,053). In this project, I defined bisexual as either endorsing a bisexual identity or reporting sexual activity with both females and males. Scholars have noted that sexual orientation is operationalized in multiple ways and that these decisions often have a nontrivial effect on the results and interpretation of sexual minority health disparities research (e.g., Bostwick et al., 2010; Savin-Williams & Ream, 2007). An inclusive theoretical stance (Ochs, 2005) informed my choice to operationalize bisexuality in terms of both identification and behavior, which was corroborated by empirical research indicating that bisexuals are likely to use multiple sexual identity labels (Galupo, Mitchell, & Davis, 2015), vary them across time and social contexts (Mohr, Jackson, & Sheets, 2016), and use disclosure strategies in accordance with situational cues (Baldwin et al., 2015; McCormack, Wignall, & Anderson, 2015; McLean, 2007), all of which may be related to their likelihood of expressing higher sexual fluidity compared to monosexuals (Diamond, Dickenson, & Blair, 2017) as well as strategic identity presentation to deter stigma. Additionally, although bisexual health disparities research has included samples that are variously defined in terms of bisexuality (e.g., identity vs. behavior), the preponderance of the evidence has pointed to similar conclusions as described in the literature review presented previously. Given these considerations, I opted for the inclusion of both identity and behavior in defining the sampling frame.

Stated sexual identity was bisexual (73%), heterosexual (15%), not sure (8%), and lesbian or gay (3%). Sex of sexual contacts was both females and males (58%), never had sexual contact (20%), males only (14%), and females only (6%). Of those who did not

identify as bisexual, all reported having had sexual contact with both females and males. Participants reported their age as 15 (28%), 16 (31%), 17 (29%), and 18 or older (18%). Participants reported high school grade as, 9th (16%), 10th (31%), 11th (29%), and 12th (24%). The sample was about 78% female and 21% male, and about 44% White, 27% multiethnic, 13% Black, 11% Hispanic/Latino, 3% Asian, and 2% Native American (e.g., including Alaskan Native, Native Hawaiian, or another Pacific Islander). The YRBS did not include other demographic variables relevant to this study.

Measures

The 2015 YRBS included 99 binary or count-based questions about risk behaviors and demographic characteristics. Methodological details of the development, structure, administration, evaluation, and validity and reliability related to and supporting the use of the YRBS are discussed elsewhere (Centers for Disease Control and Prevention, 2013). I reviewed items pertaining to the three domains of interest: sexual risk behavior, substance use, and victimization. I selected or computed five binary indicators for each domain considering theoretical rationale, literature guidance (Greenfield, 2000; National Institute on Drug Abuse, 1975; National Institute on Drug Abuse, 1997; Room, 2000), and expert feedback from researchers who have published in the areas of sexual risk behavior, substance use, or victimization. See Table 2 for the list of chosen indicators and their descriptive statistics. I used five binary items measuring suicidality (e.g., *"…did you ever seriously consider attempting suicide?"*) to estimate a latent factor of suicidality as a distal outcome.

Procedure

Participants were recruited from randomly selected schools nationwide; details regarding data collection and processing procedures are described elsewhere (Centers for

Disease Control and Prevention, 2013, 2016a). I acquired a non-human subjects research determination and thus institutional review board (IRB) approval was unnecessary.

Data Screening. The YRBS undergoes extensive fidelity checks before public release, the details of which are reported elsewhere (Centers for Disease Control and Prevention, 2013, 2016a). However, given that mischievous responding in large-scale youth surveys is commonplace and can seriously distort the estimation of population-based disparities, I applied an additional evidence-based data screening strategy described in Robinson-Cimpian (2014). Using IBM SPSS 24.0, I computed a count-based screener variable using a combination of 10 items determined to be theoretically irrelevant to bisexual health. I excluded 752 ineligible cases with a score ≥ 2 on the screener variable (of 10, where higher scores indicated increasingly implausible response patterns) from the original sample (N = 15,624). Among those excluded, sixty-two were bisexual (see above and below for how bisexuality was defined in this study). I screened the original sample rather than the bisexual subsample given that endorsing bisexuality could itself be a mischievous response. Then I selected bisexual youth—which I defined as having a bisexual identity and/or reporting sex with both girls and boys—who were 15 years or older, resulting in a final analysis sample of 1,053 cases. I handled missing data with full information maximum likelihood (FIML) under the missing at random (MAR) assumption (Enders, 2010).

Analytic Plan. All models were estimated using M*plus* 8.0 (L. K. Muthén & Muthén, 1998). The data met heuristics suggesting $N \geq 500$ for LCAs (Finch & Bronk, 2011).

Enumeration. I followed class enumeration procedures reported in Masyn (2013), which began with fitting a one-class model. I then progressively increased the number of classes by one and evaluated whether estimating each additional class led to conceptually and

statistically superior solutions. I terminated class enumeration after encountering evidence of over-parameterization (e.g., model non-convergence). I used FIML with robust standard errors and a large number of random starts to establish global maxima and to avoid convergence on local solutions (McLachlan & Peel, 2000). Please see Masyn (2013) for an in-depth treatment of issues regarding global vs. local maxima in mixture models.

To decide on the optimal number of classes, I relied on a joint evaluation of multiple fit statistics (Masyn, 2013; Nylund, Asparouhov, & Muthén, 2007). First, I examined approximate fit criteria—including the log likelihood (LL), Bayesian Information Criterion (BIC), sample size-adjusted Bayesian Information Criterion (SABIC), Consistent Akaike Information Criterion (CAIC), and Approximate Weight of Evidence Criterion (AWE)—where lower values indicate better fit. Second, I used two likelihood tests—the Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test (VLMR-LRT) and the bootstrapped likelihood ratio test (BLRT)—which provide *p*-values that evaluate whether extracting another class (*k*) improves model fit compared to a solution with one less class (*k*-1). Third, I reviewed the Bayes Factor (*BF*), a relative comparison of fit between two neighboring models (where $1 < BF < 3$ suggests "weak" support for the model with fewer classes, $3 < BF < 10$ suggests "moderate" support, and $BF > 10$ suggests "strong" support). Fourth, I examined the correct model probability (*cmP*), a probability estimate of each model being "correct" out of all models considered assuming that the "true" model is among them; the model with the highest value is selected (Masyn, 2013). Finally, as inconsistency among fit statistics is common (Masyn, 2013)—which is the rule rather than the exception in most LCA applications—I considered the substantive meaningfulness, defensibility, and parsimony of the candidate solutions by visually inspecting the conditional item probabilities (B. O. Muthén, 2003).

Classification. I reviewed several classification statistics to evaluate differentiation and separation among the classes in the chosen LCA solution (Masyn, 2013). First, I examined entropy (Celeux & Soromenho, 1996), an omnibus index where values > .80 qualify as "good" classification in the overall model (Clark & Muthén, 2009). Second, I examined average posterior probabilities (*AvePP*), a class-specific classification index that identifies how well a given set of indicators accurately predict class membership, where values > .70 denote distinct and well-separated classes (Nagin, 2005). Third, I considered the odds of correct classification (*OCC*), which is another class-specific index where *OCCs* > 5 reflect "good" class assignment accuracy. Finally, for each class, I assessed classification error by comparing the modal class assignment proportion (*mcaP*)—an index of classification certainty measured by the proportion of people modally assigned to class—to the bias-corrected bootstrapped 90% confidence interval (CI) corresponding to the model-estimated class proportion ($\hat{\pi}$). Here, I examined whether the *mcaP* was within-range of the 90% CI of the $\hat{\pi}$ for each class, where out-of-range *mcaP* values were deemed non-ignorable.

Auxiliary variables. I estimated auxiliary variable associations with the latent class variable from the chosen solution. I used three binary covariates of bisexual identification (e.g., those who openly identified as bisexual vs. those who were behaviorally bisexual only), sex (e.g., female vs. male), and race (e.g., White vs. people of color). I also used five indicators to estimate a latent factor of suicidality as a distal outcome. I selected these auxiliary variables for conceptual relevance based on prior bisexual health research and within the confines of the available data.

I used the Bolck, Croon, and Hagenaars (BCH) method for the auxiliary variable analyses (Asparouhov & Muthén, 2014; Bolck, Croon, & Hagenaars, 2004; Vermunt, 2010).

This strategy separates class enumeration and estimation from the estimation of structural associations in the modeling process to prevent auxiliary variables from unintentionally influencing the formation of the emergent latent class variable (Nylund-Gibson & Masyn, 2016). BCH accounts for classification error at the person-level, thereby lending more precision to estimates. By regressing the latent class variable on the covariates using multinomial logistic regression (see Figure 1 and 2), I examined whether class proportions were equivalent across the three covariate groups. I estimated the distal outcome as class-specific factor means with unit loading identification (T. A. Brown, 2015), controlling for the centered covariates. The centered covariates represented the relative proportions of the binary groups within each demographic predictor, which eased the interpretation of the distal outcome means (which are conditional factor means) of suicidality across classes. To make mean comparisons for suicidality across classes, I chose a substantively meaningful reference class for which all conditional factor means were fixed at 0. This permitted me to compare the class-specific factor means of each class relative to the reference class. I interpreted the conditional factor mean differences on a metric akin to Cohen's *d* (J. Cohen, Cohen, West, & Aiken, 2003), as I computed these comparisons using the pooled variance across classes. See Figure 1 for the path diagram of the first-order LCA model with auxiliary variables.

Although age range was narrow in my sample (e.g., approximately 15-18 years old), I controlled for high school grade in the chosen LCA solution to account for maturation before fixing the classes to be held constant for the auxiliary analyses. To assess the appropriateness of controlling for high school grade, I conducted sensitivity analyses to examine whether the inclusion of this variable reshaped the emergent classes; this is further discussed in Results.

Joint LCA. I followed the class enumeration steps above to estimate three separate first-order LCAs for each of the three domains of risk behaviors. Then I conducted a second-order LCA using steps adapted from Nylund (2007) to examine the latent co-occurrence of class memberships across multiple latent class variables. I planned to analyze the auxiliary associations with the second-order latent class variable with latent transition mixture modeling procedures reported in Nylund-Gibson, Grimm, Quirk, and Furlong (2014). See Figure 2 for the path diagram of the second-order LCA model with auxiliary variables.

