

UCLA

UCLA Electronic Theses and Dissertations

Title

Sexual orientation differences in distal and proximal risk factors of suicide

Permalink

<https://escholarship.org/uc/item/3d16252b>

Author

Clark, Kirsty Amy

Publication Date

2019

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Sexual orientation differences in
distal and proximal risk factors of suicide

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

Philosophy in Epidemiology

by

Kirsty Amy Clark

2019

© Copyright by

Kirsty Amy Clark

2019

ABSTRACT OF THE DISSERTATION

Sexual orientation differences in
distal and proximal risk factors of suicide

by

Kirsty Amy Clark

Doctor of Philosophy in Epidemiology

University of California, Los Angeles, 2019

Professor Susan D. Cochran, Chair

The Surgeon General classifies sexual minorities (i.e., lesbians, gay men, bisexuals) as a high-risk population for suicide. This three-paper dissertation sought to contribute to an understanding of suicide risk among sexual minorities by investigating sexual orientation differences in both distal (i.e., stigmatization) and proximal (e.g., access to firearms) cofactors of suicide. Specifically, the studies investigated: (Study 1) the impact of neighborhood-level structural stigma on changes in psychological distress among sexual minorities following a statewide vote to ban same-sex marriage, (Study 2) sexual orientation differences in gun ownership and gun safety policy beliefs, and (Study 3) sexual orientation differences in lethal method used in suicide. Data were drawn from three unique datasets, including the California Quality of Life Survey (Study 1; N=7,421), the General Social Survey (Study 2; N=4,554), and

the National Violent Death Reporting System (Study 3; N=59,075). Statistical analyses were conducted in *R* and *SAS 9.4* with analytic methods across studies including univariate and bivariate analyses, quasi-experimental methods, multivariate logistic regression adjusted for confounding, and complex survey weighting incorporating propensity score methods. Results from Study 1 demonstrated that sexual minorities residing in neighborhoods where a majority of constituents voted in favor of a same-sex marriage ban had a statistically significant mean psychological distress reduction in the time period immediately after the vote ($\beta=-4.06$, 95% CI: -7.38; -0.73), with post-hoc analyses demonstrating that increased social support might have partially influenced the direction of these unexpected findings. Study 2 findings demonstrated that gay/bisexual men were more likely to endorse a gun safety law (aOR=3.24, 95% CI: 1.79 - 5.88) and less likely to report guns in the household (aOR=0.34, 95% CI: 0.18 - 0.65) than heterosexual men. Among women reporting a household gun, lesbian/bisexual women were more likely to be the personal gun owner (aOR=3.97, 95% CI: 1.43 - 11.03) than heterosexual women. Results from Study 3 showed that sexual minorities who died by suicide had reduced odds of death by firearm (aOR=0.62, 95% CI: 0.51 - 0.75) and increased odds of death by hanging (aOR=1.36, 95% CI: 1.14 - 1.63) and drug/poison ingestion (aOR=1.30, 95% CI: 1.04 - 1.62) as compared to the reference group of suicides; however, these patterns varied by gender. Findings from this dissertation demonstrate that sexual orientation differentially impacts distal (i.e., psychological responses to structural stigma) and proximal (i.e., access to firearms, use of lethal method in suicide) risk factors for suicide. Results from the research reported here can inform public health and clinical interventions to reduce suicide risk among sexual minorities.

The dissertation of Kirsty Amy Clark is approved.

Onyebuchi Aniweta Arah

Leeka I Kheifets

Vickie M Mays

Susan D Cochran, Committee Chair

University of California, Los Angeles

2019

DEDICATION

I dedicate this dissertation to my father, Ross Henry Clark, who believed in me, nurtured my intellectual curiosities, and continually told me he was proud of me. His mantra was, “if you think you can, you can.”

I thought I could, and I did, Dad. This is for you.

TABLE OF CONTENTS

Chapter 1: Suicide, Stigma and Sexual Minorities: A Brief Introduction.....	1
Chapter 2: Measuring the impact of neighborhood-level structural stigma on psychological distress among sexual minorities: A natural experiment drawing on California’s 2008 Proposition 8 Vote.....	12
<i>Background</i>	12
<i>California’s Political Landscape & Proposition 8</i>	16
<i>Methods</i>	19
<i>Results</i>	33
<i>Discussion</i>	44
<i>Limitations and Conclusions</i>	47
<i>Appendix</i>	49
Chapter 3: Sexual orientation differences in gun ownership and beliefs about gun safety policy: Findings from the General Social Survey, 2010 – 2016.....	50
<i>Background</i>	50
<i>Public Health Significance</i>	51
<i>Methods</i>	52
<i>Results</i>	55
<i>Discussion</i>	60
<i>Public Health Implications</i>	62
Chapter 4: Sexual orientation differences in lethal method used in suicide: Findings from 59,075 suicides in the National Violent Death Reporting System.....	64
<i>Background</i>	64
<i>Methods</i>	66
<i>Results</i>	71
<i>Discussion</i>	78
<i>Limitations and Conclusions</i>	81
Chapter 5: Global Conclusions.....	83
References.....	85

LIST OF FIGURES

Figure 1.1. Interpersonal Theory of Suicide (from Van Orden et al., 2015) 3

Figure 1.2. Psychological Mediation Framework (from Hatzenbuehler, 2009)8

Figure 1.3. An adapted theoretical model of suicide among sexual minorities integrating the Interpersonal Theory of Suicide (ITS) and Psychological Mediation Theory (PMF)..... 10

Figure 2.1. Map of Democratic percent of the two-party presidential vote by county in California, 2008..... 17

Figure 2.2. Distribution of Prop 8 Vote by California county..... 18

Figure 2.3. Unweighted trend of psychological distress across time by treatment group, California Quality of Life Survey..... 28

Figure 2.4. Propensity score distribution by treatment group demonstrating propensity score overlap and balance between treated and untreated groups..... 30

Figure 2.5. Unweighted mean social support across time by treatment group (‘stigma’ vs. ‘non-stigma’) and subgroup (‘heterosexual’ vs. ‘SM [sexual minority]’) status..... 42

LIST OF TABLES

<i>Table 2.1.</i> Sample demographic characteristics by neighborhood voting status, California Quality of Life Survey, 2004-2012 (N=7,421)	34
<i>Table 2.2.</i> Partial results from difference-in-difference-in-differences analyses assessing the effects of neighborhood voting status on psychological distress: California Quality of Life Survey, 2004-2012 (N=7,421)	38
<i>Table 3.1.</i> Demographic characteristics among respondents in the 2010-2016 General Social Survey (GSS), by gender and sexual orientation (N=4,554).....	56
<i>Table 3.2.</i> Household guns and beliefs about gun safety among respondents in the 2010-2016 General Social Survey, by gender and sexual orientation (N=4,554)	58
<i>Table 3.3.</i> Partial results of multiple logistic regression models evaluating gun safety policy beliefs, presence of gun in household, and gun ownership by sexual orientation and gender, General Social Survey 2010-2016 (N=4,554).....	59
<i>Table 4.1.</i> Sample characteristics by sexual orientation, National Violent Death Reporting System (N=59,075).....	72
<i>Table 4.2.</i> Method of suicide by gender and sexual orientation, National Violent Death Reporting System (N=59,075).....	75
<i>Table 4.3.</i> Partial results of multiple logistic regression models evaluating method of suicide by sexual orientation and gender, National Violent Death Reporting System (N=59,075)	77

ACKNOWLEDGMENTS

First and foremost, I would like to express my gratitude to my dissertation chair, Professor Susan Cochran. The training I have received from Susan, especially her training on how to think innovatively about data and how to write well (“Kill your darlings!”), has been indispensable to my development as a researcher. Susan has pushed me to go against the tide, think outside the box, and to always seek originality, and for that, I am especially thankful. I would also like to thank Professor Vickie Mays for welcoming me into her lab and giving me a place to foster my own mentorship skills. I am so grateful to be a part of the “BRITE family!” I am thankful to Professor Leeka Kheifets for her thoughtful feedback and valuable insight on my dissertation proposal and drafts of this dissertation. Finally, I would like to express my appreciation for Professor Onyebuchi Arah, who demonstrated patience and generosity with his time and expertise throughout my time at UCLA, and whose office door was always open. I feel genuinely lucky to have had the opportunity to learn from such a brilliant mind.

I am especially indebted to John Pachankis, who has been a guiding light throughout my graduate training, and who, for the past five years, has demonstrated to me what an amazing mentor he is. From working with John I have gained unmatched exposure to sophisticated theory-driven research, but I have been equally impacted by John’s humanity, wisdom, and steadfast guidance. Even when I have had moments of self-doubt, John’s confidence in my ability to succeed has always remained unwavering. He is a compassionate advisor, a superb researcher, and someone who has made me – and countless others he has mentored – feel like our ideas really matter. I feel very fortunate to have the opportunity to continue working with and learning from John as a postdoctoral fellow.

I would also like to thank Kaveh Khoshnood, who gave me numerous opportunities during my time as a graduate student at Yale. I cannot thank Kaveh enough for the many doors he opened for me – and nudged me to step through. Without Kaveh’s mentorship, I am not completely sure I would even have written this dissertation – indeed, he was the first person at Yale who heard an idea for my master’s thesis (“I want to conduct HIV research in Lebanon”) and said, “let’s do it”. That project jump-started my love for research, and Kaveh’s support and mentorship throughout my time at Yale and beyond has been indispensable to my development as an academic. I look forward to many more collaborations with Kaveh in the future.

One of the most valuable things I have gained from pursuing an academic career has been my research collaboration and friendship with Jackie White Hughto. Jackie is, without a doubt, the most hard-working, driven, and motivated peer colleague I have ever worked with, and I am continually energized by Jackie’s ideas – from pioneering health interventions to her running list of new inventions. Jackie is an unparalleled role model – she is a thoughtful researcher, a trailblazing expert, and a brilliant academic who also manages to bring humor and fun into her work. The work that Jackie and I have conducted together has been the most fulfilling of my career thus far, and I cannot thank Jackie enough for imparting on me her research savvy and genuine passion for the work she does. I am beyond grateful that through this journey I have gained a lifelong colleague and friend.

I am also truly grateful for the mentorship I received while in Los Angeles from Cathy Reback, who welcomed me onto her team at Friends Research Institute, and who gave me ample opportunities over the past three years to lead papers, give conference presentations, and refine my research skills. Cathy has dedicated her life to researching and developing interventions to combat health disparities among highly-marginalized populations, and her compassion for the

populations she works with is evident in all of the work she accomplishes. Cathy is a role model for the kind of career I hope to have one day and I am so grateful to have Cathy as a mentor. At Friends Research Institute, I would also like to express my deep appreciation for Jesse Fletcher, who helped me improve my statistical chops, and who generously gave me time to talk through ideas and offered helpful advice on navigating the research world. Thank you for always treating me as an equal partner in our research endeavors.

I would also like to thank my many other colleagues and friends in academia who have offered support and guidance throughout my graduate training, including John Blosnich, Mayra Rascon, Claudia Romero, Kim Kisler, Danya Keene, Charlotte and Emma Björkenstam, Chuck Burton, and, especially, Megan Halbrook. Megan, thank you for the countless laughs and cups of coffee. My time at UCLA would have been much duller without you around.

Lastly, I am deeply indebted to my friends and family who have stood by me every step of the way throughout my graduate training. To Greg, Katherine, Sarah, and Val – you each exemplify the meaning of true friendship, and without each of you and the support you provided across many stressed-out phone calls (sorry!), I doubt this dissertation would be finished. To my brothers, Struan and Ross, and my aunt and uncle, Monica and Robert, thank you for your lifetime of love and support. And to my Mum and Dad – Ross and Teresa Clark – I do not have the words to express how much your unconditional love and support has meant to me, especially during the past five years of my graduate training. Mum, you are my best friend and confidante. The only reason I was able to start a PhD program the week after we lost Dad is because of you and your unwavering support, even in my darkest moments. I will pursue the rest of my career with the goal of honoring both of you for your unfailing encouragement of my dreams. I love you very much. Onward!

VITA

Education:

- Expected 2019 University of California - Los Angeles, Los Angeles, CA
Doctor of Philosophy (PhD), Epidemiology
- 2014 – 2016 Yale University, New Haven, CT
Master of Public Health (MPH), Social and Behavioral Sciences
- 2008 – 2011 University of Virginia, Charlottesville, VA
Bachelor of Arts (BA), Psychology

Teaching Experience:

- 2017 – 2019 Teaching Assistant/Associate/Fellow, Institute for Society and Genetics
University of California, Los Angeles
- 2018 Teaching Associate, Department of Ecology & Evolutionary Biology
University of California, Los Angeles
- 2017 Teaching Assistant, Department of Neurobiology
University of California, Los Angeles
- 2015 – 2016 Lead Teaching Fellow, Department of Chronic Disease Epidemiology
Yale School of Public Health

Research & Professional Experience:

- 2016 – 2019 Research Associate/Consultant, Friends Research Institute, Inc.
Los Angeles, CA
- 2016 – 2019 Research Consultant, ESTEEM Research Group
Yale School of Public Health, New York, NY
- 2014 – 2016 Project Coordinator, ESTEEM Research Group
Yale School of Public Health, New Haven, CT
- 2012 – 2014 Human Research Coordinator, Dana-Farber Cancer Institute
Boston, MA
- 2009 – 2011 Research Assistant, Dodson Memory and Cognition Lab
University of Virginia, Charlottesville, VA

Selected Publications:

- Clark, K.**, Blosnich, J.R., Coulter, R.W.S., Bamwine, P., Bossarte, R.M. & Cochran, S.D. (In Press) Sexual orientation differences in gun ownership and beliefs about gun safety policy, General Social Survey 2010-2016. *Violence and Gender*.

- Clark, K.,** Blossnich, J.R., Haas, A.P. & Cochran, S.D. (2019) Estimate of Lesbian, Gay, Bisexual and Transgender Youth Suicide is Inflated. *Journal of Adolescent Health*, 64(6), 810.
- Reback, C. J., **Clark, K.,** Fletcher, J. B., & Holloway, I. W. (2019). A Multilevel Analysis of Social Network Characteristics and Technology Use on HIV Risk and Protective Behaviors Among Transgender Women. *AIDS and Behavior*, 1-15.
- White Hughto, J. & **Clark, K.** (2019) Designing a Transgender Health Training for Correctional Healthcare Providers: A Feasibility Study. *The Prison Journal*.
- Reback, C. J., **Clark, K.,** & Fletcher, J. B. (2018). TransAction: A Homegrown, Theory-Based, HIV Risk Reduction Intervention for Transgender Women Experiencing Multiple Health Disparities. *Sexuality Research and Social Policy*, 1-11.
- Reback, C. J., Larkins, S., & **Clark, K.** (2018). Motivations for a Casual or Occasional Sexual Encounter with a Man and/or Transgender Woman Among Heterosexual Men: Toward a Better Understanding of Atypical Sexual Partnering. *Sexuality & Culture*, 1-16.
- White Hughto, J. M., **Clark, K.A.,** Altice, F. L., Reisner, S. L., Kershaw, T. S., & Pachankis, J. E. (2018). Creating, reinforcing, and resisting the gender binary: a qualitative study of transgender women's healthcare experiences in sex-segregated jails and prisons. *International journal of prisoner health*, 14(2), 69-88.
- Reback, C. J., **Clark, K.,** Holloway, I. W., & Fletcher, J. B. (2018). Health Disparities, Risk Behaviors and Healthcare Utilization Among Transgender Women in Los Angeles County: A Comparison from 1998–1999 to 2015–2016. *AIDS and Behavior*, 1-10.
- Vijay, A., Wickersham, J., Tee...**Clark, K.,** Kamarulzaman, A. & Altice, F. (2018) Factors associated with medical doctors' intention to discriminate against transgender patients in Kuala Lumpur, Malaysia. *LGBT Health*, 5, 61-68.
- Clark, K.,** Fletcher, J. Holloway, I. & Reback, C. (2017) Structural Inequities and Social Networks Impact Hormone Use and Misuse among Transgender Women in Los Angeles County. *Archives of Sexual Behavior*, 1-10.
- White Hughto, J.M., **Clark, K.,** Altice, F.L., Reisner, S. L., Kershaw, T.S., & Pachankis, J. E. (2017). Improving correctional healthcare providers' ability to care for transgender patients: Development and evaluation of a theory-driven cultural and clinical competence intervention. *Social Science & Medicine*, 195, 159-169.
- Clark, K.,** White Hughto, J. & Pachankis, J. (2017) "What's the right thing to do?": Correctional Healthcare Providers' Knowledge, Attitudes and Experiences Caring for Transgender Inmates. *Social Science & Medicine*, 193, 80-89.
- Clark, K.,** Mays, V. & Cochran, S. (2017) Extreme Violence and the Invisibility of Women Who Murder: The Intersectionality of Gender, Race, Ethnicity, Sexual Orientation and Gender Identity Equals Silence. *Violence and Gender*, 4(4), 117-120.
- Clark, K.,** Keene, D., Pachankis, J., Fattal, O., Rizk, N. & Khoshnood, K. (2017) A Qualitative Analysis of Multi-Level Barriers to HIV Testing among Women in Lebanon. *Culture, Health & Sexuality*, 1-15.
- Xu, X., Sheng, Y., Khoshnood, K. & **Clark, K.** (2016) Factors Predicting Internalized-stigma Among Men Who Have Sex with Men (MSM) Living With HIV/AIDS in Beijing, China. *Journal of the Association of Nurses in AIDS Care*, 28(1), 142-153.
- Hughto White, J.M., Murchison, G., **Clark, K.,** Pachankis, J.E. & Reisner, S.L. (2016) Geographic and Individual Differences in Healthcare Access for U.S. Transgender Adults: A Multilevel Analysis. *LGBT Health*, 3(6), 424-433.

Chapter 1

Suicide, Stigma, and Sexual Minorities: A Brief Introduction

Reducing suicide represents a critical intervention point for public health. Suicide^a is a leading cause of preventable mortality globally. Worldwide, suicide results in approximately 800,000 deaths per year, accounting for 1.4% of all deaths.¹ Annually, over 55,000 deaths in the U.S. are due to violence-related injury, almost two-thirds of which are attributable to suicide.² Increasingly, it has become a public health imperative to reduce suicide through public health and clinical interventions targeting groups disproportionately impacted by self-inflicted violent death.³⁻⁵ For this dissertation, I executed three related studies focused on the precursors of suicide. My purpose is to inform suicide prevention efforts among sexual minorities (e.g., lesbians, gay men, bisexuals), a population vulnerable to suicide.^{6,7} As a foundation for the work, I herein provide a brief epidemiological and theoretical background of suicide and suicide risk generally and among sexual minorities; propose an updated conceptual model of suicide risk among sexual minorities; and finally, outline the later dissertation chapter topics.