Chapter 4: Results

I encountered non-convergence of the 2nd-order models suggesting empirical non-identification of these models. Thus, I only report the results and discussion pertaining to the 1st-order model described in the first proposed study (see Table 1), from this point onward.

Fit statistics are reported in Table 3. The BIC, AWE, VLMR-LRT, and *cmP* suggested a 4-class solution. The SABIC and CAIC supported a 6-class solution. The *BF* supported the range of 4- to 9-class solutions, whereas the BLRT suggested an 8-class solution. I plotted the ICs, which revealed elbows indicating "diminishing returns" in model fit with each additional class after the 4-class and 6-class solutions (see Figure 3). I thus considered the 4- and 6-class solutions as the most plausible candidate models in this study.

To decide on the final model, I considered the information from the fit indices in context of model parsimony and substantive interpretability, which led to selecting the 6-class model for the following reasons. I found that the 6-class solution was inclusive of the 4 classes from the 4-class model, suggesting that no information would be lost in selecting the 6-class model over the 4-class model. More significantly, the 6-class model identified an additional class that I deemed theoretically non-ignorable: the *Syndemic* class, which presented with characteristic elevations in all three behavioral risk domains, as would be theorized from prior literature. I decided that distinguishing among classes that were involved in multiple domains of risk behaviors vs. a single domain of risk behavior was necessary given the premise of syndemic theory in this application. The 6-class model also identified the *Sexually Active* class, which was differentiated from the *Risk-taking* class (e.g., who endorsed both sexual risk items and substance use items). Here, I decided that the identification of classes such as the *Sexually Active* class would help to avoid unduly

pathologizing developmentally normative adolescent behaviors (e.g., consensual sex), thereby permitting a more granular discrimination among subgroups of youth who are truly at risk vs. those who are not. The class labels and interpretation are discussed in a subsequent paragraph.

Additionally, models with more than 6 classes did not confer conceptually novel classes and generally represented minor variation in the emergent classes in degree rather than type (e.g., having higher or lower class-specific item probabilities on some indicators but not varying in the patterns of joint distribution among all indicators) compared to the 6-class solution. Additionally, extracting more than 6- classes led to class prevalences as low as 4% (e.g., about 40 people), which I deemed unreliable as prior simulation studies have reported low rates of correct mixture class recovery for small classes when class proportions are unequal (Depaoli, 2013; Tueller & Lubke, 2010). With these considerations, I proceeded with the 6-class model for further examination with classification and auxiliary variables.

The classification fit statistics for my chosen solution indicated high clarity of differentiation among the six classes (Table 4). The entropy value closely approximated .80, suggesting adequate separation among the six classes in the overall model. The *AvePP* and *OCC* values definitively exceeded the cutoff heuristics, indicating high precision in the classification of individual cases into each of the six classes. All six *mcaP* values were very well within range of their respective bias-corrected bootstrapped 90% CIs for $\hat{\pi}$, indicating minimal classification error and high class assignment accuracy among the extracted classes.

Figure 4 presents the conditional item probabilities for the 6-class model, which I used to interpret and label the emergent classes. I found that not having been tested for HIV and early sexual debut (e.g., having sexual intercourse for the first time at age 13 or younger)

did not contribute significantly to class-separation given their low variation across the 6 classes (e.g., most people had not been tested for HIV or did not know, and did not endorse early sexual debut). However, I retained these two items in the analyses given their substantive relevance as noted in prior research. I also did not identify any costs to their inclusion. For example, the three classes with the highest probabilities of endorsing that they had not been tested for HIV or did not know were also very unlikely to report past or present sexual activity, thus absolving this item as an indicator of risk for these three classes with respect to the larger set of risk behaviors.

This section describes my interpretation of the classes. The largest class (38%) was labeled *Low Risk* given its low likelihood of responding affirmatively to most indicators. The second largest class (20%) was labeled *Alcohol Use* given its characteristic and definitive elevation in current alcohol use but not in any other indicators. The third largest class (14%) was labeled *Peer-victimization* given its characteristic and definitive elevation in reporting cyberbullying and/or in-person peer-victimization but not in any other indicators. The fourth largest class (11%) was labeled *Sexually Active* given its characteristic and definitive elevation in current sexual activity and a higher than chance likelihood of having 4+ lifetime sexual partners, while having a low likelihood of endorsing the other indicators. The fifth largest class (11%) was labeled *Syndemic* given its characteristic and definitive elevation in indicators of risk across all three behavioral domains, including endorsing current sexual activity, moderate elevation in having 4+ lifetime sexual partners, and evidence of polysubstance use and polyvictimization. Notably, the *Syndemic* class was the only group to definitively endorse having experienced physical and/or sexual IPV and forced sex. The smallest class (7%) was labeled *Risk-taking* given its definitive elevation in multiple

indicators of sexual risk and evidence of polysubstance use, but without endorsing any risk in victimization. This class also presented the highest conditional item probability for having been under the influence of a substance at last sexual encounter, suggesting that the association among sexual risk behaviors and substance use may be particularly robust in the *Risk-taking* class. Finally, sensitivity analyses revealed that including high school grade in the 6-class model did not substantially influence the shape and functional form of the emergent classes, lending further support to the measurement stability of the chosen solution. Thus, high school grade was controlled for in the auxiliary analyses.

Table 5 reports the logits and odds ratios (*OR*) of the covariate analyses using each of the latent classes as reference classes. This section summarizes statistically significant ($p < .05$) and interpretable *OR*s. Compared to the *Risk-taking* (*OR* = 3.29), *Sexually Active* (*OR* = 2.44)*, Alcohol use* (*OR* = 1.80), and *Syndemic* (*OR* = 2.46) classes, bisexual-identified youth were more likely than behaviorally bisexual youth to be in the *Low Risk* class. Compared to the *Peer-victimization* class, boys were more likely than girls to be in the *Risk-taking* (*OR* = 2.72) and *Low Risk* (*OR* = 2.23) classes. Compared to the *Syndemic* class, boys were more likely than girls to be in the *Low Risk* class (*OR* = 2.18). Compared to the *Peer-victimization* class, people of color were more likely than White people to be in the *Sexually Active* (*OR* = 2.32)*, Alcohol Use* (*OR* = 2.53), and *Low Risk* (*OR* = 1.97) classes. Compared to the *Syndemic* class, people of color were more likely than White people to be in the *Alcohol Use* class (*OR* = 1.93).

Table 6 reports the conditional factor mean differences in suicidality and their standard errors where each of the latent classes were used as a reference class for pairwise comparisons. Youth in the *Peer-victimization* and *Syndemic* classes reported significantly

higher suicidality at a small effect size (J. Cohen et al., 2003) compared to all other classes except with each other, where the difference was statistically non-significant. The *Risk-taking*, *Sexually Active*, and *Low Risk* classes did not significantly differ on suicidality. Youth in the *Alcohol Use* class were minimally elevated on suicidality compared to all classes except the *Peer-victimization* and *Syndemic* classes, compared to which suicidality was significantly lower in this class.

Chapter 5: Discussion

Bisexual people are an understudied, underserved, and highly vulnerable population, including bisexual youth and with respect to the continued observation of comorbid presentations of mental and behavioral risks that are suggestive of a syndemic. In this study, I applied syndemic theory and LCA to investigate categorical within-group differences among bisexual youth in terms of this co-occurrence of multiple domains of risk behavior and its auxiliary associations with demographic predictors and a suicidality outcome. My analyses and consideration of statistical fit, substantive interpretability, classification diagnostics, and model parsimony yielded a 6-class model comprised of *Low Risk*, *Alcohol Use*, *Peer-victimization*, *Sexually Active*, *Syndemic*, and *Risk-taking* classes and offered a novel understanding of the divergent patterns by which this population is engaged in and/or exposed to high-priority risk factors. My findings indicate that it is appropriate to model multidimensional behavioral risk as having a typological internal structure among bisexual youth, and that there are at least six distinct and well-classified subtypes of youth who vary qualitatively in terms of both the degree and types of risks endorsed. Furthermore, I advanced preliminary evidence that supported my hypothesis that behavioral risk among bisexual youth is expressed in multiple distinguishable forms that are differentially related to demographic characteristics and suicidality.

Low Risk Class

Notably, the preponderance of the *Low Risk* class in this sample suggests that despite the burden of binegativity and related health consequences among bisexuals, there appears to be a large subgroup that is not engaging in or exposed to intensive risk factors. The emergence of the *Low Risk* class is promising and perhaps indicative of resilience (Kwon,

2013). Given the preponderance of prior evidence suggesting elevated vulnerability among bisexuals across age range and for a multitude of health conditions, the finding that the largest subgroup of a nationally-derived bisexual sample was low in risk is very encouraging. As resilience among bisexuals has been sparsely investigated, this topic should be further examined, including identifying psychosocial strengths that predict membership in the *Low Risk* class which may offer insights and guidance for interventions for supporting bisexual youth in maintaining constructive developmental trajectories, building adaptive coping strategies, and enhancing immunity to minority stress (Meyer, 2015).

Syndemic Class

In accordance with syndemic theory and prior literature, my results supported the presence of two highly vulnerable subgroups: the *Syndemic* and *Peer-victimization* classes for which suicidality was highest compared to all other classes. Over 10% of the sample were in the *Syndemic* class in which youth were elevated on multiple indicators in each of the three chosen domains of behavioral risk. The *Syndemic* class was overrepresented with girls (vs. boys, compared to the *Low Risk* class) and unique in its high response probabilities for IPV and forced sex compared to all other classes. These patterns are consistent with prior research that have suggested that bisexual women are a vulnerable group for IPV, especially from male perpetrators (Walters, Chen, & Breiding, 2013), as well as other co-occurring psychosocial risks, such as depression, substance use, and increased social isolation and diminished social well-being (Dyar, Feinstein, & London, 2014; Molina et al., 2015). Thus, my results suggest that the IPV and related issues observed among bisexual women may begin in adolescence, and that the presence of these interpersonal risk factors may be similarly indicative of early onset of an unobserved syndemic among a subgroup of bisexual

girls. Here, a straightforward implication for psychological practice is to appropriately asses for interpersonal conflicts among bisexual youth (Horne & Hamilton, 2007), especially those involved in sexual and/or romantic relationships.

Explicitly identifying as bisexual emerged as a protective factor, where bisexual-identified youth (vs. behaviorally bisexual) were more likely to be in the *Low Risk* class compared to the *Syndemic* class. Interpreting this pattern is challenging as the characteristics of the behaviorally bisexual youth in terms of identity concealment, non-disclosure, and/or alternative labels are unknown in this study. At a minimum, identifying with a mainstream bisexual label may offer opportunities for accessing social support and/or indicate that some degree of clarity in sexual orientation identity has been achieved, including resolution of internalized stigma. Population-based research has indeed shown that for sexual minority adolescents more broadly, coming out at school is linked to positive psychosocial adjustment once sexual orientation victimization and related attempts to conceal or non-disclose their sexual minority status are accounted for (e.g., Russell, Toomey, Ryan, & Diaz, 2014).

One possibility is that the behaviorally bisexual group may use alternative plurisexual identity (e.g., pansexual) labels not included in the YRBS. In this case, there is mixed evidence in whether choice of sexual identity label confers protection or vulnerability for bisexuals. Scholars have suggested that using a non-dominant plurisexual label may increase exposure to negative responses given that conventional frameworks for sexuality in mainstream society generally espouse a binary language (Flanders, Dobinson, & Logie, 2015; Flanders, LeBreton, Robinson, Bian, & Caravaca-Morera, 2017; Galupo, Davis, Grynkiewicz, & Mitchell, 2014; P. C. Rust, 2000). In one study, however, bisexual-identified people (compared to plurisexuals using alternative labels) reported more frequent episodes of

binegativity from lesbians and gay men and perceived disconnection from mainstream LGBT circles (Mitchell, Davis, & Galupo, 2015). As noted before, bisexuals vary their choice of identity labels across context and time (Galupo et al., 2015; Mohr et al., 2016), perhaps to manage the pervasiveness of binegativity and general sexual minority stigma. These findings indicate that further research is needed regarding choice of identity label usage and its implications for membership in lower vs. higher risk classes.

Another (and not mutually exclusive to the above) possibility is that the behaviorally bisexual group is heterogeneous with respect to sexual orientation and/or sexual identity development. Sexual orientation is multidimensional and its links to gender and sexual identity are complex and nuanced (Bailey et al., 2016). Research advances in this area have argued that sexual orientation is continuous and fluid rather than categorical (Diamond, 2016; Savin-Williams, 2016), as evinced by the emergence of "mostly heterosexual" people as a distinct (Savin-Williams & Vrangalova, 2013) and longitudinally stable (Calzo, Masyn, Austin, Jun, & Corliss, 2017) sexual orientation group. It has likewise been argued that diversity in how components of sexual orientation are assessed, included, and/or excluded in measurement across studies—such as degree of sexual and/or romantic attraction to one or multiple genders, or the frequency of sexual behavior with partners of one or multiple genders—has conferred nontrivial variation in whether an adolescent is classified as a sexual minority (or not). Other complicating factors include the developmentally transitional nature of sexual orientation in adolescence (Savin-Williams & Ream, 2007) and bisexuals displaying higher sexual fluidity than other sexual orientation groups (Diamond et al., 2017).

As such, the indication that a subset of my sample was behaviorally bisexual—while allowing an ancillary comparison with bisexual-identified youth in terms of class

membership—is limited in permitting an extended elaboration about why they are overrepresented in the *Syndemic* class compared to the *Low Risk* class. It is possible that the behaviorally bisexual subsample included mostly heterosexual youth whose contextual and psychosocial health profiles are at significant variance to those identifying as bisexual and whose unstudied risk factors are expressed as membership in the *Syndemic* class. Youth who are in actively in the process of experimenting and exploring their sexual identity and relationships may be experiencing increased psychosocial vulnerability in terms of the psychological challenges of sexual identity development (e.g., overcoming internalized stigma and securing self-acceptance and affirmation) described in major theories (Bilodeau & Renn, 2005; T. Brown, 2002). In this vein and given that sexual identity development is associated with overcoming internalized stigma (Szymanski, Kashubeck-West, & Meyer, 2008a), the behaviorally bisexual subgroup of my sample may be experiencing higher internalized stigma (and its negative health consequences expressed through class membership differences); here, notably, the second largest sexual orientation identity group was heterosexual as well (despite reporting behavioral bisexuality). Conversely, these youth may indeed be stable in their bisexuality and sense of identity but have chosen not to disclose for other reasons, such as elevated external stigma and/or culture-bound issues (Jeffries IV, 2014; Malebranche et al., 2010). These topics should be investigated in future studies, including seeking clarity in how bisexuality is defined and measured, accounting for sexual fluidity and developmentally normative variation in sexual orientation components over time, and how these factors relate to modeling syndemic processes among bisexual youth.

Peer-victimization Class

The emergence of the *Peer-victimization* class in my analyses and its highest level of

suicidality compared to all other classes is not surprising considering prior work. As alluded to previously, it is well-established through multiple meta-analyses and/or large-scale studies that sexual minority youth experience disproportionate rates of peer-victimization compared to heterosexuals (Fedewa & Ahn, 2011; Toomey & Russell, 2016), and that this disparity is associated with a host of negative health (Collier, van Beusekom, Bos, & Sandfort, 2013) and academic and educational sequelae (Aragon, Poteat, Espelage, & Koenig, 2014). Peer-victimization among adolescents in the general population is a known risk factor for suicidality, as well (Kim & Leventhal, 2011; Klomek, Sourander, & Gould, 2010).

Interestingly, whereas previous literature has suggested that peer-victimization for sexual minority youth occurs in a constellation of other risk factors, such as diminished social belonging or substance use, the *Peer-victimization* class in this study was solely elevated on endorsing cyberbullying and/or in-person bullying (e.g. but was unlikely to report that they felt unsafe at school). One possible explanation is the potential preponderance of cyberbullying in my *Peer-victimization* class rather than traditional forms of bullying, which may be experienced more privately rather than in a social context of exposure or opportunities to participate in other behavioral risks. This *Peer-victimization* class was also comprised of more girls and White youth (vs. boys and youth of color) relative to the *Low Risk* class. Recent literature reviews (Edwards, Kontostathis, & Fisher, 2016) and population-based studies (Mueller, James, Abrutyn, & Levin, 2015) have suggested that some ethnic/racial minority youth groups (e.g., black youth) are less likely to experience bullying compared to White youth; that White sexual minority girls are consistently at risk for bullying; and that youth of color appear less likely to experience cyberbullying as well.

The higher likelihood of White and female bisexual youth belonging in the *Peer-victimization* class appears to align with these prior research findings and indicates that bisexual girls are a highly vulnerable group to multiple forms of bullying. It is also noteworthy that sole exposure to peer-victimization conferred a level of suicidality risk that was equivalent to belonging in the *Syndemic* class in this application, suggestive of the severity of this problem for bisexual health. The combination of these above findings, in addition to previous work suggesting diminished social belonging among bisexuals more generally (Jorm et al., 2002; Kertzner et al., 2009), highlights the importance of continued research, intervention, and policy to protect bisexual youth (and by extension all sexual minority youth) from the pernicious effects of peer-victimization and other forms of hate and violence (Feinstein, Dyar, & Pachankis, in press). School-based support (e.g., from teachers) has been meta-analytically shown to be the most robust protective factor for well-being among children and adolescents in the general population, where this association appears to strengthen over time as well (Chu, Saucier, & Hafner, 2010). Large-scale studies have also suggested that school-based adult supports are particularly protective for sexual orientation victimization for sexual minority youth (Darwich, Hymel, & Waterhouse, 2012), and that sexual minority subgroups may need specified attention with respect to tailored anti-bullying policies and practices (Poteat, Aragon, Espelage, & Koenig, 2009). Psychological practitioners working in school settings are thus encouraged to seek bisexual-specific education and training and to serve bisexual youth directly (Choi & Israel, 2019), and to support them indirectly through advocacy, policymaking, and programming to promote LGBTQ-affirming school climates (Feinstein et al., in press; Swearer Napolitano, 2010).

Other Classes

The emergence of the *Risk-taking* class suggests that syndemic risk may occur in multiple forms. Bisexual youth in the *Risk-taking* class had the highest endorsement probabilities for sexual risk and substance use items overall while having low probabilities for reporting victimization. It is also noteworthy that compared to all other classes, this class presented the highest response probability for using substances at last sexual encounter, which has been shown through meta-analyses to be a significant sexual risk factor, such as HIV/STI infection (e.g., Vosburgh et al., 2012). However, the *Risk-taking* class was indistinguishable in suicidality compared to the *Low Risk* class, suggesting that the co-occurrence of multiple risk behaviors in this class may not be associated with severe conscious distress, as was evident in the *Syndemic* class. It is possible that other unmeasured variables—such as trait personality (e.g., impulsivity; risk-taking; sensation-seeking), trauma factors, and/or health risks (e.g., HIV infection)—are more relevant and/or necessary to fully interpret the *Risk-taking* class. For example, boys were overrepresented in this class compared to the *Low Risk* class, which seems expectable given known tendencies for boys to engage in more externalizing behaviors compared to girls. In any case, the absence of suicidality does not necessarily imply that members of this class are not encountering psychosocial difficulties or negative health outcomes. Qualitative research with members of this relatively rare class may help to illuminate the nature of this subgroup and its implications for syndemic theory and bisexual health disparities.

A notable finding was the low likelihood of having been tested for HIV across all classes. For the higher risk classes—such as *Syndemic* or *Risk-taking* classes—it is apparent that targeted intervention efforts to encourage testing is indicated. On the other hand, one

may argue that bisexual youth do not have to be tested if they belong to a low risk class or a class in which endorsement probabilities are low for sexual activity. For example, the *Sexually Active* class did not emerge as particularly concerning with respect to other behavioral risk factors or suicidality. The likelihood that members of the *Sexually Active* class was tested for HIV, nevertheless, was close to random chance. From a health promotion perspective, nevertheless, efforts should be invested to encourage preventative screenings (e.g., before sexual debut) as this population experiences risks for HIV/STI infection (M. R. Friedman, Wei, et al., 2014; Jeffries IV, 2014) and barriers to accessing healthcare (Conron et al., 2010) and meeting their healthcare needs (Tjepkema, 2008).