Suicide and Suicide Risk Factors

Suicide is the tenth leading cause of death in the U.S., and among 15-19 year olds, it is the second leading cause of death after unintentional injury.⁸ A 2018 report from the Center for Disease Control and Prevention (CDC) demonstrated that since 1999, suicide rates in the U.S. have risen nearly 30%.⁹ In 2016, approximately 1.3 million U.S. adults attempted suicide (0.5%

^a Suicide is defined by the National Institute of Mental Health as, “death caused by self-directed injurious behavior with intent to die as a result of the behavior.” In this dissertation, I use the terms “suicide”, “death by suicide”, and “suicide mortality”. The terms “killed him/herself,” “completed suicide,” “successful suicide,” and “committed suicide” are avoided given negative connotations and best practices and preferred terminology from suicide prevention organizations (e.g. National Institute of Mental Health, Beyond Blue, Suicide Prevention Lifeline, and Suicide Prevention Resource Center).

of the population).¹⁰ Studies have demonstrated that 8.8% - 13% of suicide attempts are lethal; young women, blacks, and adolescents have higher rates of suicide attempt while men, whites, and the elderly have higher rates of suicide mortality.^{11,12}

Suicide does not have well-recognized risk mechanisms that can invariably predict its occurrence. It is perhaps best understood as an adverse outcome generated by a complex web of social, psychological, behavioral and environmental risk factors, none of which are essential for causation.¹³ Suicide prevention is, therefore, challenging because specific, sufficient causes of suicide are elusive. Since Emile Durkheim's seminal 1897 study of religious, regional, and demographic differences in suicide,¹⁴ numerous studies have attempted to characterize specific risks of suicide attempt and mortality, including psychiatric disorders and substance use,¹⁵⁻¹⁷ family history,^{18,19} stigmatization,²⁰ and even contagion (i.e., one suicide prompting another).^{21,22} Studies investigating the epidemiology of suicide demonstrate that distal risk factors for suicide include psychological, developmental, biological, and familial risks, while proximal risk factors include situational contexts unique to the suicide attempt, including whether or not the individual had access to a firearm.^{23,24} Distal and proximal risk factors are not mutually exclusive, and it is indeed their co-occurrence that exacerbates suicide risk.²³ Studies differentiating risk factors for suicide attempt versus mortality have demonstrated that risk factors for suicide mortality (as opposed to attempt) include a prior suicide attempt, severe psychiatric illness, and use of a firearm.²⁵⁻²⁷

Interpersonal Theory of Suicide (ITS)

Relatively few theoretical models have been proposed to explain the etiology of suicide mortality. The Interpersonal Theory of Suicide (ITS)²⁸ emerged in 2005 to fill this gap, asserting that *perceived burdensomeness* (i.e., the perception that one's existence burdens family, friends,

and/or society) and *thwarted belongingness* (i.e., disconnectedness from others) foster suicidal desire. However, the ITS asserts that it is only in the context of an *acquired capability* for lethal self-injury that suicide results. This acquired capability for suicide refers to the ability to overcome the evolutionary reflex for self-preservation required to end one’s life.²⁹ **Figure 1.1** provides a model of the Interpersonal Theory of Suicide.

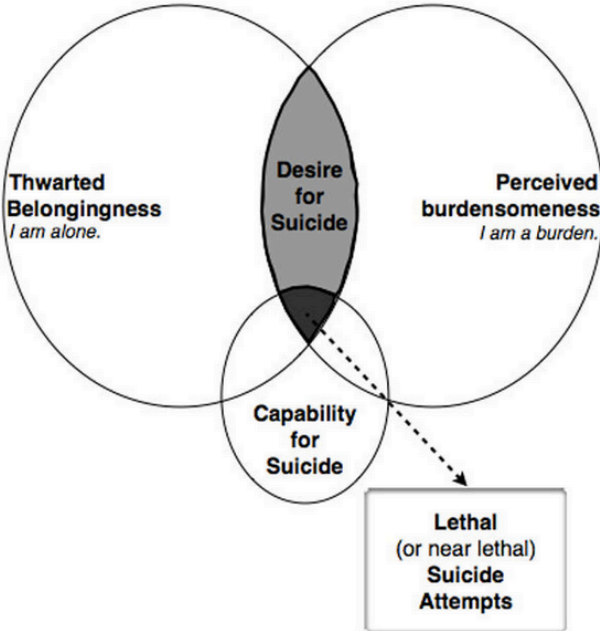


Figure 1.1. Interpersonal Theory of Suicide (from Van Orden et al., 2015)

Support for the ITS has been demonstrated across numerous diverse populations and national and international samples.³⁰ One set of studies empirically testing the ITS demonstrated three key findings supporting the interactions between the concepts outlined in the ITS: (1) the interaction of perceived burdensomeness and thwarted belongingness predicted current suicidal ideation; (2) individuals with a greater number of past suicide attempts demonstrated higher levels of acquired capability; and, (3) an interaction between acquired capability and perceived

burdensomeness was associated with clinical risk of suicidal behavior.^{31,32} Recent tests have further shown that painful and provocative experiences (e.g., substance abuse, exposure to self-harm, witnessing or experiencing trauma or violence) are positively associated with suicidal intent and increased capability for suicide.³³

What about Lethal Method? A Shortcoming of the ITS

Despite being the primary theoretical model for conceptualizing pathways to lethal or near-lethal suicide attempts, the ITS fails to include the principal predictor of whether or not a suicide attempt will ultimately result in mortality: the method used in the attempt.¹² While an individual may indeed possess the desire and capability to end their life, having access to a lethal method (e.g., firearm, high bridge) is the final gatekeeper for suicide death.³⁴ Suicide mortality has been linked to impulsivity and limited planning,^{35,36} especially among adolescents;³⁷ thus, the immediate accessibility of a lethal method is paramount to the lethality of any suicide attempt.^{34,38} Means restriction interventions have been effective in reducing firearms suicides in the U.S. and Austria,³⁹⁻⁴² carbon monoxide and barbiturate suicides in Denmark,^{43,44} gas poisoning suicides in England and Wales,^{45,46} alcohol-related suicides in Slovenia and Russia,^{47,48} and jumping-related suicides across numerous international high-bridge sites.⁴⁹⁻⁵¹ But despite the documented success of restricting lethal means in suicide prevention, this approach has historically been overlooked by policymakers presumably given its environmental nature.^{52,53} Thus, a 2012 call-to-action from researchers at Harvard School of Public Health emphasized the need to develop and implement public health and clinical interventions focused on restricting access to highly-lethal methods (e.g., firearms) to reduce suicide mortality.⁵⁴ Relatedly, theoretical models attempting to show pathways to suicide mortality should be cognizant to include lethal method as the final pathway through which suicide occurs.

In population-based studies investigating case-fatality rates in suicide attempts, researchers consider firearm, hanging, and drowning *highly lethal suicide means* as they are associated with greater than 80% fatality rates. Less lethal means include poisoning with drugs. Here case fatality estimates range from 2% to 14%^{11,12} The lethal method used in a suicide attempt not only varies by regional accessibility to the method (e.g., the disproportionately high firearms suicides in the U.S. as compared to other countries), but also varies by individual status characteristics. For example, the “gender paradox” in suicide – that women are more likely to attempt suicide, but men are more likely to die by suicide – can be partially attributed to the fact that men are more likely than women to use a highly lethal method of suicide in their attempt.⁵⁵⁻⁵⁷ Older age is also positively associated with using highly lethal suicide means.^{12,58} Studies have also demonstrated race-related differences in suicide method, including one study showing that black men were more likely to use highly lethal suicide means as compared to white men.^{59,60} Understanding differences in suicide method based on key status characteristics can not only augment our understanding of the epidemiology of suicide but can also aid in targeting interventions to groups disproportionately vulnerable to death by suicide.

Sexual minority status

Sexual orientation has been defined in varying ways for over 160 years,⁶¹ encompassing the many facets of sexual attraction, sexual behavior, and self-identity.⁶² As of 2019, the American Psychological Association defines sexual orientation as, “an often enduring pattern of emotional, romantic and/or sexual attractions of men to women or women to men (heterosexual), of women to women or men to men (homosexual, gay, lesbian), or by men or women to both sexes (bisexual).” ‘Sexual minority’ is an umbrella term for individuals who are not heterosexual, or part of the ‘sexual majority’. Whether or not a person of same-sex attraction chooses to identify

openly as a sexual minority, or “come out,” hinges on complex social and cultural influences including the supportiveness of family, involvement in religion, and community acceptance.^{63,64}

Sexual orientation identity development is hypothesized to occur across the life course in key stages spanning pre-puberty to adulthood.^{63,65} There are numerous stage-sequential models theorizing the processes involved in sexual minority identity development.⁶⁶⁻⁶⁹ These models vary in terminology and theoretical underpinnings; however, they generally follow a similar trajectory of development milestones. As a specific example of one of the earliest model’s stages, Troiden (1988) defined the four stages of homosexual identity development as: (1) Sensitization in childhood, characterized by the perceptions of being different from same-sex peers, often including gender-discordant interests and behavior; (2) Identity confusion in adolescence, characterized by the thought that one might be homosexual, which is dissonant with prior self-images, and often leads to anxiety, guilt, and social isolation; (3) Identity assumption in which one’s identity is established and shared with ‘safe’ others including other homosexuals; and (4) Commitment, which is characterized by living openly as a sexual minority and integrating sexual minority identity into all facets of life, including entering a same-sex committed sexual and/or romantic relationship. Homosexual identity development models have been updated more recently to highlight that while the ordering of “coming-out” milestones might be similar across individuals, the timing of these events across the life course varies, spanning childhood to older adulthood.^{70,71}

Stigma & Sexual Minorities

Stigma is defined as a “mark or label” (attribute, characteristic) that is devalued in a particular social context,⁷² and reduces the stigmatized “from a whole and usual person to a tainted, discounted one.”⁷³ Being a sexual minority is considered a stigmatized identity,⁷⁴ and

ample evidence demonstrates that lesbians, gay men, and bisexual people experience stigmatization across the life course.⁷⁵⁻⁸⁰ As well, research suggests that some sexual minority populations experience the additive effects of multiple stigmatized identities; for example, the sexism, racism, and homophobia experienced by black sexual minority women has been dubbed a “triple jeopardy,” exacerbating negative health outcomes.^{81,82}

Herek (2009) defines “sexual stigma” as a specific type of stigma “attached to any nonheterosexual behavior, identity, relationship, or community.”⁸³ Sexual stigma functions at two levels:⁸⁴ (1) structural-level stigma, which refers to the “policies of private and governmental institutions that intentionally restrict the opportunities” of stigmatized groups,⁸⁵ including same-sex marriage bans, anti-gay employment discrimination policies, and laws banning adoption by same-sex couples; and (2) interpersonal or individual-level stigma, which refers to negative attitudes towards sexual minorities by heterosexuals, or negative attitudes towards oneself (i.e., internalized stigma) among sexual minorities.

Minority stress theory (MST) posits that chronic stress, generated from actual and anticipated experiences of stigmatization, contributes to disproportionate mental health burden among sexual minorities, such as increased rates of psychological distress including depression, anxiety and substance use disorder, which independently predict suicidality.^{75,77,86-92}

Psychological Mediation Framework (PMF)

The Psychological Mediation Framework (PMF) builds on the MST to provide a theory-driven model explicating the intrapsychic and interpersonal pathways at play in the relationship between stigma-related stressors and psychological distress among sexual minorities. Indeed, the PMF posits that psychological distress and stigma-related stressors are mediated through three

key intermediaries: emotion dysregulation, social/interpersonal issues, and maladaptive cognitive states.⁹³ **Figure 1.2** depicts the PMF.

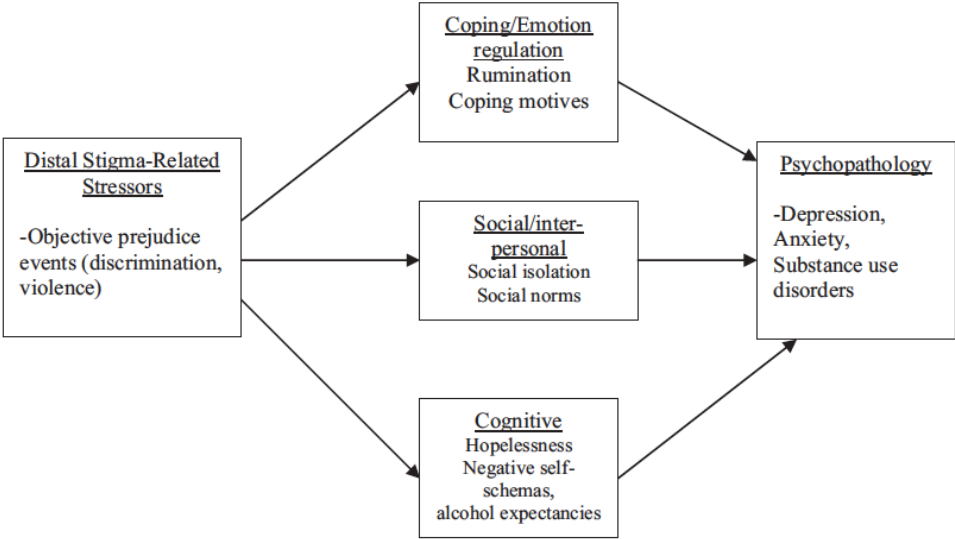


Figure 1.2. Psychological Mediation Framework (from Hatzenbuehler, 2009)

The PMF specifically posits that stress generated by sexual orientation stigma (e.g., hate crimes, victimization, discrimination)⁷⁶ leaves sexual minorities more vulnerable than heterosexuals to psychological processes that cause psychopathology.⁹³ The PMF elaborates on the MST, which does not explicitly posit specific intra- or interpersonal mediators to explain the jump in the pathway from stress to psychopathology. In this regard, the PMF identifies the specific pathways through which stigma-related stressors generate psychological distress, including depression, anxiety and, importantly, *suicidality*.

Suicide risk among sexual minorities

For over 30 years, research has consistently demonstrated that sexual minorities have higher rates of stress-related psychological distress as compared to heterosexuals, including elevated rates of mental disorders and suicidality.^{6,90,91,94,95} Indeed, the Surgeon General classifies sexual

minorities as a high-risk population for suicide.⁹⁶ Compared to heterosexuals, sexual minorities are at increased risk of suicide attempt,⁶ the most powerful clinical predictor of suicide mortality.⁹⁷ Population-based research from the U.S. finds that sexual minorities are 2-7 times more likely to attempt suicide than similar heterosexuals.⁶ As well, men and women in same-sex partnerships demonstrate disproportionate risk for suicide mortality.⁹⁸⁻¹⁰⁰ While numerous studies document elevated risk of suicidality among sexual minorities as compared to heterosexuals,^{6,7} less is understood about sexual orientation differences in proximal precursors of suicide mortality (i.e., circumstances immediately preceding death). Such knowledge might facilitate development of effective intervention and prevention strategies.

Proposed Conceptual Model of Suicide among Sexual Minorities

There is currently no widely-used conceptual model of suicide mortality specific to sexual minorities. This is warranted for two primary reasons: (1) sexual minorities demonstrate elevated risk of suicide ideation, attempt and mortality as compared to heterosexuals; and, (2) factors that exacerbate suicide risk among sexual minorities are likely different, in some cases, than those factors impacting heterosexual suicide risk (e.g., sexual minorities' disproportionate exposure to stigmatization).⁶ Thus, I herein propose a conceptual model of suicide among sexual minorities that guides the trajectory of my dissertation research. **Figure 1.3** melds two aforementioned theories, the Psychological Mediation Framework and the Interpersonal Theory of Suicide, along with method of suicide, into one integrated conceptual model of suicide among sexual minorities.

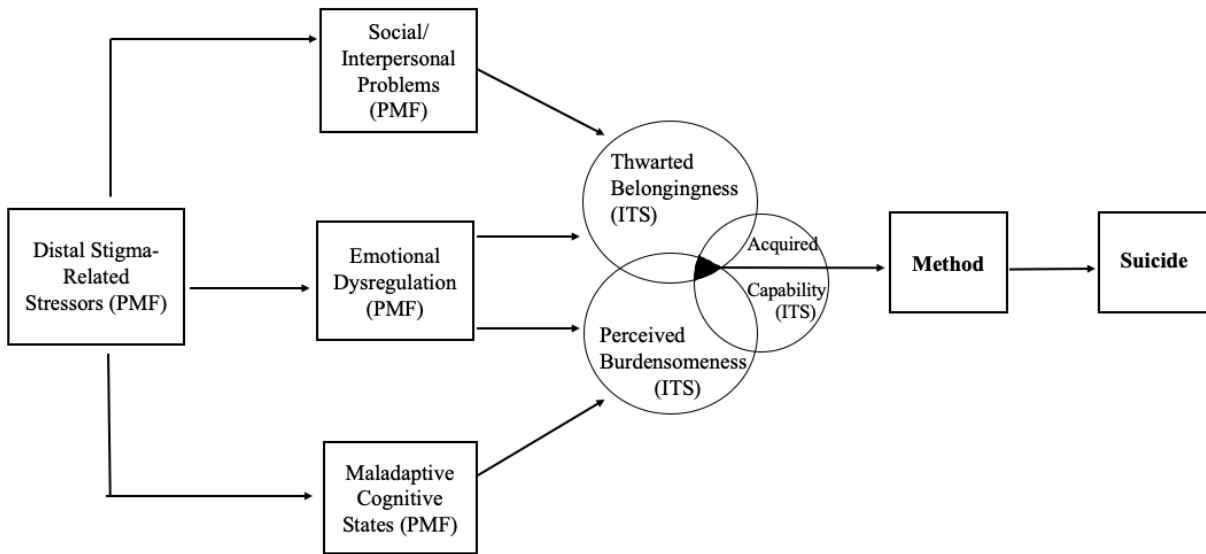


Figure 1.3. An adapted theoretical model of suicide among sexual minorities integrating the Interpersonal Theory of Suicide (ITS) and Psychological Mediation Theory (PMF)

The PMF provides explicit mechanisms whereby stigma leaves sexual minorities vulnerable to: (1) social/interpersonal problems, including low social support and exclusion, that contribute to *thwarted belongingness* (ITS), (2) emotional dysregulation, including impulsivity, negative coping strategies, and hypervigilance, that contribute to *thwarted belongingness* and *perceived burdensomeness* (ITS) and, (3) maladaptive cognitive states, including hopelessness and low self-esteem that contribute to *perceived burdensomeness* (ITS).²⁸ In the context of acquired capability, and through the ‘final gatekeeper’ of method of suicide, suicide results. Empirical research and experimental evidence provide support for the proposed conceptual model. Social and interpersonal problems, including social exclusion and ostracism, drive social isolation and thwart the need to belong.^{101,102} Emotionally dysregulated individuals evidence higher levels of both perceived burdensomeness and thwarted belongingness.¹⁰³ And maladaptive cognitive states (i.e., hopelessness and negative self-schemas) exacerbate the perception of being a burden on others.¹⁰⁴ Sexual minorities report elevated levels of thwarted

belongingness, emotional dysregulation, and perceived burdensomeness as compared to similar heterosexuals.^{90,105-110}

My dissertation does not attempt to test all pathways outlined in this conceptual model; rather I focus on two disparate pieces of this model. First, I investigate the association between a specific, distal stigma-related stressor and psychological distress among sexual minorities. Then, I explore the relationship between sexual orientation and access to firearms, the most lethal suicide method. Finally, I evaluate sexual orientation differences in method of suicide. This dissertation attempts to strengthen our understanding of key risk factors to suicide especially relevant for sexual minorities: stigmatization and differential access to and use of lethal method in suicide. This project has the potential to identify clinical and public health points of intervention in suicide prevention efforts among sexual minorities.