Similarly, from my results it is apparent that research and interventions for preventing and addressing alcohol use among bisexual youth are indicated. Approximately a fifth of the sample belonged to the *Alcohol Use* class, whose members also expressed a significantly higher level of suicidality compared to the *Low Risk* class. In this class, the heightened response probability for current alcohol use also occurred relatively independently from other measured risk behaviors. Given previous literature confirming the preponderance of substance use in this population (Green & Feinstein, 2012), health promotion efforts should target drinking issues among bisexual youth. Similarly, it is recommended that practitioners working in sexual health and/or substance use seek focused education and training on bisexual issues to facilitate affirming and effective work with this population (Choi & Israel, 2019; Feinstein et al., in press). Finally, exploration of predictive factors that inform the differential genesis of "single-risk" vs. syndemic classes is encouraged.

Modeling Syndemic Processes

A broader message from my findings is the importance of considering within-group heterogeneity when modeling the co-occurrence of risk behaviors as well as judiciously selecting indicators believed to appropriately measure aspects of syndemic processes among bisexuals and by extension other sexual minority groups. Identifying any one risk behavior in isolation may not reliably distinguish youth who are truly at risk from those who belong to a relatively normative class; stated differently, any one risk behavior may be indicative of membership in a truly at-risk class or a non-concerning class. As examples, it is apparent from Figure 4 that simply assessing for early sexual debut or feeling unsafe at school would suggest that bisexual youth are generally "low risk," whereas this conclusion would actually belie at least six different patterns, some of which are definitively "high risk." Similarly, knowing whether someone from this population is sexually active, currently drinking, or have ever used "hard" drugs illegally (e.g., if measured in isolation) would likely lead to the false impression that there are two classes (e.g., globally low and high risk) and to the failure to detect the heterogeneous patterns of vulnerability that actually emerge. The emergence of the *Sexually Active* class illustrates the benefit of an LCA approach in identifying classes that are likely to be developmentally normative relative to those that are concerning, permitting researchers and practitioners alike to better avoid unintentionally pathologizing adolescent behavior in isolation (e.g., sex-positivity). Overall, these implications are consistent with Masyn (2013) who discussed the importance of selecting LCA model indicators conscientiously and in context of theory to maximize the likelihood of recovering the mixture solution that best resembles the heterogeneity believed to exist in a given population.

The question of how many indicators qualify as "sufficient" for recovering the correct number of classes is complicated as the nature and number of classes are generally unknown *a priori*, and the extracted classes inevitably vary in accordance with the indicators chosen as the former are defined by the latter. One prior study seeking to model syndemic risk among sexual minorities with LCA reported ordered classes and the resultant suggestion that the syndemic construct may have a continuous latent structure (Starks et al., 2014). However, the authors used a relatively small number of indicators (e.g., one per substantive domain, such as substance use) which may have prevented the full expression of the nuanced patterns across multiple domains of behavioral risk. Indeed, it has been recommended that to the extent possible, mixture modeling researchers select items that as a joint set capture the full range of the construct that is believed to underlie and to drive differentiation in a given population (Lubke & Luningham, 2017). I chose 5 indicators for each of the three domains of interest, which led to the extraction of unordered classes that—while identifying level differences (e.g., more or less risk)—informed a different conclusion that the syndemic construct may be categorical in nature. Other studies using 10 or more indicators to represent multiple domains of risk behavior (albeit not explicitly in a syndemic context) have similarly reported unordered classes that presented distinctive patterns of item endorsement in addition to global level differences (Laska, Pasch, Lust, Story, & Ehlinger, 2009; Robinson, Knowlton, Gielen, & Gallo, 2016). As such, the number of indicators appears to be at least one component that influences whether a mixture model can capture granular and nuanced heterogeneity in the patterns of item response probabilities. Simulation studies have similarly suggested that increasing the number of high-quality indicators to the extent feasible (e.g., as permitted by sample size) is associated with improved correct latent class recovery in LCA

(Wurpts & Geiser, 2014). Future methodological research should continue examining LCA indicator selection and its implications for modeling complex and multidimensional behavioral phenomena, such as sexual minority syndemics. Relatedly, I am not aware of any applications in which a factor mixture model was used to model syndemics among sexual minorities, and research should explore the relevance of this class of models in capturing both level and shape differences in the syndemic construct (Lubke & Muthén, 2005).

Limitations and Future Directions

My findings should be interpreted with several limitations. Given the exploratory nature of LCAs, future research should seek to replicate my solution with confirmatory techniques (Finch & Bronk, 2011). Consideration of other covariates—such as childhood adversity and SES—and distal outcomes—such as mental health, vocational, and treatment responsiveness variables—may further contextualize my interpretations and/or lead to modified class labels, thereby advancing further knowledge of the implications of class membership in this context. Other directions include longitudinal analyses to examine how youth transition across classes over time (e.g., transitioning from lower risk to higher risk classes and vice versa) as well as their antecedents and consequences (Collins & Wugalter, 1992; Nylund, 2007), which may provide a truer developmental insight into the genesis and progression of syndemic conditions in this population. Given prior work discussing bisexual identity development across the lifespan (Brewster & Moradi, 2010b), future studies should evaluate the longitudinal stability (or change processes) in the extracted classes.

Future research should also consider other dimensions of cultural and demographic diversity with respect to my LCA solution. My sample was diverse in terms of ethnicity/race, evenly distributed in age and high school grade, and derived from a nationally-representative

dataset. I included three binary demographic covariates—bisexual identification, sex, and race—to offer some initial commentary on how known characteristics believed to be relevant to syndemic processes predicted unobserved class membership. I also controlled for high school grade with respect to developmental variation in the extracted classes where sensitivity analyses suggested that my chosen solution was stable across grade. However, other relevant demographic variables were unavailable, such as SES. I was also unable to determine the extent to which the findings apply to bisexual people who are transgender or gender nonbinary as these identities were not specified in the data set. These and other theoretically relevant variables should be investigated in subsequent studies with respect to generalizability of my results. Promising avenues include using mixture invariance techniques (Masyn, 2017; Morin, Meyer, Creusier, & Biétry, 2016) to examine whether the nature and number of classes of syndemic risk are equivalent across known group differences.

Although syndemic theory is premised on the presence of stigma, I did not directly measure or analyze indicators of minority stress. Thus, I am unable to make assertions related to whether class membership in my application relates differentially to levels and types of minority stressors and structural stigma conditions. Based on prior research, however, it is reasonable to suggest that the higher risk classes (e.g., *Syndemic*) may be expressing their elevated behavioral risks in the context of dysregulation (Hatzenbuehler, 2009)—such as using substances to cope (Feinstein & Newcomb, 2016) and/or increased sexual compulsivity (Pachankis, Rendina, et al., 2015)—and diminished social support and increased isolation, which may place youth at risk for more intensive victimization. Conversely, it is possible that the behavioral presentation among lower risk classes (e.g., *Low Risk*) is attributable to

unmeasured protective factors (e.g., connection to bisexual communities or family support). Future research should thus directly investigate the role of minority stress processes (Meyer, 2003) and resilience factors (Meyer, 2015) vis-à-vis the latent class typology presented here.

I was unable to empirically identify the JLCA models which prevented any comparative commentary on the appropriateness of using different LCA models to analyze multidimensional behavioral risk in this population. Future methodological research should investigate the feasibility of second-order latent class modeling in applied research scenarios, where the availability of a user-friendly approach to the JCLA model may facilitate knowledge of varying analytic approaches to understanding complex behavioral patterns—such as those evident in syndemic conditions—and their relative merits and limitations.

Conclusion

I examined patterns of unobserved heterogeneity in syndemic processes among bisexual youth using LCA. Findings suggested that within-group variation in the syndemic construct is categorical, systematic, and is comprised of *Low Risk*, *Alcohol Use*, *Peer-victimization*, *Sexually Active*, *Syndemic*, and *Risk-taking* classes. The proportions of identification, sex, and race varied across classes, and class membership was differentially associated with suicidality, and these auxiliary relations were consistent with prior findings. My preliminary results support the assertion that there are diverging and multiple distinctive forms of behavioral risk in this population which confer differential implications for a mortality-related outcome; illustrate the utility of LCA for classifying typologies of concerning and normative health behavior patterns; contribute theoretically and empirically to better understanding the syndemic construct; and provide guidance for future research and practice to alleviate the burden of health disparities for bisexual adolescents.

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Table 1

Summary of Research Questions:
Bisexual Youth Behavioral Risk Latent Class Analysis Models

Questions	Hypotheses	Indicators	Auxiliary Variables	Analyses
1. What are the first-order latent classes of syndemic risk among bisexual youth?	exploratory	See Table 2	N/A	LCA
2. Can class membership be predicted by demographics, and does it predict suicidality?	yes		Bisexual identity Ethnicity/race Sex Suicidality	BCH
1. What are the second-order latent classes of syndemic risk among bisexual youth?	exploratory	See Table 2	N/A	JLCA
2. Can class membership be predicted by demographics, and does it predict suicidality?	yes		Bisexual identity Ethnicity/race Sex Suicidality	LTMM

Note. LCA = latent class analysis; BCH = Bolck, Croon, and Hagenaars method; JLCA = joint LCA; LTMM = latent transition mixture modeling

Table 2

Indicators and Percentages of Affirmative and Missing Responses: Bisexual Youth Behavioral Risk Latent Class Analysis Models

Behavioral Domain	Item Description	Yes (%)	Missing (%)
Sexual Risk	Early sexual debut (< 13 years old)	7.3	10.0
	≥ 4 lifetime sexual partners	17.7	9.8
	Currently sexually active	38.1	9.7
	Substance use at last sexual encounter	13.5	13.7
	Never tested for HIV or unsure	20.7	5.8
Substance Use	Currently smoking	20.7	5.8
	Currently using marijuana	35.3	2.8
	Currently drinking alcohol	43.5	11.6
	Currently binge drinking (≥ 5 drinks per episode)	24.3	4.2
	Ever tried other drugs illegally (cocaine, ecstasy, heroine, methamphetamine, or prescription drugs)	36.3	.3
Victimization	School safety (missed school due to safety concerns, or were threatened or injured with a weapon at school)	14.3	.1
	Past year peer-victimization (cyberbullying or at school)	42.1	.5
	Past year physical fighting	26.0	17.0
	Past year intimate partner violence (physical or sexual)	24.1	25.1
	Ever physically forced into unwanted sex	21.3	1.3