Chapter 2

Measuring the impact of neighborhood-level structural stigma on psychological distress among sexual minorities: A natural experiment drawing on California's 2008 Proposition 8 Vote

Background

Stigma is considered a fundamental cause of population health inequalities.¹¹¹ Among sexual minorities (i.e., lesbians, gay men, and bisexuals [LGB]), a preponderance of evidence suggests that stigma drives the population's disproportionate risk for adverse mental health outcomes (e.g., depression, anxiety, substance use) as compared to similar heterosexuals.^{74,78,93,111,112} Stigma experiences can include both *interpersonal-level stigmatization* (e.g., violence, rejection, bullying) and *structural-level stigmatization* (e.g., discriminatory laws and policies, anti-LGB social norms).

Interpersonal-level stigma

The majority of stigma-related research on sexual minorities has focused on the adverse mental health impact of interpersonal stigma (e.g., enacted discrimination, prejudice). Minority stress theory (MST) posits that chronic stress, generated from actual and anticipated experiences of stigmatization, contributes to disproportionate mental health burden among sexual minorities, including increased rates of depression, anxiety and substance use disorder, which then predict suicidality.^{75,77,86-92} Experiences of stigma and resultant psychological distress have been linked to suicidal ideation¹¹³ and suicide attempt¹¹⁴⁻¹¹⁶ across numerous studies. Further, research has demonstrated that individuals with histories of painful and provocative experiences (e.g., violence, sexual abuse) might be at elevated risk of death by suicide because painful experiences increase a suicidal individual's pain tolerance and reduce the fear of death.^{29,117,118} As compared to heterosexuals, sexual minorities report disproportionate experiences of interpersonal

discrimination, abuse, and violent victimization across the life course;^{79,91,107,114,119,120} thus, it is pertinent that interpersonal stigma and violent victimization are addressed when developing effective suicide prevention strategies.

Structural-level stigma

Recent research has also investigated the mechanisms by which structural-level stigma impacts psychological distress and suicidality among sexual minorities. Indeed, recent quasi-experimental studies have attempted to demonstrate the impact of statewide same-sex marriage bans and statewide laws permitting denial of services to same-sex couples on sexual minority mental health. A quasi-natural experiment found that the passing of a state same-sex marriage law in Massachusetts in 2003 led to a reduction in medical and mental healthcare visits in the 12 months following the enactment among sexual minority men who entered into treatment just prior to the law's passing.¹²¹ This study was conducted with a small clinic sample and did not utilize a control group, significantly detracting from its generalizability and the study's attempt at causal inference. In the past two years, Raifman et al. have capitalized on policy implementation, large-scale survey data, and utilized causal inference methodology to investigate the causal impact of structural stigma on sexual minority mental health.^{122,123} One such study used data from 762,678 students in the Youth Risk Behavior Surveillance System (YRBSS) from 1999 to 2015 to compare adolescent suicide attempts before and after the implementation of policies permitting same-sex marriage in 32 states, using 15 states without such policies as a control group.¹²³ Findings demonstrated a 7% relative reduction in suicide attempts due to same-sex marriage implementation, with this association concentrated among sexual minorities. A second study used data from 109,089 participants in the Behavioral Risk Factor Surveillance System (BRFSS) to demonstrate that implementation of laws permitting denial of services to same-sex

couples in three states was associated with a 46% increase in sexual minority adults experiencing psychological distress.¹²² These studies demonstrate that structural stigma operating in the form of a discriminatory state-level policy might negatively impact sexual minority mental health. However, these studies provide only the state-level context of the impact of structural stigma; indeed, neither study attempted to explore how a statewide policy might differentially impact sexual minority individuals living in more- or less-stigmatizing geographic regions of the state.

State-level vs. neighborhood-level structural stigma

Understanding how laws and policies affect sexual minority mental health at the state level provides a bird's-eye view of the impact of structural stigma on mental health; however, there is less evidence demonstrating how state-level stigmatization might differentially affect sexual minority psychological distress depending on an individual's neighborhood-level characteristics. Neighborhood-level characteristics might be potent indicators of health outcomes among sexual minorities; indeed, research has demonstrated that some neighborhood characteristics are associated with sexual minority health. Several studies have investigated stigma-related neighborhood-level characteristics including the proportion of households with same-sex couples, the proportion of lesbian, gay, bisexual or transgender (LGBT) hate crimes, and the proportion of Republican voters to show that these factors influence health outcomes including mental health, substance use, and sexual risk behaviors among sexual minorities.¹²⁴⁻¹²⁶ As well, a spatial analysis from Columbus, Ohio demonstrated that sexual minorities were concentrated within neighborhoods with other sexual minorities, and among gay men, geographic patterns of housing were related to diversity, openness, and amenities in the neighborhood.¹²⁷ Indeed, the term "gayborhood" has been used historically to refer to gay neighborhoods: geographical safe

spaces in which sexual minorities are concentrated, and in which there are clusters of gay-owned or gay-friendly businesses, meeting spaces, and organizations.¹²⁸

Thus, while the aforementioned studies investigating structural stigma at the state level highlight the possible impact of statewide policies on sexual minority mental health, an in-depth investigation into how neighborhood-level characteristics might buffer or exacerbate psychological distress in relation to a state-level event (e.g., same-sex marriage ban) can offer insight into how neighborhood councils and organizations might tackle stigmatization at a local level. It is plausible that sexual minorities living in neighborhoods with climates supportive to homosexuality – even in states that pass stigmatizing state-level policies – might be more resilient against the harmful mental health effects of state-level structural stigmatization compared to sexual minorities facing both state-level and neighborhood-level stigmatization. One study from Australia used voting data from a non-binding referendum on same-sex marriage to investigate the influence of geographic variation in community-level structural stigma on mental health, life satisfaction, and overall health among sexual minorities.¹²⁹ This study showed that sexual minorities living in local areas with a higher percentage of constituents voting against same-sex marriage had worse health outcomes. But this finding was mediated by social support such that social support buffered these negative effects. However, this study utilized cross-sectional data at a single time point after the referendum had already occurred; thus, it is unknown how the vote itself might have impacted sexual minority mental health (i.e., researchers were unable to map trends in mental health before and after the vote).

In sum, while prior studies have provided some evidence for the causal impact of stigmatizing state- and federal-level policy on sexual minority mental health,^{122,123} and others have utilized cross-sectional data to demonstrate an association between neighborhood- and

community-level structural stigma and sexual minority mental health,^{126,129} our current understanding of how neighborhood-level characteristics might differentially influence sexual minority mental health in the wake of a stigmatizing state-level policy is quite limited.

Thus, the current study exploited a natural experiment to understand how a stigmatizing state-level vote might differentially impact psychological distress among sexual minorities depending on neighborhood variation in voting behavior. Specifically, I investigated the differential impact of a statewide same-sex marriage ban (i.e., California's Proposition 8) on self-reported recent psychological distress among sexual minorities using a quasi-experimental design. Below I introduce California's political landscape and provide a brief summary of California's Proposition 8.

California Political Geography & Proposition 8

California's Political Landscape

California's political landscape is complex. While California decidedly votes Democratic in presidential elections, it has strong regional variations in voting behavior and ideological public opinions, commonly associated with a "coastal-inland divide" (with the coast typically voting Democratic and the inland regions typically voting Republican).¹³⁰ **Figure 2.1** shows a map from the Public Policy Institute of California highlighting this geographic divide with data from the 2008 Presidential Election by county in California. Thus, while California might have a reputation for espousing primarily liberal views, there is a strong regional variation that is tied to voting behavior and opinions on social issues.

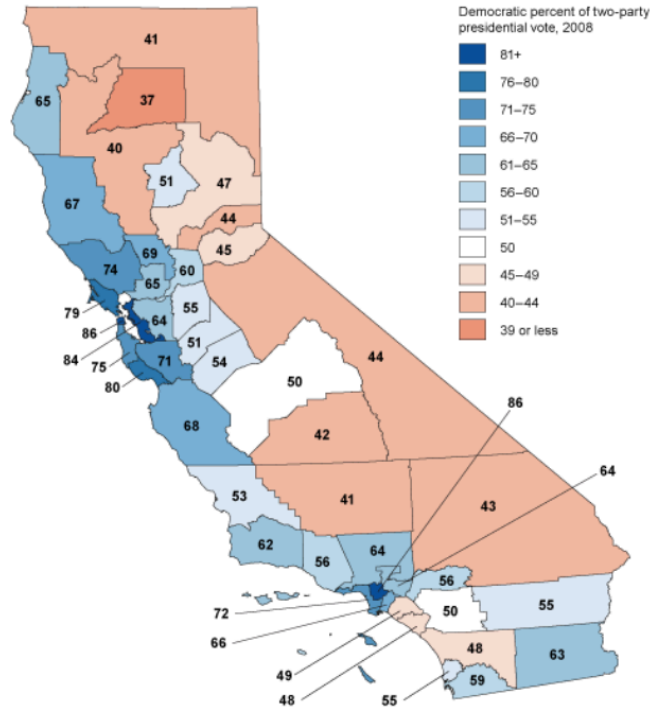


Figure 2.1. Map of Democratic percent of the two-party presidential vote by county in California, 2008

California's Proposition 8

On June 16th, 2008, same-sex marriage was legalized in California following the Supreme Court of California ruling in *In re Marriage Cases* which found that excluding same-sex couples from marrying was a violation of the California constitution.¹³¹ This resulted in populace backlash and on November 4th, 2008, Proposition 8 (hereafter Prop 8), passed in the 2008 California statewide election. Prop 8 amended the California constitution to state that "only marriage between a man and a woman is valid or recognized in California," effectively banning same-sex marriage.¹³¹ The proposition passed by a close margin: 7,001,084 (52.3%) voted in favor of Prop 8 and 6,401,482 (47.7%) voted against it. **Figure 2.2** provides a visualization of the geographic variation of voting behavior for Prop 8 by California counties. Note that a "Yes"

vote on Prop 8 was associated with a vote to ban same-sex marriage, while a “No” vote was associated with a rejection of constitutional wording changes to ban same-sex marriage.

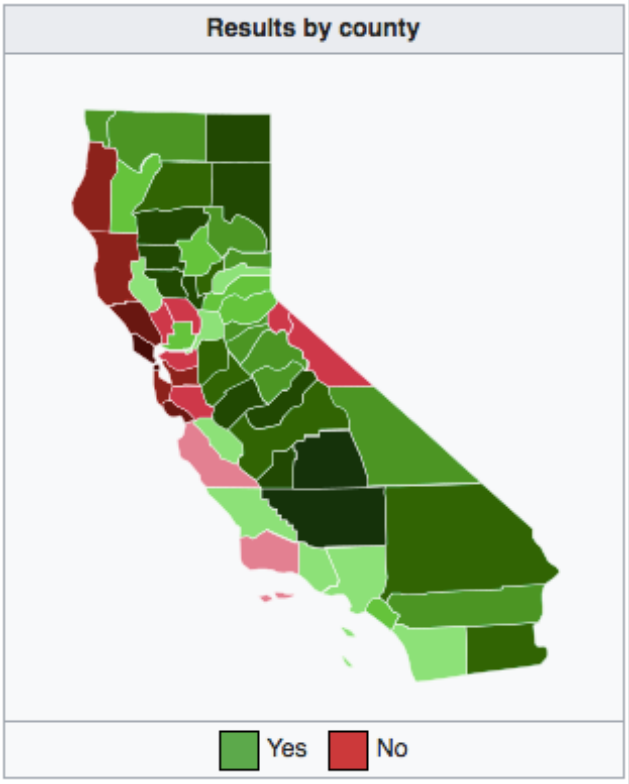


Figure 2.2. Distribution of Prop 8 Vote by California county

The Prop 8 vote was highly publicized on social media and in the news.^{132,133} A cross-sectional convenience study conducted in the days leading up to the passing of Prop 8 found that sexual minorities reported negative emotions including feeling “upset”, “nervous”, and “angry.” Of the study sample (N= 354), approximately 75% answered “7” (*A great deal*) out of a 7-point Likert scale when asked, “how much time have you spent thinking about Proposition 8?” Because Prop 8 revoked an existing right to marry, sexual minorities in California might have experienced greater psychological distress to the marriage ban than sexual minorities in other

states.^{84,134} Thus, there is solid evidence that Prop 8 was a salient matter, certainly to sexual minorities in California, and when passed served to enact an event consistent with structural stigmatization.

Study Purpose & Hypothesis

The current study sought to understand how neighborhood-level structural stigma (as indexed by the proportion of one's neighborhood that voted in favor of Prop 8, a same-sex marriage ban) impacted sexual minority psychological distress in the wake of a stigmatizing 'shock' (i.e., Prop 8). To investigate this, I used data from multiple waves of a representative statewide survey in California from time periods before, during, and after the Prop 8 vote. Given the robust literature demonstrating the strong harmful associations between structural stigma and sexual minority mental health, I hypothesized that sexual minorities residing in neighborhoods with a higher level of structural stigma would demonstrate increased levels of psychological distress in the time period immediately after the same-sex marriage ban was enacted as compared to sexual minorities living in neighborhoods with a lower level of structural stigma. This study expands on prior literature by utilizing a quasi-experimental design to offer insight into how a stigmatizing 'shock' in the population might differentially impact psychological distress depending on the stigma-related characteristics of one's local environment.

Methods

Data

Data were drawn from three waves of the California Quality of Life Survey (Cal-QOL). Each Cal-QOL is a follow-up to one of three waves of the California Health Interview Survey (CHIS). The CHIS is the largest state health survey in the United States, and at the time employed random-digit-dial telephone procedures to interview Californians about their health and

healthcare needs. From 2001-2012, the CHIS was conducted bi-annually, each time collecting data from between 42,000 and 55,000 Californian households per wave. Across years, the overall CHIS response rate was consistent with other random-digit-dial telephone interviews of the same time period, including the California Behavioral Risk Factor Surveillance System Survey.¹³⁵⁻¹³⁷

Follow-back surveys like the Cal-QOL use the obtained sample in the original survey sample (i.e., CHIS) as the sampling frame to procure a subsample of interest.¹³⁶ In the CHIS, respondents aged 18 to 70 years were asked their sexual orientation identity and gender of recent sexual partners. Eligibility for the Cal-QOL included those CHIS respondents who were willing to be re-contacted for additional health surveys and completed an English or Spanish version of the CHIS interview. From this eligible sample, the Cal-QOL oversampled for sexual minority status. Cal-QOL data were collected through structured interviews with trained interviewers using Computer Assisted Telephone Interviews (CATI). Interviews were conducted in English or Spanish.

Cal-QOL-I participants were interviewed between October 2004 and February 2005 with a 56% response rate;¹³⁶ Cal-QOL-II participants were interviewed between August 2008 and January 2009 with a 57% response rate;¹³⁵ and Cal-QOL-III participants were interviewed between January 2012 and February 2013 with a 58% response rate.¹³⁸

Participants were considered a sexual minority if they identified as lesbian, gay or bisexual at the time of the Cal-QOL interview, or if they reported lifetime histories of same-sex sexual behavior. Because sexual minorities were oversampled, the final Cal-QOL dataset includes 7,536 participants, including 2,021 sexual minorities and 5,515 heterosexuals (Cal-QOL-I n = 2,272 collected between October 2004 and February 2005; Cal-QOL-II n = 2,815 collected between

August 2008 and January 2009; Cal-QOL-III n = 2,449 collected between January 2012 and February 2013).

Variables

Outcome Variable

The dependent variable for this study is the Kessler Psychological Distress Scale (K-10) score.¹³⁹ This 10-item scale measures psychological distress in the past 30 days (see **Appendix 2.A** for the full scale). Scores range from 0 to 40. Previous research linking K-10 scores to clinical measures of mental health morbidity suggest the following cutoff scores: no/low levels of psychological distress (0-9), mild psychological distress (10-14), moderate psychological distress (15-19), and severe psychological distress (20-40).¹⁴⁰ Preliminary analyses of the K-10 distribution in the total Cal-QOL sample revealed that the average weighted K-10 score was 4.96 (Std Err: 0.09) and the weighted distribution of K-10 classification was as follows: 84.1% met criteria for no/low distress, 8.5% met criteria for mild distress, 3.6% met criteria for moderate distress, and 3.7% met criteria for severe distress. Because the K-10 measures current or recent (prior 30 days) psychological distress, it is an ideal measure with which to capture changes in population distress over time and in response to a shock event. As well, the K-10 has been used as a valid measure of psychological distress in numerous studies investigating sexual minority mental health.^{137,141,142}

Treatment Variable: Neighborhood-level Structural Stigma

The treatment variable for this study is a binary measure of structural stigma generated from precinct-level voting data and individual-level geographic variation by neighborhood. Participants were allocated into 'treated' (i.e., resides in a neighborhood where a majority voted in favor of same-sex marriage ban) or 'untreated' (i.e., resides in a neighborhood where a

majority voted against same-sex marriage ban) groups. How this variable was created is described below.