Table 3

Fit Statistics: Bisexual Youth Behavioral Risk Unconditional Latent Class Analysis Models

K	LL	BIC	SABIC	CAIC	AWE	BLRT *p*	VLMR-LRT *p*	*BF*	*cmP*
1	-8108.707	16321.805	16274.162	16277.750	16353.087	-	-	.00	.00
2	-7318.270	14852.281	14753.820	14761.235	14916.931	< .001	< .001	.00	.00
3	-7195.852	14718.795	14569.516	14580.758	14816.812	< .001	.003	.00	.00
4	-7077.392	**14593.226**	14393.128	14408.197	**14724.610**	< .001	**< .001**	19.22	**.95**
5	-7024.673	14599.138	14348.222	14367.118	14763.890	< .001	.267	> 99	.05
6	-6935.921	14615.932	**14314.197**	**14253.973**	14731.103	< .001	.357	> 99	.00
7	-6953.648	14679.790	14327.236	14353.786	14911.275	.013	.136	> 99	.00
8	-6930.000	14743.844	14340.472	14370.848	15008.697	**.030**	.706	> 99	.00
9	-6909.315	14813.824	14359.634	14393.837	15112.045	.125	.386	**> 99**	.00
10	**-6889.009**	14884.563	14379.554	14417.584	15216.150	.030	.591	-	.00

Note. K = number of classes; LL = log-likelihood; BIC = Bayesian Information Criterion; SABIC = sample-size adjusted BIC; CAIC = Consistent Akaike Information Criterion; AWE = Approximate Weight of Evidence Criterion; BLRT *p* = bootstrapped likelihood ratio test *p*-value; VLMR-LRT *p* = Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test *p*-value; *BF* = Bayes Factor; *cmP* = correct model probability. **Bolded** values indicate "best" fit for each respective statistic. The **bolded** value under K indicates the chosen class solution.

Table 4

Classification Statistics: Bisexual Youth Behavioral Risk Unconditional 6-class Model (Entropy = .78)

Class	$\hat{\pi}$ [90% CI]	*mcaP*	*AvePP*	*OCC*
1: Risk-taking	.07 [.04, .10]	.06	.78	52.13
2: Syndemic	.11 [.08, .14]	.10	.84	42.14
3: SA	.11 [.07, .15]	.10	.73	22.34
4: PV	.14 [.10, .19]	.13	.75	18.49
5: AU	.20 [.16, .25]	.21	.82	17.44
6: Low Risk	.38 [.34, .42]	.39	.94	23.82

Note. $\hat{\pi}$ = model-estimated class proportion; CI = bias-corrected bootstrapped confidence interval; *mcaP* = modal class assignment proportion; *AvePP* = average posterior probability; *OCC* = odds of correct classification; SA = Sexually Active; PV = Peer-victimization; AU = Alcohol Use.

Table 5

Logits and Odds Ratios of the Covariates of Class Membership by Reference Class: Bisexual Youth Behavioral Risk Conditional 6-class Model

Class Membership	*x*	Reference Class 1 Logit	1 *OR*	2 Logit	2 *OR*	3 Logit	3 *OR*	4 Logit	4 *OR*	5 Logit	5 *OR*	6 Logit	6 *OR*
1: Risk-taking	BI	-	-	-.29	.75	-.30	.74	-.74	.48	-.60	.55	-1.19*	.30
	M	-	-	.98	2.66	.76	2.14	1.00*	**2.72**	.63	1.88	.20	1.22
	POC	-	-	.46	1.58	-.12	.89	.73	2.08	-.20	.82	.05	1.05
2: Syndemic	BI	.29	1.34	-	-	-.01	.99	-.45	.64	-.31	.73	-.90*	.41
	M	-.98	.38	-	-	-.22	.80	.02	1.02	-.34	.71	-.78*	.46
	POC	-.46	.63	-	-	-.57	.57	.27	1.31	-.66*	.52	-.40	.67
3: SA	BI	.30	1.35	.01	1.01	-	-	-.44	.64	-.30	.74	-.89*	.41
	M	-.76	.47	.22	1.25	-	-	.24	1.27	-.13	.88	-.56	.57
	POC	.12	1.13	.57	1.77	-	-	.84*	**2.32**	-.09	.91	.17	1.19
4: PV	BI	.74	2.10	.45	1.57	.44	1.55	-	-	.14	1.15	-.45	.64
	M	-1.00*	.37	-.02	.98	-.24	.79	-	-	-.36	.70	-.80*	.45
	POC	-.73	.48	-.27	.76	-.84*	.43	-	-	-.93*	.39	-.68*	.51
5: AU	BI	.60	1.82	.31	1.36	.30	1.35	-.14	.87	-	-	-.59*	.55
	M	-.63	.53	.34	1.40	.13	1.14	.36	1.43	-	-	-.43	.65
	POC	.20	1.22	.66*	**1.93**	.09	1.09	.93*	**2.53**	-	-	.25	1.28
6: Low Risk	BI	1.19*	**3.29**	.90*	**2.46**	.89*	**2.44**	.45	1.57	.59*	**1.80**	-	-
	M	-.20	.82	.78*	**2.18**	.56	1.75	.80*	**2.23**	.43	1.54	-	-
	POC	-.05	.95	.40	1.49	-.17	.84	.68*	**1.97**	-.25	.78	-	-

Note. SA = Sexually Active; PV = Peer-victimization; AU = Alcohol Use; *x* = covariate; BI = explicit bisexual identification; M = male; POC = people of color; *OR* = odds ratio. "Conditional" refers to controls for high school grade. **Bolded** values indicate statistically significant and interpretable *OR* values.
*$p < .05$

Table 6

Suicidality Distal Outcome Mean Differences for Class Membership by Reference Class: Bisexual Youth Behavioral Risk Conditional 6-class Model

Class Membership	Reference Class											
	1		2		3		4		5		6	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
1: Risk-taking	-	-	-.26**	.06	.01	.05	-.30**	.06	-.08	.05	.04	.05
2: Syndemic	.26**	.06	-	-	.27**	.05	-.04	.05	.18**	.04	.30**	.04
3: SA	-.01	.05	-.27**	.05	-	-	-.31**	.05	-.09*	.04	.03	.03
4: PV	.30**	.06	.04	.05	.31**	.05	-	-	.22**	.04	.33**	.04
5: AU	.08	.05	-.18**	.04	.09*	.04	-.22**	.04	-	-	.11**	.03
6: Low Risk	-.04	.05	-.30**	.04	-.03	.03	-.33**	.04	-.11**	.03	-	-

Note. SA = Sexually Active; PV = Peer-victimization; AU = Alcohol Use. "Conditional" refers to controls for high school grade.
*$p < .05$ **$p < .001$

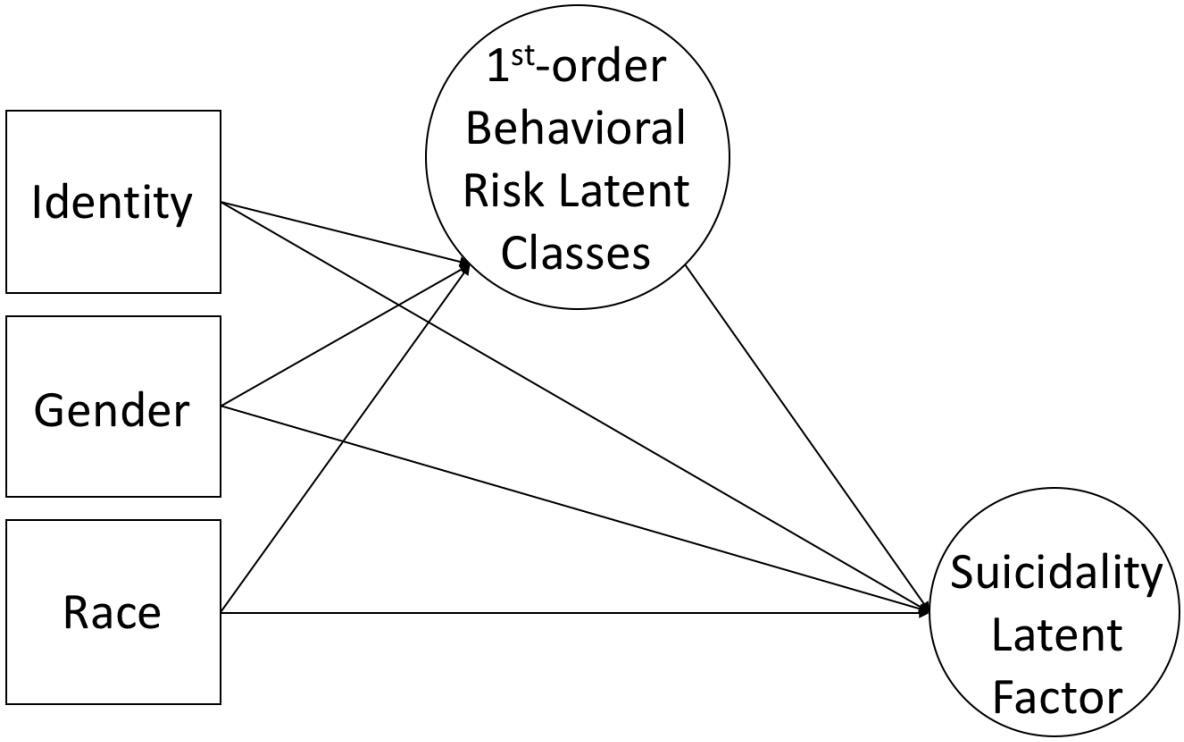

Figure 1. Path Diagram of the Bisexual Youth Behavioral Risk 1st-order Latent Class Analysis Model with Covariates and Distal Outcome. The following elements are omitted for clarity: covariance among covariates and disturbance terms and manifest indicators for latent variables. Please note that the diagrammed relation between the latent class variable and distal outcome represents conditional means rather than a *bona fide* regressive path.

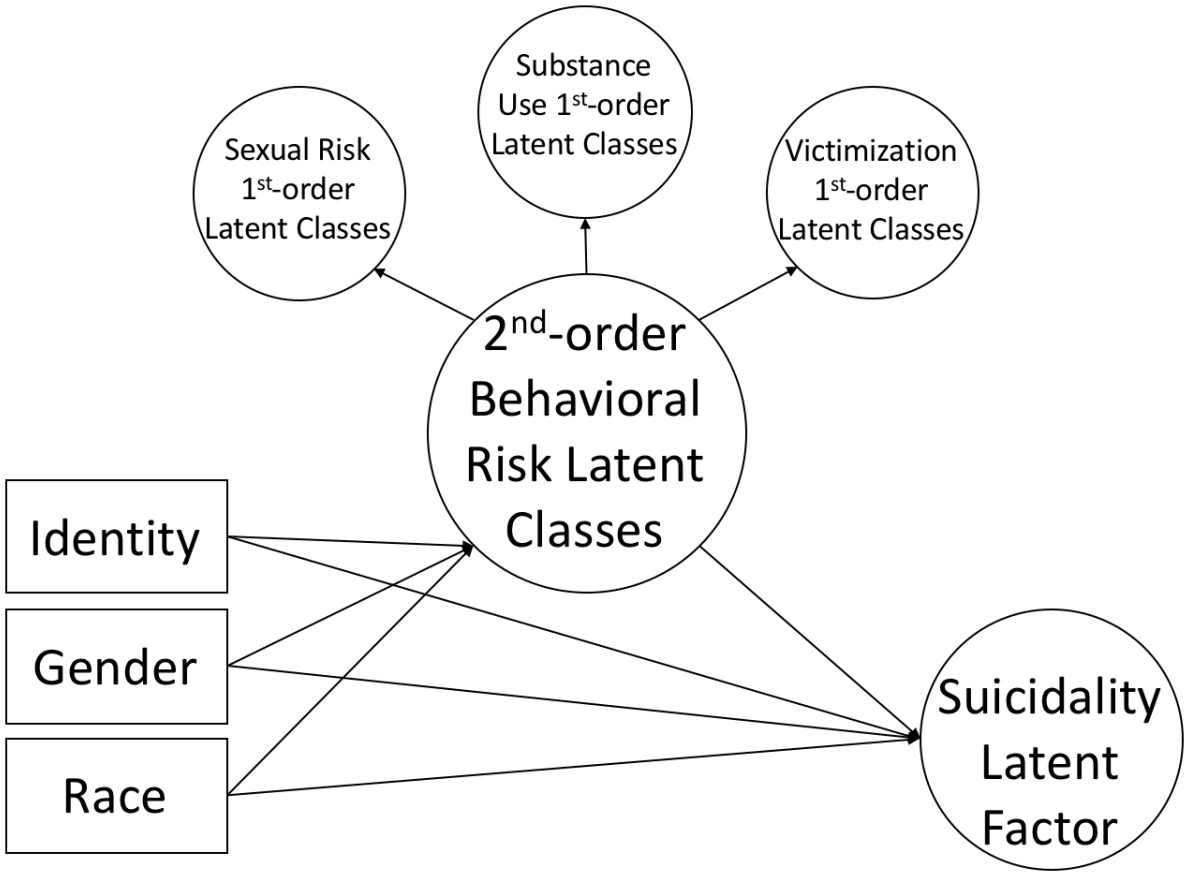

Figure 2. Path Diagram of the Bisexual Youth Behavioral Risk 2nd-order Latent Class Analysis Model with Covariates and Distal Outcome. The following elements are omitted for clarity: covariance among covariates and disturbance terms and manifest indicators for latent variables. Please note that the diagrammed relation between the latent class variable and distal outcome represents conditional means rather than a *bona fide* regressive path.

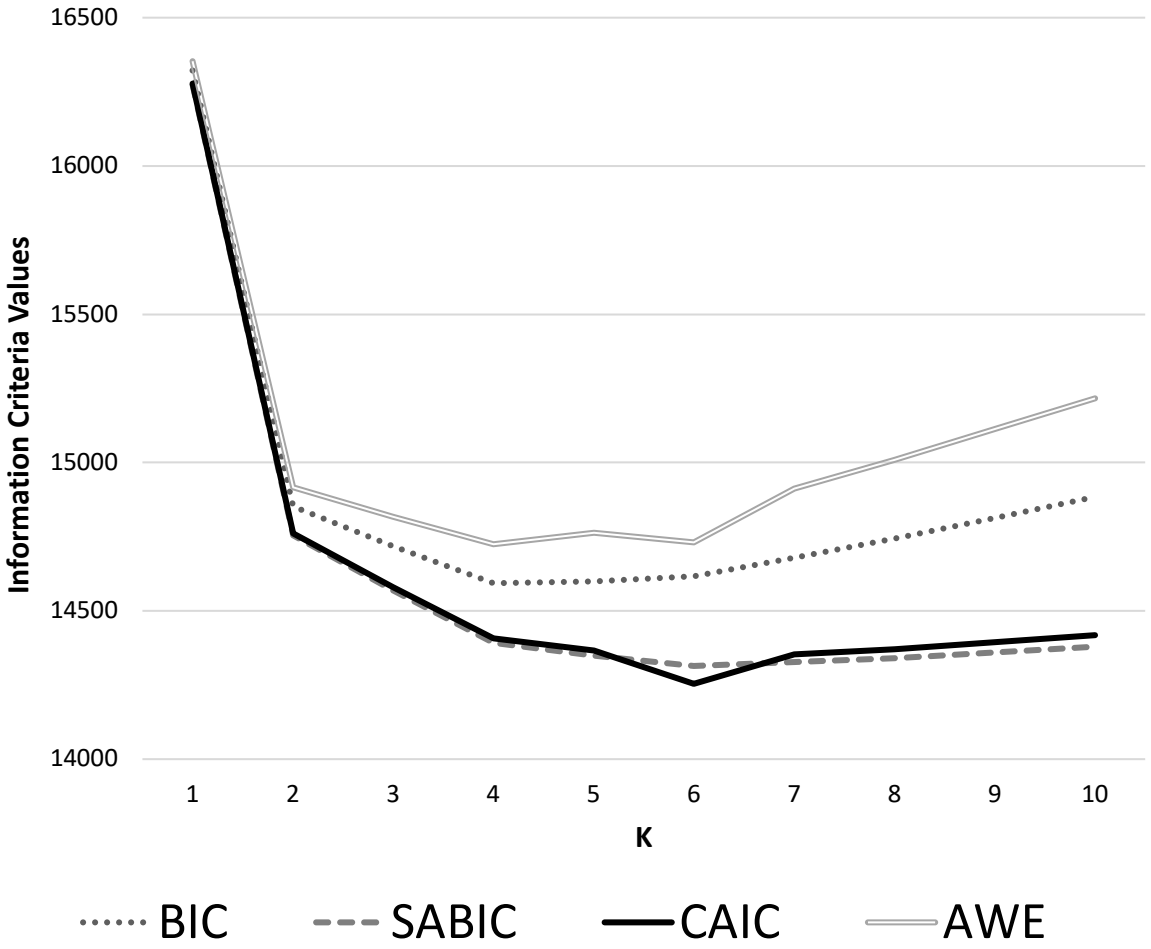

Figure 3. Information Criteria Plot: Bisexual Youth Behavioral Risk Latent Class Analysis Models. K = number of classes; BIC = Bayesian Information Criterion; SABIC = Sample-size Adjusted BIC; CAIC = Consistent Akaike Information Criterion; AWE = Approximate Weight of Evidence Criterion.

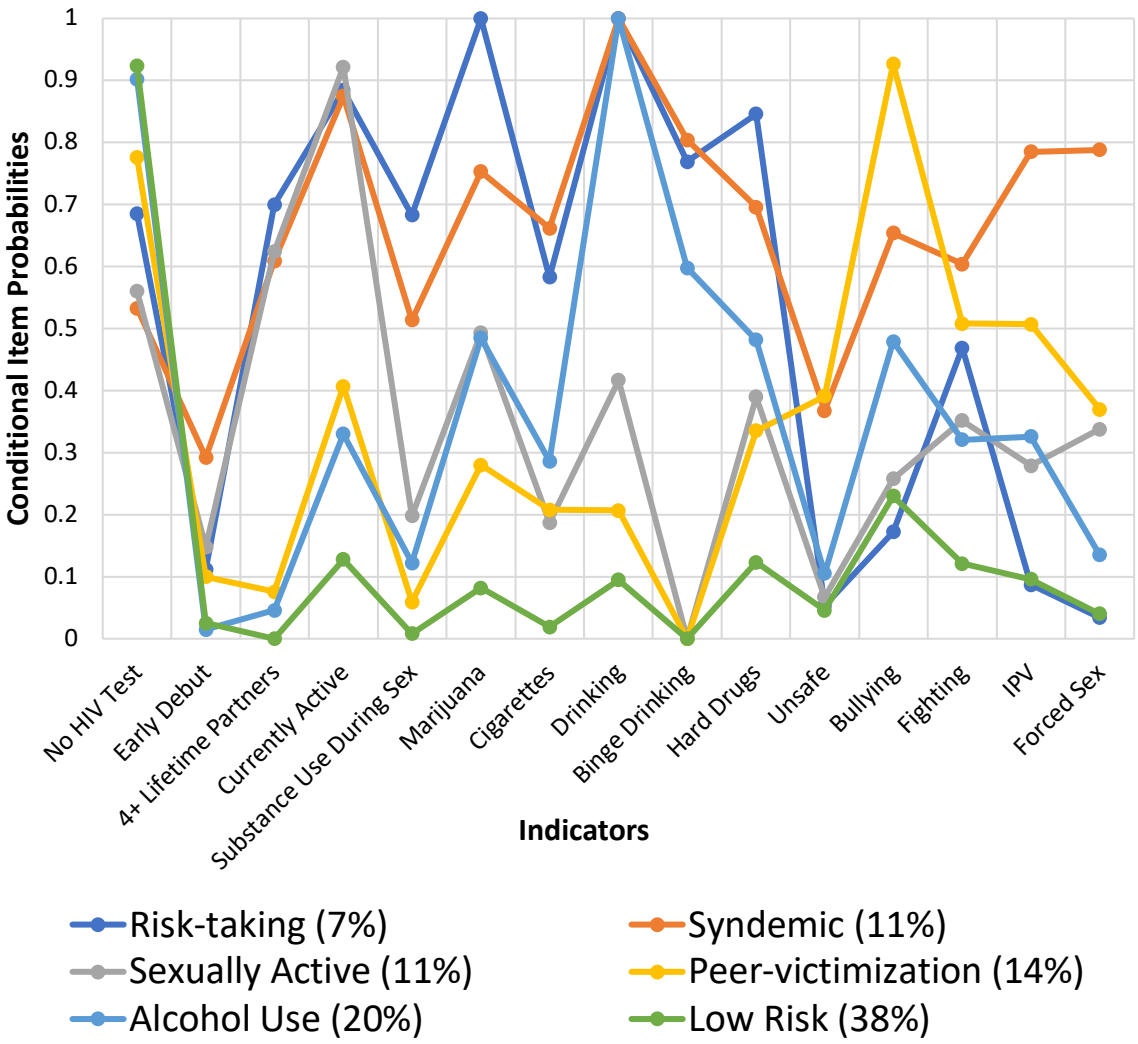

Figure 4. Conditional Item Probability Plot: Bisexual Youth Behavioral Risk Unconditional 6-class Model. See Table 2 for full indicator labels. Percentages indicate class prevalences based on the estimated model.