Zip Code Tabulation (ZCTA) overview. The Cal-QOL obtained information on respondents' zipcode and majority cross-streets during the course of the interview. This was converted to ZCTAs. Created by the U.S. Census Bureau, ZCTAs are generalized area representations of U.S. Postal Service (USPS) service areas.¹⁴³ In most cases, a ZCTA is the same as a zip code for a geographic area, though this is not always the case in regions where one residential or business address is assigned a unique zip code for ease in mail delivery. ZCTA-level data is commonly used in the social sciences to measure neighborhood-level structural factors including socioeconomic status, unemployment rate, percent of vacant housing, segregation, and healthcare utilization.¹⁴⁴⁻¹⁴⁷ ZCTA-level percentage of male-male unmarried partners has also been used to model "gay neighborhood" associations with health.¹⁴⁸

Neighborhood-level structural stigma. To generate a treatment variable capturing exposure to neighborhood-level structural stigma, the percent of 'yes' votes for Prop 8 in a ZCTA (i.e., proportion of neighborhood voting in favor of a same-sex marriage ban) was generated, and then dichotomized into a binary category: 0 = less than 50% of ZCTA voted in favor of Prop 8 ('untreated'); 1 = 50% or greater of ZCTA voted in favor of Prop 8 ('treated'). Public precinct-level voting data for Prop 8 were downloaded from the California Secretary of State website.^a Precinct-level data were then aggregated to the ZCTA level using crosswalk conversion files that are available through the Statewide Database, the redistricting database for the state of California.^b

^a See: <https://www.sos.ca.gov/elections/prior-elections/statewide-election-results/>

^b See: <http://statewidedatabase.org/faq.php?category=Conversion%20Files>

The Prop 8 vote occurred in 2008; however, treatment status was applied to participants across all survey years (2004 – 2012). Gallup poll historical trend data demonstrates that national public approval of homosexuality and same-sex marriage has steadily increased over time.^c For instance, in response to the question, “Do you think gay or lesbian relations between consenting adults should or should not be legal?” 52% of respondents stated that this should be legal in May 2004, 55% in May 2008, and 63% in May 2012. Given this upward linear trajectory, with 2008 being an approximate, but slightly underestimated, average of public opinion in 2004 and 2012, I assumed for these analyses that the treatment categorization of neighborhood-level structural stigma in 2008 was an adequate approximation of average stigma across survey years.

Final Analytic Sample

ZCTAs were missing for 115 participants who were dropped from the analysis; thus the final analytic sample included 7,421 participants. A total of 442 unique ZCTAs were represented in the analysis. The weighted percent of ‘yes’ votes on Prop 8 across ZCTAs represented in the dataset was 52.6% (Std Err: 0.26). For comparison, the true proportion of ‘yes’ votes for Prop 8 for the entire state of California was 52.3%, thus demonstrating the representativeness of this survey sample to the state of California. The ‘untreated’ group included 3,265 participants (Wt % = 37.8%), and the ‘treated’ group included 4,156 participants (Wt % = 62.2%).

Individual Variables

Sexual orientation was captured in Cal-QOL by asking participants if they self-identified as lesbian/gay/homosexual, bisexual or heterosexual. As well, participants were asked about the sex of their sexual partners since their 18th birthday. Participants who self-identified as

^c See: <https://news.gallup.com/poll/1651/gay-lesbian-rights.aspx>

lesbian/gay/homosexual or bisexual or who had had same-sex sexual partners since their 18th birthday were classified as a sexual minority.

Gender was recorded as male or female by the interviewer. If the interviewer was unsure, participants were asked to identify their gender as “male”, “female”, or “neither – transgender”. No participants in the sample were identified as transgender.

Age was measured in years in the Cal-QOL. Age is categorized into the following categories: 18-29, 30-39, 40-49, 50-59, and 60+. The age range in the Cal-QOL is 18 to 77.

Race/ethnicity was classified in the Cal-QOL through a number of questions relating to racial/ethnic origin, including whether or not the participant identified as Hispanic/Latino. From this, respondents’ race/ethnicity was categorized into one of five groups: Non-Hispanic White, Hispanic/Latino, Black/African-American, Asian/Pacific Islander, and American Indian/Alaska Native.

Marital/Cohabitation status was assessed by the following question: “Are you now married, living with a partner in a marriage-like relationship, widowed, divorced, separated, or never married?” Participants were classified as married/cohabiting or other.

Income and Federal Poverty Level were determined by asking participants their “household’s annual income from all sources before taxes.” Income was classified into the following four categories: less than \$20,000, \$20,000-\$59,999, \$60,000-\$99,999 and \$100,000 or greater. These cutoff points provided an even distribution across categories with a median cut point similar to the median household income in California in 2008 (~\$60,000).¹⁴⁹ To provide a measure of income adjusted for inflation across survey years, a binary cutoff for Federal Poverty Level (FPL) was derived from income and household size. This variable was dichotomized as: 0 = income greater than 200% of the FPL, and 1 = income less than 200% of the FPL.

Time Variable

Four time points ($t_1 - t_4$) were utilized to examine the immediate and long-term impact of the Prop 8 vote on psychological distress among sexual minorities. The time points were based on the Cal-QOL collection waves with the second and third time points separated by the Prop 8 vote: t_1 : October 2004 – February 2005 (Cal-QOL I respondents; $n=2,245$); t_2 : August 2008 – November 3rd 2008 (Cal-QOL II respondents; $n=2,135$), t_3 : November 4th 2008 – January 2009 (Cal-QOL II respondents; $n=636$), and t_4 : January 2012 – February 2013 (Cal-QOL III respondents; $n=2,405$).

Statistical Method

Analytic Approach

A difference-in-differences (DID) approach was utilized to measure the treatment effect of neighborhood-level structural stigma on psychological distress among sexual minorities in the wake of the Prop 8 vote. DID is a quasi-experimental design that uses observational, longitudinal, or cross-sectional panel data from treated and untreated groups to estimate the causal effect of a treatment or intervention.¹⁵⁰ In econometrics and health policy, DID is common in measuring the effects of policy changes on populations in which a true control group is not available.¹⁵¹ In social sciences, it is sometimes referred to as an “untreated control group design with pretest and posttest samples.”¹⁵² In its most common form, DID is utilized to measure pre-post differences in the outcome of interest utilizing two groups; one group that received some policy change or intervention and another group that did not receive some policy change or intervention. The current analysis expands upon the commonest approach to allocate treatment group status based on the intensity of exposure to a shock (i.e., the ‘intensity’ of local-level stigmatization as measured by percent of one’s neighbors voting to ban same-sex marriage). This

unique application of DID has been successfully utilized in a prior study measuring geographic variation in the intensity of an earthquake on maternal birth outcomes.¹⁵³

DID is commonly implemented as an interaction term between time and treatment group dummy variables in a regression model.¹⁵⁴ In its most general iteration, the outcome Y_i is modeled by the following equation:

$$Y_i = \beta_1 * treated_i + \beta_2 * time + \beta_3(treated_i * time) + X_i,$$

where the β_3 coefficient for the interaction term captures the pre-post difference in average outcome in the *treated* group minus the pre-post difference in the average outcome in the *untreated* group. The β_1 coefficient measures the average permanent differences between the treated and untreated groups. The β_2 coefficient is a time trend common to the treated and untreated groups. X_i captures a set of individual-level covariates.

To capture how sexual minorities might be affected by the Prop 8 vote as compared to heterosexuals, I employed a triple differences or difference-in-difference-in-differences (DDD) methodology.¹⁵⁵ With this methodology, a sexual minority subgroup is defined (i.e., those primarily affected by Prop 8) versus a comparison subgroup of similarly located heterosexuals who were expected to be less affected by the Prop 8 vote, and a three-level interaction term is added to the standard DID regression equation. Thus, the resulting DDD model is as follows:

$$Y_i = \beta_1 * treated_i + \beta_2 * subgroup_i + \beta_3 * (treated_i * subgroup_i) + \beta_4 * time \\ + \beta_5 * (time * treated_i) + \beta_6 * (time * subgroup_i) \\ + \beta_7 * (time * treated_i * subgroup_i) + X_i,$$

where the β_7 coefficient is the expected “treatment effect coefficient” in the subgroup of interest.¹⁵⁵ Similar to multilevel modeling, DID estimation is designed to control for systematic differences across treatment groups that might emerge from neighborhood composition,

socioeconomic status, and other unknown structural-level confounders.¹⁵³ Models also adjusted for individual-level confounders (gender, age, race/ethnicity, marital status, and federal poverty level) that are associated with sexual orientation and psychological distress, and were weighted to account for the complex survey design of the Cal-QOL (see *Weighting* section below for a detailed description of weighting strategies).

The most critical assumption of the DID methodology is the parallel trend or common trend assumption.¹⁵⁰ This assumption implies that if the treatment group had not been treated (i.e., if individuals living in stigmatizing neighborhoods had never experienced the Prop 8 vote), then the trend of psychological distress as compared to psychological distress among individuals living in non-stigmatizing neighborhoods would have been constant over time. **Figure 2.3** presents a line graph of raw data from the Cal-QOL showing trends in psychological distress across time by treatment group, demonstrating that the data adheres to the parallel trend assumption (i.e. in the time period before the Prop 8 vote, the trends in outcome by treatment group and subgroup status are parallel).

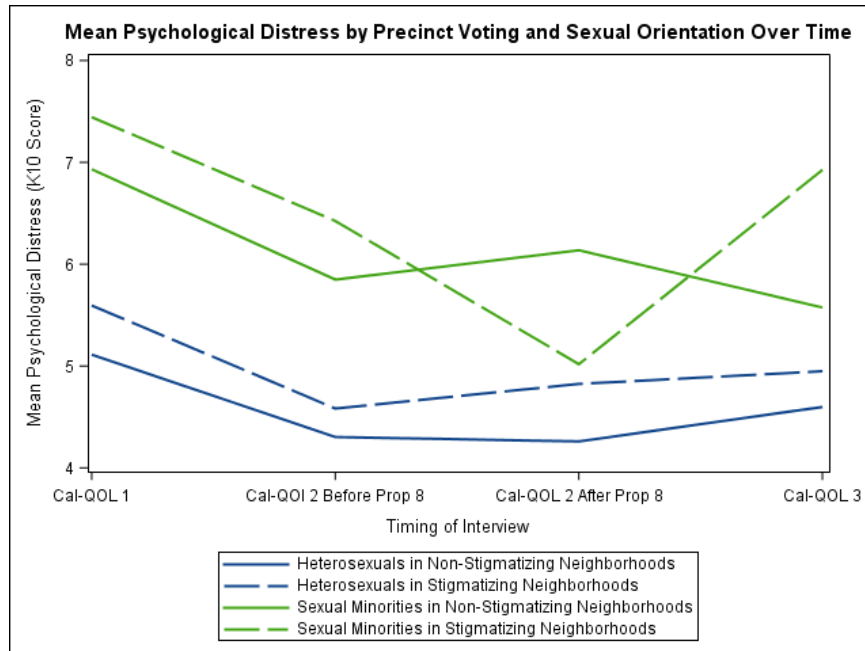


Figure 2.3. Unweighted trend of psychological distress across time by treatment group, California Quality of Life Survey

Weighting

Two approaches to weighting were conducted to ensure that the analyses adequately accounted for the oversampling survey design of the Cal-QOL and to ensure that the ‘exchangeability’ assumption of causal inference was met (i.e., treated and untreated groups are equal in respect to characteristics except for the outcome of interest). If individuals living in neighborhoods that voted in favor of Prop 8 (‘treated’) and individuals living in neighborhoods that voted against Prop 8 (‘untreated’) are not comparable with respect to individual-level characteristics, then the estimation of differences in psychological distress will be biased. Thus, I first used the original Cal-QOL survey weights and, next, I incorporated the original survey weights with a propensity score method approach. Recent guidelines have suggested that, when applying propensity score methods to analyses of complex survey data, analyses should also incorporate the original survey weights or risk generating results that do not generalize to the

survey target population.¹⁵⁶ DuGoff et al. provide a decision tree to assist researchers in deciding what type of weighting is necessary based on the estimand of interest and the desired generalizability. Because the goal of the current analysis was to make a population-level inference (i.e., population average treatment effect), and to generalize to the survey target population (i.e., the state of California), I incorporated the original survey weights in the final analyses along with using propensity score methods.

To create a weight that incorporated propensity score methods and original survey weighting, I conducted a four-step process based on guidelines outlined by DuGoff et al.¹⁵⁶ First, I generated propensity scores by regressing individual-level covariates *and* the original Cal-QOL survey weight on treatment status. Second, propensity score balance was assessed by visual inspection of a histogram demonstrating propensity score distribution by treatment status (see **Figure 2.4**). Once a propensity score is calculated, one must determine that the range of propensity scores across treatment groups overlaps and has similar ‘balance’ in treated and untreated groups.¹⁵⁷ As demonstrated by Figure 2.4, the overlap and balance of propensity scores in the treated and untreated groups were satisfactory.

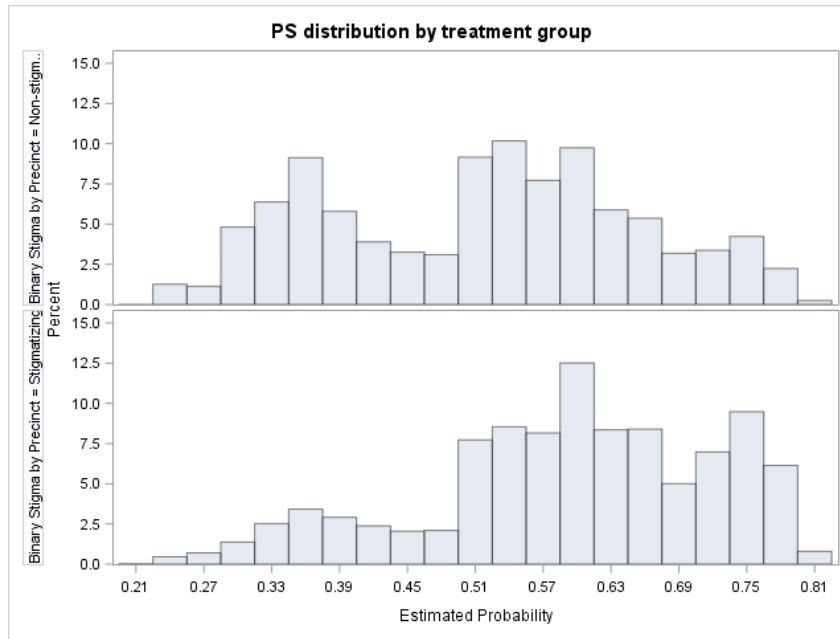


Figure 2.4. Propensity score distribution by treatment group demonstrating propensity score overlap and balance between treated and untreated groups

In a third step I calculated inverse probability of treatment weights (IPTW) from the propensity scores. IPTW produces unbiased estimates of the average treatment effect by generating a synthetic population composed of individuals in the original population weighted by the inverse of their probability of treatment; thus, the distribution of their baseline covariates is independent of treatment assignment.^{158,159} With IPTW, the treated group is weighted by $\frac{1}{PS}$, with PS being the propensity score, and the untreated group is weighted by $\frac{1}{1-PS}$. Finally, in a fourth step, I multiplied the original Cal-QOL survey weights by the IPTW to create final ‘IPTW+original survey weights’ that were utilized in final analyses, as described below.

Analyses

Primary analyses. All analyses were conducted in SAS 9.4. Weighted univariate analyses were conducted to characterize sample demographic characteristics. Then, bivariate analyses were employed to assess demographic characteristics between treatment groups under the

original weighting and propensity score weighting. Linear regression difference-in-difference-in-differences models, weighted by original survey weights and ‘IPTW+original survey weight,’ were then conducted to assess continuous K-10 score outcomes. Finally, logistic regression difference-in-difference-in-differences models with both weighting schemes were used to assess a binary outcome of ‘meeting criteria for any K-10 distress’ utilizing the following cutoff: 0, no distress: score 0-9 on the K-10; 1, any distress: score 10+ on the K-10.^{139,140} Models also adjusted for gender, age, race/ethnicity, marital status, and federal poverty level. Results were evaluated at $p \leq 0.05$. All confidence intervals (CI) are 95% CI. This study was approved by the Institutional Review Board at the University of California, Los Angeles.

Supplemental Analyses. Several additional analyses were conducted to triangulate results from the primary analyses and elicit further analytic insights. First, I conducted falsification tests to assess the association between treatment status and health outcomes that would not be expected to be associated with the Prop 8 vote, including the presence of (i) asthma and (ii) heart disease. If treatment status was associated with either or both of these health outcomes, it would suggest that uncontrolled confounders influencing poor health outcomes were driving the obtained results.

Second, two robustness checks were conducted to test the sensitivity of the findings: (i) A three-level treatment status variable was created to test whether an even greater intensity of the local neighborhood environment would influence results. The percent of a neighborhood voting ‘yes’ on Prop 8 was trichotomized into tertiles representing the lower third (<43.87% voted ‘yes’ on Prop 8), middle third (43.87% - 61.02% voted ‘yes’ on Prop 8), and highest third (>61.02% voted ‘yes’ on Prop 8) levels of structural stigma and this three-level variable was included as the treatment variable in the DDD models. (ii) A treatment variable was created removing

participants living in neighborhoods with the least stigmatizing (5th percentile; $\leq 14.14\%$ voted ‘yes’ on Prop 8) and most stigmatizing (95th percentile; $\geq 75\%$ voted ‘yes’ on Prop 8) constituents (N = 6,689). This second robustness check sought to determine whether individuals living in highly-anomalous environments were driving results.