Appendix: Causal Mechanisms Underlying Sexual Minority Health Disparities

Structural Stigma

Structural stigma is believed to constrain and threaten sexual minority health by generating and perpetuating cultural conditions (e.g., heterosexist ideologies) and social contexts that deny sexual minorities a global sense of acceptance, affirmative representation, belonging, power, safety, and valuation in society otherwise afforded to heterosexuals, contributing to a lived experience of hostility, inferiority, and second-class citizenship (Hatzenbuehler, 2010; Herek, 2007; Link & Phelan, 2001; Meyer, 2003). Increasing empirical work suggests that structural stigma can indeed *directly* confer deleterious effects on sexual minority health.

Community-level climate regarding sexual orientation has been explored as a health determinant in this population and emerging evidence indicates that simply living in environments marked by significant heterosexist attitudes exerts a nontrivial impact on health. In a study examining the effects of residing in communities with either low or high levels of antigay prejudice, Hatzenbuehler and colleagues (2014) found that sexual minorities living in high antigay prejudiced communities suffered an increased hazard of mortality—including a 12-year difference in life expectancy—with elevations homicide, suicide, and cardiovascular disease. A study with sexual minority youth likewise revealed that residence in neighborhoods with a higher prevalence of anti-LGBT assault hate crimes was significantly associated with increased suicidal ideation and attempts (Duncan & Hatzenbuehler, 2014). A study on stigma-related physiological stress found that compared to sexual minorities that spent their adolescence in low antigay stigma states, sexual minorities that grew up in environments with high antigay stigma exhibited evidence of disrupted

hypothalamic-pituitary-adrenal axis (a neuroendocrine system governing cortisol stress responses) activity patterns akin to those who have been subjected to child maltreatment, poverty, and other forms of deprivation (Hatzenbuehler & McLaughlin, 2014).

Policy related to civil rights and family law has also been examined as a salient determinant to sexual minority health, producing a similar pattern of findings. A nationally-representative study found that sexual minorities residing in states without protective policies for either anti-LGBT hate crimes or workplace discrimination (compared to those living in states with such policies) experienced a significantly higher prevalence of mood and trauma disorders and psychiatric comorbidity (Hatzenbuehler, Keyes, & Hasin, 2009). Sexual minorities living in states that passed same-sex marriage bans in 2004-2005 experienced significant increases in mood and substance use disorders and psychiatric comorbidity compared to those living in states without such legislation (Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010). A similar study found that in states that passed same-sex marriage bans in 2006, sexual minorities reported increased depressive symptoms (Rostosky, Riggle, Horne, & Miller, 2009). Conversely, legalization of same-sex marriage in Massachusetts was linked with significant decreases in mental healthcare visits and costs regardless of partner status for sexual minority men (Hatzenbuehler et al., 2012). These findings suggest that social policy can *de facto* function as health policy by augmenting or buffering stigma-related vulnerabilities (Hatzenbuehler, 2010)

Institutional and structural stigma can furthermore introduce barriers that delimit the acquisition and maintenance of socioeconomic (e.g., financial) opportunities and resources associated with health outcomes (Hatzenbuehler, 2009, 2010, 2016; Meyer, 2003). Experimental and survey research has demonstrated that a significant number of sexual

minorities experience employment discrimination, including in areas of hiring, evaluation/promotion, harassment, and unequal pay and benefits (Badgett, Lau, Sears, & Ho, 2007; Ozeren, 2014; Sears & Mallory, 2011). A recent meta-analysis estimated an average earnings penalty of 11% for gay men, echoing previous findings by the Urban Institute, Williams Institute, and others reporting significant wage gaps between gay and heterosexual men (Badgett et al., 2007; Gates, 2003; Ozeren, 2014). Sexual minorities were also denied a range of federal benefits, privileges, and rights before the federal legalization of same-sex marriage (*Obergefell v. Hodges*, 2015), as there are 1138 statutory provisions that include marital status as a relevant factor for accessing employee health insurance, tax law, social security, pension, and death benefits (Hatzenbuehler, 2010; Herek, 2006; U.S. General Accounting Office, 2004). Indeed, same-sex couples faced disadvantages related to estate tax benefits amounting to $3.5 billion in the period of 2001-2011 (Steinberger, 2009). These findings imply that differential access to tangible opportunity structures may disadvantage sexual minorities with respect to the necessary resources for health-related prevention, maintenance, and intervention efforts (Hatzenbuehler, 2010). It is apparent that structural mechanisms biased against sexual minorities can confer significant direct and indirect influences on health and related deficits (Hatzenbuehler, 2010).

Minority Stress

The most influential framework that has been used to explain the relations among societal stigma and health disparities discussed previously is undoubtedly Meyer's (2003) minority stress theory. It is extensively established that *general* life adversity and stressors—for example, negative events (e.g., family conflicts), chronic strain (e.g., financial burden), and traumas (e.g., natural and/or manmade disasters)—are risks that collectively have a

substantial linkage with mental and physical health (Dohrenwend, 2000; Thoits, 2010). Recent reviews demonstrate that exposure to chronic psychosocial stress confers a profound burden on multiple physiological systems associated with the genesis of disease, cognitive impairment, and psychopathology in the general population (Doom & Gunnar, 2013; Juster et al., 2011; Juster, McEwen, & Lupien, 2010). Minority stress theory asserts that compounding generally applicable (that is, irrespective of sexual orientation) stressors, sexual minorities contend with a set of socially-based stressors that is both *unique* and *specific* to their stigmatized status. Two types of minority stressors are further distinguished in Meyer's (2003) framework. *Distal* stressors are comprised of discrimination, interpersonal rejection, victimization and violence, and other events inspired by anti-LGBT prejudice. *Proximal* stressors are consequences of distal stressors and include the learned expectation of rejection, the psychological vigilance required to manage a stigmatized identity in potentially hostile environments (e.g., concealment), as well as developing negative thoughts and feelings about one's sexual orientation (e.g., internalized heterosexism). The accumulation of elevated and protracted exposure to such stigma-specific stressors is theorized to confer perpetual and unstainable adaptational demands that amplify risk factors and account for the health deficits documented in this population (Meyer, 2003).

General Stressors. Evidence confirms that compared to heterosexuals, sexual minorities indeed experience increased exposure to various forms of general victimization and violence that, in turn, are linked with deleterious outcomes. An innovate study revealed that compared to heterosexual siblings, sexual minorities experienced more psychological, physical, and sexual abuse in childhood, and they were also more likely to experience physical and sexual interpersonal violence in adulthood (Balsam, Rothblum, & Beauchaine,

2005). In a national study, Corliss and colleagues (2002) found that close to half of sexual minority men had experienced emotional and physical maltreatment by a parent—including major physical maltreatment (e.g., being kicked; hit with a fist or object; choked)—and that this prevalence was significantly elevated compared to heterosexual men. For sexual minority women in the sample, 43-45% had experienced emotional and physical maltreatment by a parent and were more likely than heterosexuals to experience major physical maltreatment as well. A recent meta-analysis similarly indicated that compared to heterosexuals, sexual minorities were more likely to experience sexual and physical abuse as well as school assault (M. S. Friedman et al., 2011).

As in the general population, it appears that increased exposure to these stressors negatively impacts health for sexual minorities. In a nationally representative study, McLaughlin, Hatzenbuehler, Xuan, and Conron (2012) found that compared to heterosexuals, sexual minority youth were more likely to experience child maltreatment, housing adversity (e.g., being kicked out of home), and IPV, and that these collectively and partially accounted for disparities in depressive symptoms, substance use, and suicidality. Balsam and colleagues (2010) found childhood emotional abuse to be a robust predictor of adulthood psychopathology in a sample of ethnically diverse sexual minority women and men. Analyses of Pacific Northwest population-data revealed that the higher rates of HIV risk behaviors seen among sexual minority youth compared to heterosexuals were partially explained by the former's higher risk for sexual victimization; furthermore, the findings were consistent over a decade, and interaction effects among sexual orientation and abuse history were stronger for sexual minorities (Saewyc et al., 2006). Findings from a U.S. national study found that compared to heterosexuals, sexual minorities had a higher risk of onset for

post-traumatic stress disorder and, moreover, that this disparity was accounted for by sexual minorities' greater lifetime risk of childhood maltreatment, interpersonal violence, and exposure to potentially traumatic experiences (Roberts, Austin, Corliss, Vandermorris, & Koenen, 2010). In a national study of U.S. college students, sexual minorities were more likely to experience various forms of verbal and physical victimization compared to heterosexuals, which was further linked with an increased likelihood of smoking tobacco (Blosnich & Horn, 2011).