Third, because the results from these analyses (explained below) were contradictory to the primary hypothesis, I conducted post-hoc explanatory analyses to investigate why the findings were not in the predicted direction based on the prevailing structural stigma literature. Because of the robust literature documenting the protective role of social support in mitigating psychological distress among sexual minorities,¹⁶⁰⁻¹⁶⁵ I conducted a set of analyses to identify whether social support differed by treatment status, time point, and sexual minority status, and might plausibly explain the discordant findings. For these analyses, I drew on a measure of social support included in the Cal-QOL. Six items in the Cal-QOL, drawn from the Medical Outcomes Study Social Support Survey,¹⁶⁶ measured social support in the past 4 weeks on a scale of 1 (*all of the time*) to 5 (*none of the time*), with items asking about social support in the domains of *help* (“how often was there someone who could help with daily chores if you were sick?”), *love* (“how often was there someone to love and make you feel wanted?”), *conversation* (“how often was there someone to confide in or talk to about yourself or your problems?”), *time* (“how often was there someone to have a good time with?”), *information* (“how often was there someone to give you information to help you understand a situation?”), and *money* (“how often was there someone to give you money if you needed it?”). Data were missing on at least one of the social support items for 7.1% of the sample. Individual social support items were imputed with single imputation methods; then, items were reverse-coded, summed, and rescaled so that the social

support scale score ranged from 0 to 24, with 24 being the highest possible level of social support. The weighted mean score in the total sample was 18.81 (Range: 0 – 24; Std Err: 0.08).

Results

Sample Characteristics

I analyzed data from 7,421 individuals from the California Quality of Life Survey interviewed in 2004-2005, 2008-2009, and 2012-2013. Univariate weighted averages were utilized to characterize sample demographics. Sexual minorities comprised 3.08% (SE: 0.12) of the sample as compared to 96.92% (SE: 0.12) heterosexuals. A slight majority of participants were female 52.02% (SE: 0.76) as compared to male 47.97% (SE: 0.76). The mean age of the sample was 42.5 years (SE: 0.22). Participants were predominately Non-Hispanic White (49.44%; SE: 0.76), followed by Hispanic/Latino (32.6%; SE: 0.74), Asian/Pacific Islander (10.23%; SE: 0.53), Black/African-American (6.83%; SE: 0.32), and American Indian/Alaska Native (0.86%; SE: 0.13). About one-fifth (21.56% [SE: 0.64]) of the sample earned less than \$20,000 per year; 31.1% (SE: 0.72) of participants earned less than 200% of the Federal Poverty Level. Almost two-thirds of the sample were married or cohabiting (62.52%; SE: 0.74). Allocation of treatment status by neighborhood voting characteristics demonstrated that 37.8% (SE: 0.74) of the sample resided in a neighborhood that voted against Prop 8, ('untreated') and 62.2% (SE: 0.74) resided in a neighborhood that voted in favor of Prop 8 ('treated').

Table 2.1. Sample demographic characteristics by neighborhood voting status, California Quality of Life Survey 2004-2012 (N=7,421)

Demographic Characteristics	Original survey weights		IPTW + Original survey weights		p-value ^a
	Wt % (SE)	Wt % (SE)	Wt % (SE)	n (Wt %)	
Sexual Orientation					0.02
Heterosexual	95.5 (0.2)	97.8 (0.1)	97.1 (0.2)	96.5 (0.2)	
Sexual Minority	4.5 (0.2)	2.2 (0.1)	2.9 (0.2)	3.5 (0.2)	
Gender					<i>ns</i>
Female	50.4 (1.2)	53.0 (1.0)	52.2 (1.3)	51.7 (1.0)	
Male	49.6 (1.2)	47.0 (1.0)	47.8 (1.3)	48.3 (1.0)	
Age (M, SE)	43.2 (0.4)	42.2 (0.3)	42.5 (0.4)	42.6 (0.3)	<i>ns</i>
Race/ethnicity					<i>ns</i>
Non-Hispanic White	56.3 (1.2)	45.3 (1.0)	48.5 (1.4)	50.0 (0.9)	
Non-Hispanic Black	6.7 (0.5)	6.9 (0.4)	7.4 (0.6)	6.6 (0.4)	
Hispanic/Latino	22.7 (1.1)	38.7 (1.0)	32.4 (1.4)	32.6 (0.9)	
Asian/Pacific Islander	13.5 (1.0)	8.3 (0.6)	10.6 (0.8)	10.0 (0.7)	
American Indian/Alaska Native	0.8 (0.2)	0.9 (0.2)	1.0 (0.3)	0.8 (0.2)	
Married/cohabiting					<i>ns</i>
Yes	61.4 (1.2)	63.2 (0.9)	61.9 (1.3)	62.6 (0.9)	
No	38.6 (1.2)	36.8 (0.9)	38.1 (1.3)	37.4 (0.9)	
Income					<i>ns</i>
<\$20,000	18.1 (1.0)	23.6 (0.8)	22.6 (1.2)	21.3 (0.8)	
\$20,000-\$59,999	29.9 (1.1)	36.6 (0.9)	32.7 (1.3)	34.2 (0.9)	
\$60,000-\$99,999	21.5 (1.0)	20.3 (0.8)	20.5 (1.0)	21.0 (0.8)	
\$100,000+	30.5 (1.1)	19.5 (0.8)	24.2 (1.0)	23.5 (0.9)	

<200% of Federal Poverty Level						<i>ns</i>
Yes	23.8 (1.1)	35.6 (0.9)	29.2 (1.3)	32.1 (0.9)		
No	76.2 (1.1)	64.4 (0.9)	70.8 (1.3)	67.9 (0.9)		

<.001

Note. Wt = Weighted percentages.

^aP-value evaluated by t-test or χ^2 test as appropriate. *ns* = not significant; $p \geq 0.05$.

Table 2.1 shows results from bivariate analyses demonstrating differences between groups based on treatment status (i.e., neighborhood in which an individual resides). In the overall weighted sample (original weights), there are several significant differences by treatment group status, including that as compared to individuals living in neighborhoods that voted in favor of Prop 8, individuals living in neighborhoods that voted against Prop 8 were slightly older, more likely to be a sexual minority, more likely to be non-Hispanic White and less likely to be Hispanic/Latino, and more likely to earn a higher annual income. After propensity score weighting (IPTW+ original weights), individuals living in ‘treated’ and ‘untreated’ groups were balanced with respect to covariates. As demonstrated by Table 2.1, there were no significant differences between treatment groups with respect to any demographic characteristics except for sexual orientation where propensity weighting served to reduce the absolute difference in the weighted proportion of sexual minorities between the groups (2.9% vs. 3.5%).

Primary Analyses

Table 2.2 presents results from the primary difference-in-difference-in-differences analyses for the outcome of psychological distress (K-10 score) as measured: (i) on a continuous scale and (ii) with a binary cutoff. The partial results of four models are shown; one for each outcome (linear or logistic) with each weighting scheme (original or incorporating propensity score weights). The parameter estimate of interest for each of the models is the interaction term between time period, treatment group status, and the subgroup of interest (i.e., sexual minorities). Model 1 predicts mean psychological distress across time by treatment status and subgroup of interest and is weighted with original Cal-QOL survey weights. Results demonstrated that sexual minorities living in neighborhoods where a majority of constituents voted in favor of Prop 8 (a same-sex marriage ban; i.e., ‘treated’) had a statistically significant mean psychological distress

reduction of 4.06 on the K-10 scale (95% CI: -7.38; -0.73) in the time period immediately after the Prop 8 vote. In Model 3, the integration of propensity score methods demonstrated little change in this result, with only a slight attenuation to a statistically significant mean psychological distress reduction of 3.71 (95% CI: -6.85; -0.56). Logistic regression models (Models 2 and 4) demonstrated parallel results to the linear regression models, highlighting that not only was there a significant reduction in mean psychological distress in the period after the Prop 8 vote among ‘treated’ sexual minorities, but also that this reduction in psychological distress was associated with significantly reduced odds of meeting the threshold for mild, moderate, or severe psychological distress. Model 4 also demonstrated a significant increase in psychological distress in the follow-up time period among sexual minorities in the ‘treated’ group (aOR = 1.22; 95% CI: 1.02-1.45).

Table 2.2. Partial results from difference-in-difference-in-differences analyses assessing the effects of neighborhood voting status on psychological distress: California Quality of Life Survey, 2004-2012 (N = 7421)

	Original Survey Weighting				IPTW+Original Survey Weighting							
	Model 1: K-10 Score, Continuous ^a		Model 2: K-10 Disorder Cutoff, Binary ^b		Model 3: K-10 Score, Continuous ^a		Model 4: K-10 Disorder Cutoff, Binary ^b					
	Coef.	SE	95% CI	aOR	SE	95% CI	Coef.	SE	95% CI	aOR	SE	95% CI
Heterosexual [<i>Subgroup</i> = 0]	2.33	0.58	(1.20; 3.47)	1.32	0.07	(1.16; 1.50)	2.37	0.62	(1.16; 3.57)	1.35	0.07	(1.19; 1.54)
Sexual Minority [<i>Subgroup</i> = 1]												
Less than 50% of Neighborhood voted in favor of Same-Sex Marriage (SSM) Ban [<i>V</i> = 0]	0.24	0.31	(-0.36; 0.86)	0.99	0.06	(0.88; 1.13)	0.17	0.33	(-0.48; 0.82)	0.98	0.06	(0.86; 1.11)
50% or More of Neighborhood voted in favor of Same-Sex Marriage (SSM) Ban [<i>V</i> = 1]												
Baseline (2004-2005) [<i>t</i> =0]												
3 Months Preceding Same-Sex Marriage Ban [<i>t</i> =1]	-0.42	0.34	(-1.10; 0.22)	1.14	0.09	(0.95; 1.37)	-0.53	0.37	(-1.24; 0.18)	1.19	0.10	(0.98; 1.45)
3 Months Following Same-Sex Marriage Ban [<i>t</i> =2]	-0.94	0.44	(-1.80; -0.07)	0.77	0.15	(0.57; 1.03)	-1.09	0.46	(-1.99; -0.19)	0.76	0.15	(0.56; 1.02)
Follow-Up (2012-2013) [<i>t</i> =3]	-0.34	0.34	(-1.00; 0.32)	0.96	0.09	(0.80; 1.14)	-0.77	0.44	(-1.06; 0.46)	0.96	0.09	(0.80; 1.15)
<i>Subgroup</i> ₁ (Sexual Minority) x <i>V</i> ₁ (Pro-SSM Ban) x <i>t</i> ₀ (Baseline)												
<i>Subgroup</i> ₁ (Sexual Minority) x <i>V</i> ₁ (Pro-SSM Ban) x <i>t</i> ₁ (Before SSM Ban)	-0.54	1.48	(-3.44; 2.37)	1.16	0.09	(0.96; 1.39)	-0.84	1.55	(-3.87; 2.20)	1.15	0.10	(0.95; 1.40)
<i>Subgroup</i> ₁ (Sexual Minority) x <i>V</i> ₁ (Pro-SSM Ban) x <i>t</i> ₂ (After SSM Ban)	-4.06	1.69	(-7.38; -0.73)	0.70	0.15	(0.52; 0.95)	-3.71	1.61	(-6.85; -0.56)	0.69	0.15	(0.52; 0.94)
<i>Subgroup</i> ₁ (Sexual Minority) x <i>V</i> ₁ (Pro-SSM Ban) x <i>t</i> ₃ (Follow-up)	1.20	1.43	(-1.60; 3.99)	1.19	0.09	(0.99; 1.41)	1.49	1.35	(-1.14; 4.13)	1.22	0.09	(1.02; 1.45)

Intercept	6.07	0.36	(5.36; 6.78)	0.28	0.10	(0.23; 0.34)	6.00	0.39	(5.23; 6.76)	0.27	0.10	(0.22; 0.33)
-----------	-------------	------	--------------	-------------	------	--------------	-------------	------	--------------	-------------	------	--------------

Note. N = 7,421. Models weighted and adjusted for Age, Gender, Married/cohabiting Status, Race, and Federal Poverty Level.
 IPTW = Inverse Probability of Treatment Weighting; Coef. = Coefficient; aOR = adjusted odds ratio; 95% CI = 95% Confidence Intervals
 Statistical significance **bolded** at $p \leq 0.05$.
^aK-10 Score range: 0 - 40 ^bK-10 Disorder Scaling: Score 0-9; no distress (0), Score 10 or higher; any distress (1)

Supplementary Analyses – Robustness Checks

Falsification tests were run by regressing the difference-in-difference-in-differences models from the primary analyses on the outcomes of the presence of (i) asthma and (ii) heart disease. Results revealed, as expected, that treatment status was not associated with these health outcomes that theoretically should not be affected by neighborhood voting behavior.

Sensitivity analyses included running the difference-in-difference-in-differences models from the primary analyses with (i) a three-level treatment variable (i.e., lowest, middle, highest percent of constituents voting ‘yes’ on Prop 8) and (ii) with the two-level treatment variable excluding individuals living in neighborhoods that represented the 5th and 95th percentile of constituents voting ‘yes’ on Prop 8 (i.e., included neighborhoods with 14.14% - 75% ‘yes’ votes). Linear regression DDD models utilizing the three-level treatment variable with original Cal-QOL survey weights and continuous K-10 outcome demonstrated that the influence of neighborhood voting behavior on psychological distress was even more severe when voting behavior was trichotomized into tertiles. Indeed, the parameter estimate from the desired interaction term,

$$\beta_7(\text{Subgroup}_{\text{Sexual Minority}} * \text{Time}_{\text{After Prop 8}} * \text{Treatment}_{\text{Highest Stigma}})$$

demonstrated a statistically significant mean psychological distress reduction of 5.70 (95% CI: -9.72; -1.68). This highlights that, as compared to sexual minorities living in neighborhoods with the least support for Prop 8, sexual minorities in neighborhoods with the most support for Prop 8 saw a significant psychological distress reduction in the period after the vote. The second robustness check excluded participants living in neighborhoods with voting behavior representing the 5th and 95th percentiles of voting behavior (excluded n = 732). Results showed little difference from the primary analyses, with the parameter estimate of interest showing a

statistically significant mean psychological distress reduction of 3.53 (95% CI: -7.02; -0.04), confirming that these results are not being driven by individuals living in anomalous neighborhood environments.

Additional Analyses – Social Support

A series of post-hoc exploratory analyses were conducted through an iterative process to investigate the role of social support in influencing the aforementioned unexpected results. First, to obtain a visual depiction of trends in social support across time, I graphed unweighted mean social support by treatment group, subgroup status, and time. From this graph (see **Figure 2.5**) it was evident that mean social support indeed differed across time and that, in particular, there was an increasing trend in mean social support among sexual minorities living in ‘treated’ (i.e., stigmatizing) neighborhoods in the time period immediately after the Prop 8 vote. I then conducted a series of bivariate and multivariate analyses to investigate the significance of this trend.

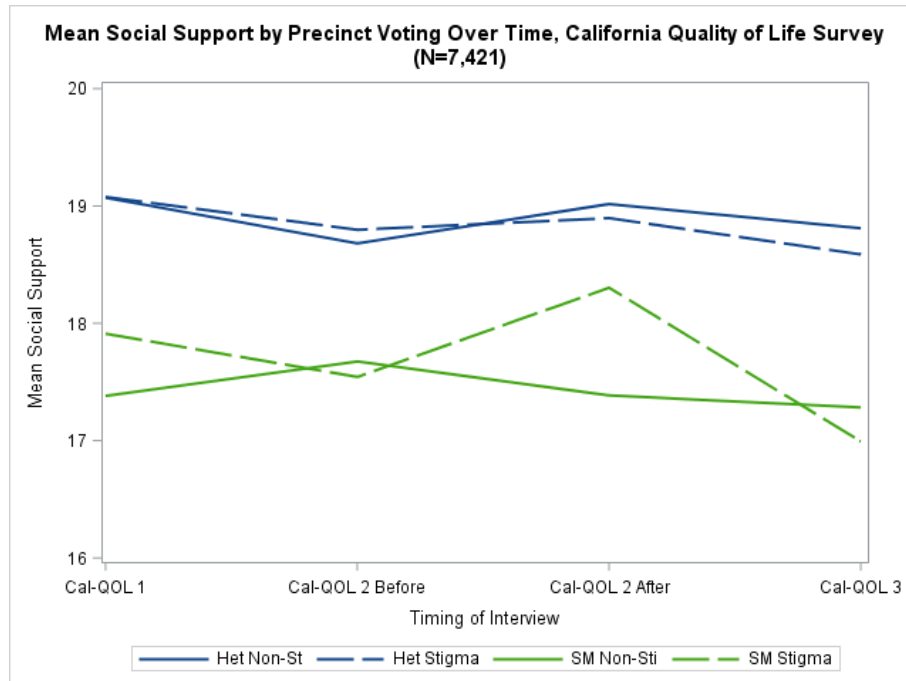


Figure 2.5. Unweighted mean social support across time by treatment group (‘stigma’ vs. ‘non-stigma’) and subgroup (‘heterosexual’ vs. ‘SM [sexual minority]’) status

Next, I investigated bivariate differences in social support by sexual minority status and treatment group status. In the total weighted sample, sexual minorities reported significantly lower mean social support ($M = 17.66$, Std Err: 0.23) as compared to heterosexuals ($M = 18.85$; Std Err: 0.08); $p < .0001$). There was no evidence of mean difference in social support by neighborhood voting behavior (treatment group). As well, when restricting bivariate analyses to sexual minorities, there was no significant main effect difference in mean social support by treatment group status.

I then ran a series of weighted linear regression models restricted by treatment group status at each time point to investigate whether the significant subgroup differences (i.e., sexual minority vs. heterosexual) in average social support remained across time. Models adjusted for age, race, and sex. When restricting these analyses to ‘untreated’ participants (i.e., residing in neighborhoods where less than 50% of constituents voted in favor of Prop 8), sexual minorities

demonstrated significantly lower average social support than heterosexuals at each of the four time points ($p < .05$). However, when restricting analyses to ‘treated’ participants (i.e., residing in neighborhoods where greater than or equal to 50% of constituents voted in favor of Prop 8), average social support among sexual minorities was significantly lower as compared to heterosexuals at time points 1 (Cal-QOL Wave 1) and 4 (Cal-QOL Wave 4), but the adjusted mean social support difference between sexual minorities and heterosexuals was not significant at time points 2 and 3 (Cal-QOL Wave 2 Before Prop 8 and Cal-QOL Wave 2 After Prop 8), tentatively suggesting that mean social support may have differed somewhat across time and treatment group status.

To test the causal impact of the Prop 8 vote on social support among sexual minorities, I ran the weighted difference-in-difference-in-differences linear regression models from the primary analyses with social support as the outcome of interest. The obtained parameter estimate for the β_7 coefficient of interest was 2.79 (95% CI: -0.22; 5.80), highlighting that while this did not reach significance at $p \leq .05$, the parameter estimate was positive, in the expected direction, and the 95% confidence interval demonstrated that the parameter trended towards a positive mean increase in social support among sexual minorities living in ‘treated’ neighborhoods in the time period immediately after the Prop 8 vote ($p = 0.07$). These results are not confirmation that social support was a reason for the unexpected results from the primary analyses (that sexual minorities living in treated neighborhoods reported *reduced* psychological distress after the Prop 8 vote); rather, these post-hoc analyses provide exploratory evidence that social support may indeed have been one factor influencing these findings. Only further analyses with additional measures of social support not available within the current study can help to triangulate these preliminary findings; indeed, future studies should seek to investigate the causal role of social support as a

buffer against psychological distress among sexual minorities in stigmatizing environments and in the face of discriminatory policies.

Discussion

Findings from this representative study of 7,421 adults in California demonstrated that a state-level vote to effectively ban same-sex marriage was associated with a significant *reduction* in psychological distress among sexual minorities living in neighborhoods in which a majority of constituents voted in favor of the proposition as compared to those living in neighborhoods in which a majority of constituents voted against the proposition. Several robustness checks were conducted to triangulate these unexpected findings. The unanticipated results from this study complicate understanding how structural stigma operates to produce psychological distress among sexual minorities. However, while these results do not fit neatly into the current understanding of the impact of structural stigma on sexual minority mental health, they do offer an opportunity to think critically about reactions to stigmatizing events and, especially, to consider how social support and other resilience factors can buffer the harmful effects of structural stigma.

Several studies have sought to investigate the association between anti-LGB amendments and mental health among sexual minorities.^{134,167-171} These studies primarily drew on a minority stress framework to explain the increased levels of psychological distress experienced by sexual minorities following votes on anti-LGB amendments including same-sex marriage bans. However, most used convenience sampling strategies and cross-sectional data of individuals drawn often times from higher gay density environment. These designs limit causal inference from these studies. Nonetheless, in addition to documenting how anti-LGB policies can negatively impact mental health, many of these studies also reported how stigmatizing events

like a statewide vote to ban same-sex marriage can foster social support, LGB community-building, and resilience among affected sexual minority populations. Indeed, Russell and Richards (2003) documented resilience factors among 316 sexual minorities following an amendment to Colorado state's constitution to deny legal recourse to LGB people who had experienced sexual orientation-related discrimination.¹⁷¹ Five main resilience factors emerged from that research, including (1) *movement perspective* (e.g., "Increased LGB community's visibility through publicity and media coverage"), (2) *confronting internalized homophobia* (e.g., "Felt less shame as a LGB person"), (3) *expression of affect* (e.g., "Had opportunity to express anger"), (4) *successful witnessing* (e.g., "Heterosexual friends offered understanding and support"), and (5) *LGB community* (e.g., "Increased support from LGB community"). A similar study that sought to document reactions to California's Prop 8 – the same-sex marriage proposition investigated in the current study – among 354 sexual minorities recruited from LGBT venues, social media, and "No on Proposition 8" campaign events found that participants reported similarly moderate levels of positive (e.g., 'happy', 'pride') and negative (e.g., 'upset', 'angry') emotions.¹³⁴ Further, participants also reported experiencing statistically significantly *greater* support than conflict from their intimate partner, family, friends, coworkers, and the heterosexual community in relation to Prop 8. Results from the present study expanded on findings from these prior studies to demonstrate that psychological resilience might have been temporarily enhanced among sexual minorities in the wake of a stigmatizing same-sex marriage ban. This finding might be partially explained by some of the aforementioned resilience factors: indeed, sexual minorities living in neighborhoods where a majority of constituents voted in favor of a same-sex marriage ban might have positively benefited from these resilience factors – especially social support – more so than sexual minorities in less stigmatizing (i.e., more

supportive) neighborhoods where these resilience factors may have already been more common, or even the status quo. Post-hoc analyses in the current study showed that perceived social support among sexual minorities was significantly lower as compared to heterosexuals at each time point among those living in ‘non-stigmatizing’ neighborhoods, but not significantly different at time points 2 and 3 (immediately before and after Prop 8) among those living in ‘stigmatizing’ neighborhoods. Thus, for sexual minorities in ‘stigmatizing’ neighborhoods, their perception of levels of social support in the time period immediately before and after the Prop 8 vote was on par with the perceived levels of social support among heterosexuals. This uptick in perceived social support might partially explain the reduction in psychological distress among this group in the wake of the same-sex marriage ban, and it highlights how perceptions of social support in the sample differed by sexual minorities’ local residential environments.

Prior research investigating how geography moderates perceived social support and access to resources among sexual minorities has primarily focused on the urban-rural divide: some studies have demonstrated that sexual minorities in rural locales are less connected to LGB communities, experience more discrimination, have significantly lower social engagement, and are less likely to be ‘out’ to family and social circles as compared to those in urban communities.^{172,173} However, other studies – mainly qualitative investigations and ethnographies – have demonstrated that sexual minorities in rural communities often construct their queer identities in concert with their identity as a “local,” incorporating strong ties to their local, ‘small town’ communities in tandem with building ‘gay community’ support through online venues.¹⁷⁴⁻¹⁷⁶ While the current study did not investigate an urban-rural divide, but rather an electoral divide, the reduction in psychological distress among sexual minorities in stigmatizing neighborhoods after the Prop 8 vote elucidates how stigmatizing events can differentially impact

individual-level mental health among sexual minorities depending on the context of where they live. Future investigations – both qualitative and quantitative – should attempt to unpack how sexual minorities’ local environments moderate reactions to events that are objectively stigmatizing to increase our understanding of how stigma might operate differently than we presume and how resilience can be drawn on by sexual minorities to buffer the harmful effects of discriminatory policies and events.

Limitations and Conclusions

This study is subject to a number of potential limitations. First, I operationalized the proportion of votes for a same-sex marriage ban in a neighborhood as an objective measure of structural stigma in that neighborhood. This strategy rests on the assumption that there were no other paths of influence, other than stigmatization, whereby exposure to the Prop 8 vote had a detrimental effect on psychological distress among sexual minorities. Further, this strategy also assumed that sexual minorities in the neighborhood were aware of their neighbors’ views of their right to marry beyond just the state-level Prop 8 vote. While studies have highlighted that Prop 8 was highly advertised across mediums, including news and local advertisements, posters, and yard signs,^{84,134} it is plausible that some sexual minorities were unaware of the support of Prop 8 within their own neighborhood. A second primary concern was that the Prop 8 vote occurred on the same day as the 2008 Presidential Election of Barack Obama. Thus, while Prop 8 was a salient, stigmatizing event in California for sexual minorities, the effect of the vote cannot be separated from the effects that the Presidential Election might have had on sexual minority psychological distress. Because sexual minorities evidence greater political liberalism than heterosexuals,¹⁷⁷ the election of Barack Obama, a Democrat, might have had a differential impact on psychological distress among sexual minorities as compared to heterosexuals. A third

limitation to this study is that the political engagement of participants was unknown: if, for example, sexual minorities in less stigmatizing environments were significantly more likely to engage in political activism, this might have confounded results. Last, the main outcome (K-10 psychological distress) was based on self-report, and might have been underreported given the sensitive nature of the questions and that the measure is collected via telephone rather than with a computer-based questionnaire.¹⁷⁸

Despite these limitations, the study also demonstrated numerous strengths. A primary strength of this study was that it met the gold-standard methodology of employing a quasi-experimental design. Indeed, by using cross-sectional panel data across time and utilizing a causal difference-in-difference analytic strategy with propensity weighting, this study improves our understanding of temporal changes in psychological distress before and after a stigmatizing event. As well, the study participants were drawn from the Cal-QOL, a methodologically-rigorous statewide survey that is representative of the population of California. The only known prior study investigating the impact of Prop 8 on psychological distress among sexual minorities employed convenience sampling with a small sample, likely leading to selection biases.¹³⁴

Findings from this study showed that sexual minorities living in objectively stigmatizing neighborhoods – as indexed by the proportion of neighborhood constituents voting in favor of a proposition that effectively banned same-sex marriage – reported reduced psychological distress in the two-month period after the vote. This project adds to – and complicates – our understanding of how structural stigma operates to produce psychological distress among sexual minorities at a neighborhood-level; as well, these findings emphasize the need for additional research on resilience factors and protective influences, especially social support, in the wake of stigmatizing events.

Appendix 2.A.

Kessler 10 Psychological Distress Scale

The following questions ask about how you have been feeling during the **past 30 days**. For each question, please circle the number that best describes how often you had this feeling.

Q1. During that month, how often did you feel ...	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. ... tired out for no good reason?	1	2	3	4	5
b. ...nervous?	1	2	3	4	5
c. ...so nervous that nothing could calm you down?	1	2	3	4	5
d. ...hopeless?	1	2	3	4	5
e. ...restless or fidgety?	1	2	3	4	5
f. ...so restless that you could not sit still?	1	2	3	4	5
g. ...depressed?	1	2	3	4	5
h. ...so depressed that nothing could cheer you up?	1	2	3	4	5
i. ...that everything was an effort?	1	2	3	4	5
j. ...worthless?	1	2	3	4	5

Chapter 3

Sexual orientation differences in gun ownership and beliefs about gun safety policy: Findings from the General Social Survey, 2010 – 2016

Background

Gun violence in the United States is a major public health concern; gun-related injuries are estimated to cost \$2.8 billion annually in healthcare costs alone.¹⁷⁹ More than half of all violent deaths in 2012 in the U.S. involved the use of guns (69.6% of homicides; 50.9% of suicides).¹⁸⁰ In addition to mortality, in the first decade of the 21st century, the rate of non-fatal gun-related injury in the United States was twice the rate of fatal gun-related injury and accounted for 921,613 non-fatal injuries.¹⁸¹ Gun ownership is also a crucial predictor of gun-related violence including suicide.¹⁸² Access to a gun is a robust predictor of suicide beyond individual-level psychopathology.^{34,183} In general, men are more likely to own guns than women,^{42,182,184} which partially explains why men are more likely to die by suicide than women.¹⁸⁵ Whether differences in gun exposure are also shaped by sexual orientation is largely unknown, but may represent unrecognized differences in risk for suicide, a significant knowledge gap given sexual minorities' (e.g., lesbians, gay men, and bisexuals) disproportionate suicide risk.⁶ Blossnich et al. conducted the only known study of sexual orientation and gun ownership and found that same-sex partnered individuals were significantly less likely to report having a gun in the household compared to opposite-sex partnered individuals, an association that was modified by military service history.¹⁸⁶ But this study was unable to test gender differences in sexual minority gun ownership, a critical limitation given differences in gender-based behavioral patterns among sexual minorities.^{7,187,188}

A related factor to gun ownership is personal views about gun safety laws. In general, sexual minorities voice more liberal political views as compared to heterosexuals;¹⁷⁷ thus, one might

expect that sexual minorities favor stricter gun control and gun safety laws.¹⁸⁹ After 49 lesbian, gay, bisexual and transgender (LGBT) individuals were killed in 2016 by an armed gunman at Pulse nightclub in Orlando, Florida,¹⁹⁰ activists, news media and policy centers argued that gun control must be viewed as an “LGBT policy issue” given the population’s unique vulnerability to gun violence.^{189,191} But, in actuality, no studies to date of which I am aware have investigated gun-specific policy views among sexual minority individuals.

Thus, I used information from multiple years of the General Social Survey to investigate sexual orientation-related patterns of gun ownership and beliefs about gun safety policy. I hypothesize that sexual minorities will be more endorsing of gun safety policy than their heterosexual peers. I also hypothesize that sexual minority men will have a lower prevalence of gun ownership as compared to heterosexual men. However, given evidence demonstrating the wide range of elevated behavioral health risks among sexual minority women (e.g., high rates of smoking, alcohol use, poor diet, lower rates of health care utilization¹⁹²⁻¹⁹⁴), I further hypothesize that sexual minority women will demonstrate a greater prevalence of gun ownership as compared to heterosexual women.

Public Health Significance

Understanding the risk of gun ownership among sexual minorities might identify important and unrecognized pathways to reducing suicide risk in this vulnerable population. This study has the potential to identify specific public health intervention points related to sexual minority gun ownership. Interventions targeting safe gun ownership might be one important strategy in preventing suicide risk among sexual minorities. To that end, research has shown that means restriction – limiting a suicidal person’s access to highly lethal means – is effective in suicide prevention.^{34,183} Means restriction includes training clinicians to ask about gun ownership and

counseling at-risk individuals and their families to store guns away from the home or making household guns inaccessible.³⁴ Thus, findings of this study might elucidate that mental health providers working with sexual minorities represent a key point of intervention in suicide prevention efforts. Inquiring about gun ownership and providing lethal means counseling to sexual minorities at risk for suicide would represent an innovative and important public health addition to mental health providers' suicide reduction toolkits.

Methods

Study Design and Population

The current study used cross-sectional data from multiple years of the General Social Survey (GSS). The GSS is a biennial survey that employs a multi-stage sampling design to obtain a sample of non-institutionalized adults (≥ 18 years old) living in the United States. For over four decades, the GSS has been a social litmus test: the survey includes items related to attitudes and beliefs on various topics including crime, politics, immigration, morality, national security priorities, and social mobility. Since 2002, the GSS has administered surveys to respondents using computer-assisted personal interviews. In 2008, the GSS added a question to gather respondents' self-identified sexual orientation. However, military veteran status, a strong modifier of gun ownership,¹⁹⁵ was not collected in that cycle; thus, the proposed project will analyze data from the GSS collected in 2010, 2012, 2014, and 2016. Response rates for the GSS ranged from 71.4% (in 2012) to 61.3% (in 2016).

From 2010-2016, three question ballots were implemented (A, B and C), and only certain questions were asked depending on ballot type (e.g., gun-related questions were not asked on ballot B). To determine a final analytic sample size, I conducted a set of pre-analytic data restriction measures. I restricted analyses to include only respondents who received all of the

following questionnaire items: gun safety policy beliefs, presence of guns in the household, sexual orientation, and an item asking about military veteran status (N=4,867). I dropped respondents with missing data for our key independent and dependent variables, including gun safety policy beliefs (n=74), presence of a gun in the household (n=155), and sexual orientation (n=139). Additionally, I removed respondents with missing data for military veteran status (n=7). Given the overlap in missing data, I dropped from consideration a total of 313 respondents. Thus, the final analytic sample for the proposed project includes 4,554 respondents who range in age from 18 to 89 years of age.

Measures

Dependent Variables

I focused on three dependent variables: (1) beliefs about gun safety policy, (2) the presence of guns in the household, and (3) among those reporting household guns, whether the respondent was the gun owner. The following item measured gun safety beliefs: “Would you favor or oppose a law which would require a person to obtain a police permit before he or she could buy a gun?” Response options included “favor” or “oppose.” The presence of gun(s) in the household was assessed by the question: “Do you happen to have in your home or garage any guns or revolvers?” This variable was coded trichotomously (“yes”/ “no”/ “refused”). If participants responded affirmatively, a follow-up question asked: “Do any of these guns personally belong to you?” This variable was coded dichotomously (“yes”/ “no”).

Primary Independent Variables

Respondents’ gender was coded as male or female. The following item assessed sexual orientation: “Which of the following best describes you?” Response options included: “gay, lesbian, or homosexual”, “bisexual”, or “heterosexual or straight.” Given the small number of

respondents who selected “gay, lesbian, or homosexual” or “bisexual,” I combined these respondents into a single category denoting sexual minority status.

Demographics

The GSS measures several other demographic characteristics including race/ethnicity, age, education level, household size, urbanicity, political views, and military veteran status. The GSS codes race/ethnicity in three categories (White, Black, or other). For analytic purposes, I recoded education level into two categories (high school or less versus more than high school); urbanicity into three categories (urban/suburban, small city/town, or rural); military veteran status into two categories (military veteran versus not); and political views into three categories (conservative, moderate, or liberal).

Statistical Analysis

Statistical analyses were conducted in *R* taking into account the complex sampling design and weighting of the GSS using the “survey” package. Covariates with missing data included education (<1%); age (<1%); and political views (3%). Missing covariate data were imputed with Rubin’s multiple imputation method¹⁹⁶ using the “mice” package in *R*.

Analyses were conducted with the full analytic sample as well as with gender-stratified (male only/female only) samples. Initially, bivariate analyses were used to determine unadjusted group differences between heterosexuals and sexual minorities for demographics characteristics and gun-related outcomes. I report the results of t-tests and Wald chi-square tests as appropriate. Then, multivariable logistic regression models were used to evaluate the adjusted association of sexual minority status with each of the three outcomes in the overall sample and in gender-stratified samples. Analyses controlled for several possible known confounders of gun safety beliefs and gun ownership including gender, age, race/ethnicity, education level, size of

household, urbanicity, military veteran status, and political views as well as survey year.^{195,197}

Results were evaluated at $p \leq 0.05$. I report weighted percentages and standard errors (SE). All confidence intervals (CI) are 95% CI. This study was exempt from IRB review.

Results

Sample Characteristics

Approximately 3.6% (SE: 0.004) of the weighted GSS sample identified as a sexual minority (see **Table 3.1**). Among men, 3.5% (SE: 0.005) identified as a sexual minority (2.4% gay [SE: 0.004] and 1.2% bisexual [SE: 0.002]). Among women, 3.7% (SE: 0.004) identified as a sexual minority (1.1% lesbian [SE: 0.002] and 2.7% bisexual [0.004]). For both men and women, sexual minority status was significantly associated with younger age and more liberal political views. As well, sexual minority men reported higher education levels and smaller households when compared to heterosexual men. There was also a trend that sexual minority men were less likely to be military veterans as compared to heterosexual men ($p = 0.054$).