Distal Stressors. Sexual minorities face sexual orientation-based victimization in the form of hate crimes (Herek, 2009); school-based harassment, peer-victimization and violence for youth (Russell, Everett, Rosario, & Birkett, 2014); and heterosexist discrimination (Díaz, Ayala, Bein, Henne, & Marin, 2001; McCabe et al., 2010). Analyzing data from a national probability sample of sexual minorities, Herek (2009) reported that the prevalence of experiencing an antigay person- or property-related hate crime in the U.S. was approximately 20%. A recent meta-analysis of 164 studies drawn from 1992-2009 revealed that almost half of the sexual minorities studied had experienced various forms of victimization, including discrimination (44%) and verbal (56%) and sexual (50%) harassment (Katz-Wise & Hyde, 2012); trends also indicated increases in physical and sexual assault over the studied period. The combination of these findings suggests that the prevalence of sexual minority victimization continues to be substantial and elevated in comparison to heterosexuals.

Anti-sexual minority victimization experiences have known associations with detrimental mental and behavioral health outcomes (Mays & Cochran, 2001; McLaughlin, Hatzenbuehler, & Keyes, 2010; Pascoe & Richman, 2009). Parental psychological abuse on the basis of sexual orientation was significantly associated with suicidality in a community

sample of youth (D'Augelli et al., 2005). Similarly, peer-victimization was found to mediate the relation among sexual minority status and suicidal thoughts in a national sample of U.S. adolescents (Russell & Joyner, 2001). A systematic review of 39 studies revealed that sexual orientation-related peer-victimization was significantly associated with elevated depressive symptoms, substance use, and traumatic stress in sexual minority adolescents (Collier et al., 2013). Finally, Burton, Marshal, Chisolm, Sucato, and Friedman (2013) found that sexual orientation-based victimization longitudinally explained later disparities in depression and suicidality in a community sample of sexual minority youth.

Similar patterns exist for heterosexist discrimination. A U.S. population-based study using an ethnically diverse sample of sexual minorities revealed strong associations among past-year discrimination and psychiatric disorders (McLaughlin et al., 2010). Antigay discrimination experiences have been shown to prospectively predict substance use in gay men (Hatzenbuehler, Nolen-Hoeksema, & Erickson, 2008). Experiencing prejudiced events (as assessed by an external rater) was longitudinally linked with a 1-year onset of physical health problems in a community sample of sexual minority adults. A Swedish population-based study found that perceived discrimination, reported victimization, and threats of violence partially explained disparities in self-reported general health and physical symptoms between sexual minority and heterosexual adults (Bränström et al., 2016). These studies conclude that sexual minorities face significant discrimination, victimization, violence across numerous settings and that its health consequences are persisting and nontrivial.

Proximal Stressors. Sexual minorities must also combat a variety of proximal stressors that stem from the chronic need to appraise and adaptively respond to distal stressors and other stigma-relevant situations, given their pervasive and deleterious nature as

discussed previously. First, sexual minorities must perpetually determine whether to conceal (e.g., prevent discovery) or disclose their stigmatized identity across situational circumstances that confer potentially negative consequences that vary in severity and type. Managing a stigmatized identity constitutes a significant psychosocial burden—including self-consciousness, hypervigilance, shame, and guilt—and leads to effortful behavioral consequences, consisting of impression management, social avoidance, and isolation (from potential sources of identity-based support), and impairment in relational functioning (Pachankis, 2007). Furthermore, the continuous taxation of affective, cognitive, and behavioral resources may lead sexual minorities to negatively self-evaluate their identity and develop decreased self-efficacy with identity management, contributing to a "vicious cycle" by which concealment confers negative health outcomes (Pachankis, 2007). For instance, in a survey of 38 European countries, Pachankis, Hatzenbuehler, and colleagues (2015) found that sexual minority men living in countries with higher levels of structural stigma were more likely to engage in risky sexual behaviors and less likely to take preventative measures related to HIV, and that this relation was significantly mediated by increased concealment.

Second, sexual minorities may develop increased expectations of rejection—on basis of prior experience and exposure to sexual orientation stigma—as well as anxiously anticipate and perceive rejection in ambiguous situations—an attribute referred to as rejection sensitivity (Pachankis, Goldfried, & Ramrattan, 2008). Indeed, rejection sensitivity displayed significant associations with anxiety and posttraumatic stress symptoms in a sample of sexual minority men (J. M. Cohen, Feinstein, Rodriguez-Seijas, Taylor, & Newman, 2016). Furthermore, studies have suggested that—as hypothesized by the minority stress model—rejection sensitivity mediates the relations among distal stressors and negative

health outcomes. In a study of gay men, sexual orientation-based parental rejection predicted rejection sensitivity and this relation was found to be mediated by internalized heterosexism (Pachankis et al., 2008). Above and beyond the effects of internalized heterosexism, rejection sensitivity explained unique variance in unassertive interpersonal behavior, an attribute with known associations with social anxiety and unsafe sexual behavior (Pachankis et al., 2008). A study on sexual minority adult men found that current and past (in adolescence) exposure to structural stigma interacted with rejection sensitivity in predicting patterns alcohol and tobacco use (Pachankis, Hatzenbuehler, & Starks, 2014). Using a prospective design, Hatzenbuehler, Nolen-Hoeksema, and Erickson (2008) found that increases in discrimination experiences were predictive of future depressive symptoms.

Third, as previously implied, sexual minorities may adopt the negative messages and experiences to which they have been exposed through the process of *internalized heterosexism,* which is independently associated with a host of negative mental and behavioral health consequences as reviewed and studied elsewhere (Berg et al., 2016; Herek et al., 2009; Newcomb & Mustanski, 2010; Szymanski et al., 2008b). Feinstein, Goldfried, and Davila (2012) found that the effects of discrimination on psychological distress were, as could be expected, mediated by both internalized heterosexism and rejection sensitivity. Hatzenbuehler, Nolen-Hoeksema, and colleagues (2008) found that internalized heterosexism was longitudinally linked with future sexual risky behavior in a sample of bereaved gay men. In summary, research suggests that all three proximal stressors are linked with negative health outcomes and, in many cases, at least partially account for the documented variance in the relations among distal stressors and health consequences.

Psychological Mediation Framework

The psychological mediation model (Hatzenbuehler, 2009) extends Meyer's (2003) theory and articulates that the known relations among minority stressors and health outcomes are further mediated by *generic* psychological processes involved in self-regulation and constructive responses to life challenges (Berking & Wupperman, 2012; Miller, Chen, & Parker, 2011). Emerging evidence has supported this assertion that the associations among stigma stressors and health consequences can be explained by disruptions in biopsychosocial pathways that have well-established relations to psychopathology in the general population (Hatzenbuehler, 2009).

Emotion Regulation. A wealth of literature has established that chronic psychosocial stress can lead to a developmental sequela of emotion regulation deficits in the general population (Cicchetti & Toth, 2005), which in turn robustly predicts psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). The psychological mediation model applies these patterns to sexual minorities given that managing a stigmatized identity is an effortful process that over time depletes psychological resources for adaptive functioning (Inzlicht, McKay, & Aronson, 2006). For instance, minority stressors related to concealment discussed previously present a host of elements that are shared with *rumination*—a maladaptive regulatory strategy—including hypervigilance, repetitive preoccupation and self-monitoring, and worry about behaviors and circumstances in which one's sexual orientation may be discovered and persecuted (Major & O'Brien, 2005; Pachankis, 2007). Within this framework, a longitudinal study by Hatzenbuehler, McLaughlin, and Nolen-Hoeksema (2008) demonstrated that the increased prevalence of internalizing symptoms in their sample of sexual minority adolescents (compared to heterosexuals) was explained by heightened

emotion dysregulation—consisting of rumination and poor emotional awareness. Rumination also mediated the relations among exposure to stigma-related stressors and depressive symptoms in a separate study of sexual minority adults (Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009). In a prospective study with bereaved gay men, exposure to stigma (e.g., perceived danger for being gay) was linked to increased rumination and pessimism (a negative cognitive style) which, in turn, were predictive of heightened internalizing symptoms (Hatzenbuehler, Hilt, & Nolen-Hoeksema, 2010).

Social Isolation. Research indicates that positive social relationships and support are reliably associated with health among the general population (S. Cohen, 2004; Thoits, 2010; Uchino, 2006) and sexual minorities (Fredriksen-Goldsen & Muraco, 2010; Kwon, 2013) in terms of their directly salubrious and stress-buffering qualities. Conversely, low social support has established associations with health risks; a study using data from Add Health found that lower parental support partially or fully mediated the relations among sexual orientation and increased prevalence in numerous negative health outcomes (Needham & Austin, 2010). Identity-based social support is also a salient variable in Meyer's (2003) model theorized to moderate and buffer minority stress processes.

Hatzenbuehler's (2009) theory further asserts that minority stressors compromise social competence required to access interpersonal resources related to health outcomes. Social avoidance and isolation, for example, are plausible outcomes of concealment-related difficulties and rejection sensitivity (Pachankis, 2007). Hypervigilant appraisals of social environments may taint normative relational processes by communicating interpersonal anxieties and expectancies of rejection, and thereby potentially achieving the problematic outcomes that are precisely feared from the start (Major & O'Brien, 2005). Available

evidence in this area in fact supports these claims. Prospective studies by Hatzenbuehler, McLaughlin, and colleagues (2008) and Hatzenbuehler, Hilt, and colleagues (2010) found that minority stressors were associated with psychological distress vis-à-vis the mediating pathway of increased social isolation in sexual minority adults. Using a cross-sectional probability sample of sexual minority Latino men, Díaz, Ayala, Bein, Henne, and Marin (2001) likewise found that discrimination experiences were associated with increased social isolation and decreased self-worth, both of which predicted psychiatric symptoms.

In summary, it is apparent that the influence of stigma and minority stress exerts insidious effects that are both ecological and transactional in how they influence sexual minority health outcomes. An impressive amount of evidence indicates that health disparities among sexual minorities and heterosexuals are a function of the disproportionate burden of structural and socially-based stressors that propagate and reinforce oppressive conditions that are both hostile to and unequivocally deleterious for sexual minorities. Research is also increasingly illustrating and documenting that such stressors are lifelong, confer multiple biopsychosocial cascades, and operate through both generic and minority-specific mechanisms in perpetuating the negative mental and behavioral health consequences observed in this population.