Table 3.1 Demographic characteristics among respondents in the 2010-2016 General Social Survey (GSS), by gender and sexual orientation

Characteristics	Total				Women				Men			
	Sexual Minority (n=195)		Heterosexual (n=4359)		Sexual Minority (n=102)		Heterosexual (n=2401)		Sexual Minority (n=93)		Heterosexual (n=1958)	
	Est. (SE)	P	Est. (SE)	P	Est. (SE)	P	Est. (SE)	P	Est. (SE)	P	Est. (SE)	P
Women, %	55.6 (0.04)	0.71	54.2 (0.01)	0.71	--	--	46.7 (0.4)	<0.001**	--	--	46.0 (0.44)	0.01*
Age, \bar{x}	38.8 (1.19)	<0.001**	46.4 (0.35)	<0.001**	37.1 (1.7)	0.77	46.7 (0.4)	<0.001**	41.0 (1.8)	0.77	46.0 (0.44)	0.01*
Race/ethnicity, %		0.33		0.33								0.26
White	76.0 (0.04)		74.4 (0.02)		76.4 (0.05)		73.6 (0.02)		75.7 (0.06)		75.3 (0.02)	
Black	15.8 (0.03)		14.7 (0.01)		15.7 (0.04)		15.9 (0.02)		15.9 (0.04)		13.3 (0.01)	
Other	8.1 (0.02)		10.9 (0.01)		7.9 (0.03)		10.5 (0.02)		8.4 (0.03)		11.3 (0.01)	
Education Level, %		0.04*		0.04*								0.03*
High school or less	31.4 (0.05)		41.5 (0.01)		33.5 (0.06)		40.7 (0.02)		28.9 (0.06)		42.4 (0.02)	
More than high school	68.6 (0.05)		58.5 (0.01)		66.5 (0.06)		59.3 (0.02)		71.1 (0.06)		57.6 (0.02)	
Household size, \bar{x}	2.5 (0.15)	0.04*	2.8 (0.04)	0.04*	2.9 (0.23)	0.12	2.9 (0.04)	0.92	2.0 (0.14)	0.12	2.8 (0.05)	<0.001**
Rural/urban, %		0.56		0.56								0.74
Urban/suburban	59.2 (0.06)		56.4 (0.04)		58.3 (0.07)		55.3 (0.04)		60.4 (0.07)		57.8 (0.05)	
Small city/town	32.9 (0.06)		32.8 (0.04)		37.2 (0.07)		33.4 (0.04)		27.3 (0.07)		32.1 (0.07)	
Rural	7.9 (0.03)		10.8 (0.02)		4.5 (0.04)		11.3 (0.02)		12.3 (0.05)		10.1 (0.02)	
Military Veteran, %	9.2 (0.02)	0.60	10.3 (0.01)	0.60	6.4 (0.03)	0.12	2.0 (0.00)	0.12	12.6 (0.03)	0.03*	20.2 (0.01)	0.05
Political Views, %		<0.001**		<0.001**								<0.001**
Conservative	23.2 (0.04)		33.2 (0.01)		21.7 (0.04)		31.3 (0.01)		25.0 (0.06)		35.4 (0.01)	
Moderate	31.1 (0.04)		39.6 (0.01)		36.3 (0.05)		40.8 (0.01)		24.5 (0.06)		38.2 (0.01)	
Liberal	45.8 (0.04)		27.2 (0.01)		42.0 (0.05)		27.9 (0.01)		50.5 (0.06)		26.4 (0.01)	

Note. N = 4,554. Weighted estimates (Est) and standard errors (SE) shown. Statistical significance evaluated by adjusted Wald chi-square test or

t-test.

* $p \leq 0.05$ ** $p \leq 0.001$

Gun safety policy beliefs and gun ownership

Table 3.2 reports the prevalence of gun safety beliefs and gun ownership by gender and sexual orientation, highlighting unadjusted group differences.

Table 3.3 reports partial results from the three multivariable models. Sexual minority men reported over three times the odds (aOR = 3.24, 95% CI: 1.79 - 5.88) of favoring a gun safety law compared to heterosexual men, after adjusting for confounding. As well, sexual minority men demonstrated about one-third the odds (aOR = 0.34, 95% CI: 0.18 - 0.65) of reporting the presence of a gun in the household as compared to heterosexual men. Gun ownership among men did not differ significantly by sexual orientation. In contrast, among women, gun safety beliefs and reporting a gun in the household did not differ significantly by sexual orientation, although the reported presence of a household gun was somewhat higher among heterosexual (31.5%) than sexual minority (23.6%) women. But, among those women who reported gun(s) in the household, sexual minority women demonstrated nearly four times the odds (aOR = 3.97, 95% CI: 1.43 - 11.03) of being the gun(s) owner as compared to heterosexual women.

I also conducted a post-hoc sensitivity analysis to assess sexual orientation differences in personal gun ownership in the population (not shown in tables). To do this, I created a binary variable in the total analytic sample (N=4,554) that identified personal gun owners (respondents who indicated that they were the owner of the gun in the household) and non-owners (all others). Gender-stratified analyses demonstrated similar patterns of personal gun ownership as in the total sample. Sexual minority men demonstrated less than one-third the odds of being a gun owner as compared to heterosexual men (aOR = 0.30, 95% CI: 0.17 - 0.56). Conversely, sexual minority women demonstrated moderately elevated odds of being a gun owner as compared to heterosexual women (aOR = 1.89, 95% CI: 0.99 - 3.60).

Table 3.2. Household guns and beliefs about gun safety among respondents in the 2010-2016 General Social Survey, by gender and sexual orientation

Characteristics	Total			Women			Men		
	Sexual Minority (n=195) Wt % (SE)	Heterosexual (n=4359) Wt % (SE)	P	Sexual Minority (n=102) Wt % (SE)	Heterosexual (n=2401) Wt % (SE)	P	Sexual Minority (n=93) Wt % (SE)	Heterosexual (n=1958) Wt % (SE)	P
<u>Gun safety beliefs</u>			<0.01*			0.87			<0.001**
Favors law requiring police permit before gun purchase	82.3 (0.03)	73.6 (0.01)		78.6 (0.04)	77.8 (0.01)		86.8 (0.04)	68.5 (0.02)	
<u>Household guns</u>									
Gun(s) in household	21.5 (0.04)	35.7 (0.02)	<0.001**	23.6 (0.05)	31.5 (0.02)	0.12	18.8 (0.05)	40.6 (0.03)	<0.001**
Respondent is gun(s) owner ^a	70.4 (0.07)	65.2 (0.01)	0.49	61.8 (0.10)	35.8 (0.02)	0.04*	83.8 (0.10)	92.2 (0.01)	0.42

Note. N=4,554. Weighted percents (Wt %) and standard errors (SE) shown. Statistical significance evaluated by Wald chi-square tests.

^an = 1,523 (respondents reporting presence of gun in household)

*p ≤ 0.05

**p ≤ 0.001

Table 3.3. Partial results of multiple logistic regression models evaluating gun safety policy beliefs, presence of gun in household, and gun ownership by sexual orientation and gender, General Social Survey 2010-2016

	<u>Favors Gun Safety Law</u>		<u>Reports Gun(s) in Household</u>		<u>Owner of Gun(s) in Household^a</u>	
	n	aOR (95% CI)	n	aOR (95% CI)	n	aOR (95% CI)
Overall Sample						
Sexual Minority (n = 195)	160	1.77 (1.14 - 2.78)*	35	0.55 (0.36 - 0.83)**	26	3.05 (1.00 - 9.33)*
Heterosexual (n = 4,359)	3203	<i>ref</i>	1494	<i>ref</i>	1032	<i>ref</i>
Women only						
Sexual Minority (n = 102)	80	1.09 (0.62 - 1.92)	20	0.76 (0.43 - 1.35)	13	3.97 (1.43 - 11.03)**
Heterosexual (n = 2,401)	1880	<i>ref</i>	694	<i>ref</i>	283	<i>ref</i>
Men only						
Sexual Minority (n = 93)	80	3.24 (1.79 - 5.88)**	15	0.34 (0.18 - 0.65)**	13	0.37 (0.05 - 2.67)
Heterosexual (n = 1,958)	1323	<i>ref</i>	800	<i>ref</i>	749	<i>ref</i>

Note. N = 4,554. Sexual minority includes individuals who self-identify as lesbian, gay, or bisexual. aOR = adjusted odds ratio; CI = confidence interval; Ref = referent. Multivariable analyses weighted and adjusted for gender (overall sample), age, race, education, household size, urbanicity, veteran status, political views, and survey year.

^aN = 1,523. Sample limited to individuals reporting presence of a gun in the household.

* $p \leq 0.05$, ** $p \leq 0.01$

Discussion

Results from this study are consistent with a prior study conducted in a sample of U.S. veterans which found that same-sex partnered individuals were significantly less likely to report having a gun in the household as compared to opposite-sex partnered individuals.¹⁸⁶ Here, I expanded on these findings to show that sexual minority women were significantly more likely to report personal gun ownership than did heterosexual women. Individuals who personally own guns report gun ownership with greater accuracy than non-gun owners who live in a household with guns; thus, injury prevention experts have called for research focused on personal gun ownership.¹⁹⁸

Elevated gun ownership among sexual minority women as compared to heterosexual women might be partially explained by the populations' disproportionate risk of stigma-related victimization.⁷⁶ Perceived risk of victimization is associated with obtaining a gun for self-protection.¹⁹⁹ However, sexual minority men in our sample demonstrated reduced risk of gun ownership as compared to heterosexual men despite the fact that sexual minority men also experience elevated risk of victimization.⁷⁶ These results highlight the importance of recognizing gender differences in the sexual minority population.

Gender norms may be one alternate explanation for personal gun ownership among sexual minority women: compared to heterosexual women, sexual minority women are more likely to report self-ascribed masculinity and traditionally male-associated hobbies and occupational preferences.²⁰⁰ Indeed, concordant with other studies,¹⁸⁶ sexual minority women in our sample were more likely to report military veteran status, a masculine-associated occupation, than heterosexual women. Across studies, masculine-linked gender norms have been associated with specific patterns of health risk behaviors,²⁰¹ including higher rates of gun ownership.¹⁹⁸ As well,

this result is consistent with previous observations that sexual minority women may evidence patterns of behavioral health risks more similar to that of heterosexual men than of heterosexual women, including elevated tobacco and alcohol use, overweight and obesity, and lower rates of healthcare utilization.^{90,187,188,202,203} These results underscore the public health imperative of gender-stratifying behavioral risk research among sexual minority populations, and call for additional research on the ways in which sex differences among sexual minorities shape health risks and inform tailored interventions.

Physicians tend to underestimate gun ownership among their patients,²⁰⁴ but gun storage counseling by physicians is effective in improving patient gun storage practices.²⁰⁵ Personal gun owners are more likely to be responsible for gun storage and safety practices.²⁰⁶ Given that sexual minorities report favorable gun safety policy beliefs and generally liberal political views, an elevated propensity for personal gun ownership among sexual minority women could be unrecognized by physicians. Thus, clinicians working with sexual minority women should be cognizant of the populations' elevated propensity for personal gun ownership given that sexual minority women experience disproportionate risk for violence in the home, including suicide attempt⁶ and intimate partner violence.²⁰⁷

The finding that sexual minority status was associated with supporting gun safety laws was not unexpected; sexual minority individuals tend to espouse political liberalism, as shown in the current sample. But, even after adjustment for political liberalism, sexual minority status was still highly predictive of favoring a gun safety law, suggesting that sexual minority populations endorse gun safety regardless of political views. However, this finding also invites several other questions regarding sexual minority gun owners. For instance, because sexual minorities favor gun safety laws, do they have safer gun ownership practices than heterosexual individuals (e.g.,

keeping a gun locked, storing ammunition separate from the gun)? This may have relevance to gun-related violence risk reduction efforts and warrants further study.

Three limitations should be considered in contextualizing these results. First, I aggregated lesbian, gay, and bisexual individuals into a single sexual minority group to increase statistical power. Relatedly, due to the relatively small sample size, the frequencies of the subgroup outcomes are small, which reduced power to detect differences. Second, 2.3% of respondents refused to answer the initial question pertaining to guns in the household; elsewhere research finds that ‘refusals’ are more likely to be gun owners.^{208,209} In analyses not shown I evaluated the impact of this effect on study outcomes and found no evidence that the refusal rate could have impacted the conclusions. Third, the measures of gun safety attitudes in the GSS were limited to a single question. In addition, gun safety practices within gun-owning households were not assessed. Additional studies with both larger sample sizes and more thorough assessment of gun-related safety concerns can resolve these concerns.

Public Health Implications

Understanding accessibility to guns is a critical component of suicide prevention efforts, especially in the U.S., which has the highest rate of gun-related mortality when compared to other high-income countries.¹⁸⁰ Findings from this study suggest sexual minority women may be more likely to personally own guns, a readily available lethal method for suicide, than their heterosexual peers. Given the generally liberal political views of the sexual minority population, this propensity for gun ownership may be an unrecognized risk factor for suicide. As such, I recommend that mental health providers include gun ownership questions in regular screening and counseling materials for sexual minority women to identify individuals at elevated vulnerability for suicide in the presence of other known risk factors, such as loss or depression.^{6,7}

The following chapter of this dissertation (Chapter 4) expands upon the current findings to examine sexual orientation differences in lethal means used in suicide. In addition to highlighting access to guns among sexual minorities, these results underscore the public health imperative of gender-stratifying behavioral risk research among sexual minority populations.

Chapter 4

Sexual orientation differences in lethal method used in suicide: Findings from 59,075 suicides in the National Violent Death Reporting System

Background

Sexual minorities (i.e., lesbians, gay men, bisexual people) demonstrate elevated risk of suicide attempt and mortality as compared to similar heterosexuals.^{6,98-100} But because research on antecedents of suicide among sexual minorities has generally been limited to studies assessing the risk of suicide attempt and/or ideation, rather than suicide mortality,^{6,210} little is known about critical antecedents of suicide mortality among sexual minorities, including proximate contexts of death such as the method used suicide (e.g., firearm, hanging). This represents a critical gap in the literature given the robust association between chosen method of suicide and lethality of a suicide attempt.²¹¹

The most proximal factor associated with suicide mortality is the method used in a suicide attempt.^{23,210} It can thus be considered the “final gatekeeper” of a suicide attempt, as it is only through the lethal method that death will occur. Case fatality rates of suicide attempt differ greatly depending on the type of lethal method used. For instance, one population-level study investigating case fatality rates of suicide attempt by method demonstrated that individuals who attempted suicide with a firearm were 55 times more likely to die than those who attempted suicide by drug/poison ingestion.¹¹ Lethal means used in suicide attempts not only vary by regional accessibility of the method (e.g., the disproportionately high firearms suicides in the U.S. as compared to other countries), but also vary by individual status characteristics. For example, the “gender paradox” in suicide – that women are more likely to attempt suicide, but men are more likely to die by suicide – stems partially from the fact that men are more likely than women to use a firearm in their attempt.⁵⁵⁻⁵⁷ As well, age is associated with lethal method

such that older age has been shown to predict using a highly-lethal method (hanging, firearm, jump/fall) as compared to younger suicide attempters who are more likely to use poisoning/overdose.^{12,58} Understanding differences in suicide method based on key status characteristics not only augments our understanding of the epidemiology of suicide but can also aid in targeting interventions to groups disproportionately vulnerable to death by suicide.

Sexual orientation differences in suicide method are understudied but might represent an opportunity for intervention. Only recently have any studies investigated this aspect of suicidality among sexual minorities. One study from 2019 investigating suicide risk in the National Violent Death Reporting System (NVDRS) among youth and young adults aged 12-29 found that sexual minority males evidenced reduced risk of using a firearm as compared to heterosexual males;²¹² however, the analytic approach of this study has been called into question due to the large amount of missing data.²¹³ Another 2019 Centers for Disease Control and Prevention (CDC) study also utilizing the NVDRS compared gay male and lesbians to non-LG (lesbian or gay) decedents, and found that LG decedents were less likely to use firearms and more likely to use hanging than non-LG decedents; however this study, too, suffered from analytic issues, including considering all decedents – those classified as heterosexual and those with unknown sexual orientation – as non-LGB.²¹⁴ Drawing from the homicide literature, one study investigating sexual orientation differences in method of intimate partner homicide found that the percentage of homicides using a firearm was significantly higher among heterosexuals as compared to sexual minorities, but that stabbing was higher among sexual minorities.²¹⁵ Because intimate partner homicides primarily occur in the home, this study supports evidence that firearms might be less available to some sexual minorities as compared to heterosexuals.²¹⁶ Beyond these few studies, there is a paucity of evidence investigating sexual orientation

differences in suicide method that might inform suicide prevention efforts among a population vulnerable to suicide. Thus, the purpose of this study was to identify sexual orientation differences in lethal method drawn from a large, multi-year sample of suicides in the U.S.

Methods

Data source: National Violent Death Reporting System

We used data from the National Violent Death Reporting System (NVDRS; 2003-2015). The NVDRS is a restricted-access CDC database that, as of 2018, pools data from 50 states and the District of Columbia on all decedents of violent death, including suicides and homicides among individuals age 12 years and older. Data were drawn from 2003-2015, which, as of 2015, pooled data from 32 states. Case records are abstracted by trained coders from police reports, medical examiner reports, hospital records and toxicology reports, witness statements, suicide notes, if available, and statements from decedents' family and friends. Each case record in the NVDRS dataset includes a series of close-ended codes regarding the decedent's demographic characteristics, circumstances surrounding the death, and information regarding the cause of death, including method of suicide.

Analytic Sample and Sexual Orientation Coding

As of 2015, the NVDRS dataset includes data on 143,784 suicides among individuals 12 years and over. In 2012, the NVDRS added a code to denote decedent sexual orientation. To procure a final analytic sample, we first restricted the dataset to adults, age 18 and older, who died by suicide in the years in which sexual orientation was officially coded (n = 59,519). Decedents with missing data for method of suicide were dropped (n=416) as well as decedents with completely missing entries other than lethal method (i.e., missing all demographic variables

and narratives; n=28). Thus, the final analytic sample included 59,075 suicide decedents who ranged in age from 18 to 102 years old at death.

The sample includes 577 lesbian, gay or bisexual (LGB), 12,573 heterosexual deaths, and 45,925 decedents for which sexual orientation is unclassified. This large percent of unclassified data for sexual orientation represents the primary limitation of the NVDRS. Selection for sexual orientation (i.e., coded as heterosexual, lesbian, gay, or bisexual) requires that this information was included in the law enforcement or medical examiner report. For sexual minorities, this requires that a decedent was either “out” to his or her family or close friends, or reported their sexual orientation in a suicide note, journal, or social media message that was discovered soon after death. Analytic mechanisms to account for the large proportion of records with unclassified sexual orientation are described in detail below in the *Statistical Analysis* section.

Study Measures

Dependent Variable: Method of Suicide

Method of suicide was abstracted from the code ‘weapon type’ in the NVDRS. Method of suicide was categorized into one of the following categories following the work of injury prevention experts: drug/poison ingestion, poison by fumes, suffocation/hanging, firearm, cut/pierce, fall, other.¹² Each of these categories is pre-coded in the NVDRS except ‘Poison by Fumes’; this category was created using the International Classification of Diseases (ICD) code included in each decedent record in the NVDRS to extract individuals who died by car exhaust, carbon monoxide, or another gas. “Other” method of suicide included all decedents who were either pre-coded in the NVDRS as having died by “other” method of suicide, or who used a method of suicide used by less than or equal to 1.0% of the population in the NVDRS (i.e., motor

vehicle, other transport vehicle, intentional neglect [e.g., starving oneself], biological weapons, drowning, explosive, fire or burns, non-powder gun, and blunt instrument).

Primary Independent Variables

Sex is coded in the NVDRS as male or female and drawn from the death certificate, law enforcement report, or medical examiner report.

Sexual orientation in the NVDRS is coded as “lesbian”, “gay”, “bisexual,”, or “heterosexual”. Due to power constraints, lesbian, gay, and bisexual decedents were collapsed into a single “sexual minority” category.

Demographic and Circumstantial Variables

Race/ethnicity in the NVDRS is coded based on standards used by the U.S. Census Bureau in the 2000 decennial census, and categorized as: White, Black/African-American, Asian/Pacific Islander, American Indian/Alaska Native, Two or more, or Other.

Marital status is coded in the NVDRS into the following categories: Married/Civil Union/Domestic Partnership, Never Married, Widowed, Divorced, Separated, and Single, not otherwise specified.

Military veteran status in the NVDRS is drawn from the section denoting military veteran status on the U.S. Death Certificate.

Region is drawn from a code in the NVDRS denoting the state in which the death was processed and then collapsed into one of four Census region categories: Northeast, Midwest, South, and West.

In addition, the NVDRS includes the following variables to capture mental health history and substance use history: history of prior suicide attempt; history of suicidal thoughts; history of treatment for mental illness; current alcohol dependence or alcohol problem; and, current non-

alcohol substance use problem. These circumstantial variables are coded in the NVDRS as binary variables (0/1) to denote the presence or absence of the issue and are drawn from information provided in the law enforcement and medical examiner reports.

Statistical Analysis

What to do with unclassified sexual orientation?

As aforementioned, perhaps the most critical limitation of the NVDRS is the large percentage of decedents with unclassified sexual orientation.²¹⁷ In the current analytic sample, 77.7% of decedents have an unclassified sexual orientation. For analyses in which sexual orientation is of critical interest, appropriate analysis of these data is not straightforward, especially in determining a denominator or comparison group.^{217,218} Dropping all participants with unclassified sexual orientation leaves a biased dataset that is not representative of suicides in the U.S.²¹² Unless the decedent's sexual orientation is implied (e.g., reference to the decedent's romantic partner) or specifically stated (e.g., "decedent was gay") in either the medical examiner or law enforcement report, the individual's sexual orientation, LGB or otherwise, is left unclassified. Therefore, including only participants with coded sexual orientation in analysis leads to severe selection biases.²¹⁸

To ensure that the following analyses were as representative of the 'true' population of suicides as possible, analyses were conducted with a trichotomous 'sexual orientation' predictor variable, including those with unclassified sexual orientation as a reference group to which sexual minorities and heterosexuals were compared. In the general population, sexual minorities represent about 3.5% of the population.²¹⁹ Because of evidence demonstrating that sexual minorities are overrepresented in suicide,^{99,100} it is expected that the proportion of sexual minorities in a population of suicides might be somewhat elevated as compared to in the general

population. Crude demographic differences between sexual orientation groups (see *Results*) suggest that the reference group with unclassified sexual orientation is 90% or more heterosexual, thus representing an appropriate reference group with which to compare sexual minorities and heterosexuals.

Analytic Plan

Analyses were conducted in SAS version 9.4. Covariate data were analyzed to determine patterns of missingness. There was generally very little missing data (ranging from <0.01% missing ‘age at death’ to 8.40% missing ‘military veteran status’). Bivariate analyses were conducted with the overall sample, and multivariable analyses were conducted with imputed data following Rubin’s multiple imputation method.¹⁹⁶

Statistical analyses proceeded in two stages: (a) descriptive statistics and bivariate analyses by sexual orientation were calculated to demonstrate unadjusted associations between sexual orientation and method of suicide; and, (b) multivariable logistic regression analyses were conducted to demonstrate the adjusted association between sexual orientation and each method of suicide. Given that sex is a strong effect modifier of the association between sexual orientation and mental health outcomes including suicidality, and is strongly correlated with method of suicide in the general population,^{6,55,100,220} analyses were conducted in the full analytic sample and in sex-stratified samples. The multivariable models adjusted for sex, age at death, race/ethnicity, geographic region, military veteran status, and mental health history including prior suicide attempt, alcohol dependency, and substance use. Results were evaluated at $p < 0.05$. We report adjusted risk ratios (aOR) and 95% confidence intervals (CI). This study was exempt from IRB review.

Results

Sample demographic characteristics, stratified by sexual orientation, are presented in **Table 4.1**. Significant differences in demographic characteristics are denoted by p -values from Wald X^2 test or F tests as appropriate. Unadjusted odds ratios (ORs; not presented in tables) are presented in the text to expand on results. As expected, heterosexuals demonstrated few or negligible differences in demographic characteristics as compared to decedents with unclassified sexual orientation (e.g., unadjusted ORs: Sex OR=1.03; White Race/Ethnicity OR=0.94; History of Substance Abuse OR=1.04; all $p \geq 0.05$). The primary notable demographic difference between these two groups was that heterosexuals were more likely to be married/domestic partnered than decedents with unclassified sexual orientation (unadjusted OR=2.91, $p < 0.001$); this is expected given that decedents were coded as heterosexual in part due to the mention of an opposite-sex spouse in the law enforcement or medical examiner reports.

Compared to decedents with unclassified sexual orientation, sexual minorities were younger, more likely to be female, more likely to be Black/African American, less likely to be married, and less likely to have served in the U.S. Armed forces. Variables capturing mental health history demonstrated that sexual minorities were significantly more likely to have experienced a host of mental health issues than decedents with unclassified sexual orientation. Unadjusted ORs (not shown in tables) demonstrated that, as compared to decedents with unclassified sexual orientation, sexual minorities demonstrated 2.56 greater odds of prior suicide attempt, 1.88 greater odds of prior suicidal thoughts or plans, 1.74 greater odds of a history of mental illness treatment, 1.35 greater odds of being alcohol dependent or having an alcohol problem, and 1.48 greater odds of having a non-alcohol substance use problem (all $p < 0.001$).

Table 4.1. Sample characteristics by sexual orientation, National Violent Death Reporting System (N=59,075)

	Lesbian, Gay or Bisexual (n=577)	Heterosexual (n=12,573)	Unclassified Sexual Orientation (n=45,925)
Demographics	n (%)	n (%)	n (%)
Sex			
Male	380 (65.9)	9794 (77.9)	35566 (77.8)
Age at Death (M, SD) ^a	38.6 (13.9)	48.6 (17.1)	47.4 (17.6)
Race/ethnicity ^b			
White	495 (86.1)	11168 (89.2)	40502 (88.8)
Black/African American	43 (7.5)	596 (4.8)	2889 (6.3)
American Indian/Alaska Native	10 (1.7)	254 (2.0)	552 (1.2)
Asian/Pacific Islander	14 (2.4)	248 (2.0)	810 (1.8)
Two or more	11 (1.9)	143 (1.1)	492 (1.1)
Other	2 (0.4)	107 (0.9)	367 (0.8)
Marital Status ^c			
Married/Domestic Partnered	57 (10.1)	6826 (54.7)	13325 (29.4)
Widowed	10 (1.8)	616 (4.9)	2959 (6.6)
Divorced	57 (10.1)	1962 (15.7)	11110 (24.6)
Separated	15 (2.7)	455 (3.6)	1233 (2.7)
Never Married	403 (71.3)	2346 (18.8)	15686 (34.7)
Single, Unspecified	23 (4.1)	286 (2.3)	861 (1.9)
Census Region			
Northeast	80 (13.9)	1922 (15.3)	6251 (13.6)
Midwest	114 (19.8)	3280 (26.1)	9619 (21.0)
South	210 (36.4)	3978 (31.6)	13316 (29.0)
West	173 (30.0)	3393 (27.0)	16739 (36.5)
Ever served in U.S. Armed Forces ^d			
Yes	40 (7.6)	2310 (21.1)	7965 (18.7)
Mental Health and Substance Abuse			
History of prior suicide attempt			
Yes	203 (35.2)	2341 (18.6)	8045 (17.5)
History of suicidal thoughts, plans or attempts			
Yes	226 (39.2)	3924 (31.2)	11725 (25.5)
History of treatment for mental illness			
Yes	275 (47.7)	4082 (32.5)	15761 (34.3)
Alcohol dependence or alcohol problem			
Yes	117 (20.3)	2362 (18.8)	7285 (15.9)
Non-alcohol substance use problem			
Yes	119 (20.6)	1820 (14.5)	6861 (14.9)

Note. Statistical significance evaluated by Wald χ^2 test or F test as appropriate. All significant at $p < 0.0001$ except non-alcohol substance use problem which was significant at $p = 0.002$.
^an=59,073; ^bn=58,703; ^cn=58,230; ^dn=54,110

Results from sex-stratified bivariate analyses assessing unadjusted associations between sexual orientation and method of suicide are presented in **Table 4.2**. Hanging was the most common method of suicide among sexual minorities, while firearm was the most common method of suicide among heterosexuals and those unclassified for sexual orientation. Unadjusted odds ratios (ORs; not shown in tables) demonstrated that heterosexual decedents did not differ significantly in death by hanging (OR=1.00, $p = 0.79$), but demonstrated moderately elevated odds of death by firearm (OR=1.19, $p < 0.001$) as compared to decedents with unclassified sexual orientation.

Sexual minorities demonstrated increased odds of death by hanging (OR=1.77, $p < 0.001$) and reduced odds of death by firearm (OR=0.43, $p < 0.001$) as compared to decedents with unclassified sexual orientation. Drug/poison ingestion (OR=1.56) and fall (OR=1.69; both $p < 0.05$) also demonstrated significantly elevated odds of use among sexual minority suicide decedents as compared to decedents with unclassified sexual orientation.

Sex-stratified bivariate analyses revealed that sex strongly modified the unadjusted association between sexual orientation and method of suicide (unadjusted ORs not shown in tables). Sexual minority men demonstrated significantly reduced odds of death by firearm as compared to men with unclassified sexual orientation (OR=0.30, $p < 0.001$). In contrast, sexual minority women did not differ significantly in the use of a firearm as compared to women with unclassified sexual orientation (OR=1.24, $p = 0.15$). Sexual minority women demonstrated significantly reduced odds of death by drug/poison ingestion as compared to women with unclassified sexual orientation (OR=0.54), while sexual minority men demonstrated significantly elevated odds of death by drug/poison ingestion as compared to men unclassified for sexual orientation (OR=2.74; both $p < 0.001$). Hanging was similarly elevated among both sexual

minority men (OR=1.86) and women (OR=1.67) as compared to decedents with uncoded sexual orientation (both $p < 0.001$).

Table 4.2 Method of suicide by gender and sexual orientation, National Violent Death Reporting System (N=59,075)

	Lesbian, Gay or Bisexual (n=577)	Heterosexual (n=12,573)	Unclassified Sexual Orientation (n=45,925)	
Overall Sample (N=59,075)				
	n (%)	n (%)	n (%)	P
Firearm	174 (30.2)	6871 (54.7)	23102 (50.3)	<.0001
Hanging/Suffocation	219 (38.0)	3247 (25.8)	11805 (25.7)	<.0001
Drug/Poison Ingestion	117 (20.3)	1436 (11.4)	6428 (14.0)	<.0001
Poisoning by Fumes	19 (3.3)	365 (2.9)	1133 (2.5)	0.013
Cut/Pierce	13 (2.3)	217 (1.7)	914 (2.0)	0.140
Fall	22 (3.8)	147 (1.2)	1055 (2.3)	<.0001
Other Suicide Method ^a	15 (2.4)	290 (2.3)	1488 (3.2)	<.0001
Women Only (n=13,335)				
	n (%)	n (%)	n (%)	P
Firearm	69 (35.0)	1004 (36.1)	3143 (30.3)	<.0001
Hanging/Suffocation	68 (34.5)	695 (25.0)	2483 (24.0)	0.002
Drug/Poison Ingestion	44 (22.3)	822 (29.6)	3592 (34.7)	<.0001
Poisoning by Fumes	4 (2.0)	77 (2.8)	251 (2.4)	0.531
Cut/Pierce	3 (1.5)	47 (1.7)	179 (1.7)	0.969
Fall	2 (1.0)	42 (1.5)	283 (2.7)	0.001
Other Suicide Method ^a	7 (3.3)	92 (3.3)	428 (4.1)	0.137
Men Only (n=45,740)				
	n (%)	n (%)	n (%)	P
Firearm	105 (27.6)	5867 (59.9)	19959 (56.1)	<.0001
Hanging/Suffocation	151 (39.7)	2616 (26.3)	9873 (26.9)	<.0001
Drug/Poison Ingestion	73 (19.2)	614 (6.3)	2836 (8.0)	<.0001
Poisoning by Fumes	15 (4.0)	288 (2.9)	882 (2.5)	0.010
Cut/Pierce	10 (2.6)	170 (1.7)	735 (2.1)	0.079
Fall	20 (5.3)	105 (1.1)	772 (2.2)	<.0001
Other Suicide Method ^a	6 (1.6)	198 (2.0)	1060 (3.0)	<.0001

Note. Statistical significance evaluated by Wald X^2 tests.

^aOther Suicide Method includes: motor vehicle, other transport vehicle, intentional neglect (e.g., starving oneself), biological weapons, personal weapons (i.e., hands and fists), drowning, explosive, fire or burns, non-powder gun, blunt instrument

Table 4.3 presents partial results from multiple logistic regression models evaluating the adjusted association between sexual orientation and method of suicide in the overall sample in sex-stratified samples. Sexual minority women demonstrated increased odds of death by firearm (aOR=1.45) and reduced odds of death by drug/poison ingestion (aOR=0.67) as compared to the reference group of female suicides unclassified for sexual orientation (all $p < 0.05$). In contrast, sexual minority men demonstrated reduced odds of death by firearm (aOR = 0.40) and increased odds of death by hanging (aOR=1.41), drug/poison ingestion (aOR=2.25), and poisoning by fumes (aOR=1.17) as compared to the reference group of male suicides unclassified for sexual orientation (all $p < 0.001$). In the overall sample, heterosexuals demonstrated elevated odds of death by firearm (aOR=1.15) and poisoning by fumes (aOR=1.19) and reduced odds of death by drug/poison ingestion (aOR=0.82) and fall (aOR=0.56) as compared to the reference group of suicides uncoded for sexual orientation (all $p < 0.01$).

Table 4.3 Partial results of multiple logistic regression models evaluating method of suicide by sexual orientation and gender, National Violent Death Reporting System (N=59,075)

	Firearm			Hanging/Suffocation			Drug/Poison Ingestion			Poisoning by Fumes		
	aOR	95% CI	P	aOR	95% CI	P	aOR	95% CI	P	aOR	95% CI	P
Overall Sample												
LGB	0.62	(0.51 - 0.75)	<.0001	1.36	(1.14 - 1.63)	0.001	1.30	(1.04 - 1.62)	0.022	1.52	(0.95 - 2.43)	0.077
Heterosexual	1.15	(1.10 - 1.20)	<.0001	1.02	(0.97 - 1.07)	0.519	0.82	(0.77 - 0.88)	<.0001	1.19	(1.05 - 1.35)	0.006
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--
Women Only												
LGB	1.45	(1.05 - 1.98)	0.022	1.15	(0.84 - 1.57)	0.382	0.67	(0.48 - 0.97)	0.034	1.01	(0.37 - 2.76)	0.988
Heterosexual	1.26	(1.14 - 1.39)	<.0001	1.02	(0.92 - 1.14)	0.664	0.84	(0.76 - 0.93)	<.001	1.30	(0.99 - 1.70)	0.062
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--
Men Only												
GB	0.40	(0.32 - 0.51)	<.0001	1.41	(1.14 - 1.75)	0.002	2.25	(1.72 - 2.94)	<.0001	1.74	(1.03 - 2.95)	0.039
Heterosexual	1.12	(1.06 - 1.18)	<.0001	1.01	(0.96 - 1.07)	0.597	0.81	(0.74 - 0.89)	<.0001	1.17	(1.02 - 1.35)	0.028
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--
	Cut/pierce			Fall			Other Suicide Method ^a					
	aOR	95% CI	P	aOR	95% CI	P	aOR	95% CI	P	aOR	95% CI	P
Overall Sample												
LGB	1.14	(0.66 - 2.00)	0.631	1.33	(0.86 - 2.06)	0.197	0.52	(0.30 - 0.90)	0.020			
Heterosexual	0.89	(0.77 - 1.05)	0.170	0.56	(0.47 - 0.67)	<.0001	0.77	(0.67 - 0.88)	<.0001			
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--
Women Only												
LGB	1.20	(0.38 - 3.85)	0.755	0.34	(0.08 - 1.37)	0.128	0.74	(0.34 - 1.60)	0.444			
Heterosexual	0.96	(0.68 - 1.34)	0.806	0.56	(0.40 - 0.79)	<.001	0.81	(0.64 - 1.02)	0.075			
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--
Men Only												
GB	1.15	(0.61 - 2.18)	0.668	1.99	(1.25 - 3.17)	0.004	0.40	(0.18 - 0.91)	0.028			
Heterosexual	0.89	(0.74 - 1.06)	0.176	0.56	(0.45 - 0.69)	<.0001	0.76	(0.65 - 0.89)	<.0001			
Unclassified SO	--	--	--	--	--	--	--	--	--	--	--	--

Note. All analyses are adjusted for sex (overall sample), age at death, race, marital status, military veteran status, region, suicide attempt history, alcohol dependency issues, and substance abuse issues. LGB = Lesbian, Gay or Bisexual. GB = Gay/Bisexual. SO = Sexual Orientation.

aOR = adjusted odds ratio. CI = confidence interval. **Bolding** denotes statistical significance at $p < 0.05$

^aOther Suicide Method includes: motor vehicle, other transport vehicle, intentional neglect (e.g., starving oneself), biological weapons, personal weapons (i.e., hands and fists), drowning, explosive, fire or burns, non-powder gun, and blunt instrument

Discussion

Findings from this study of 59,075 adult suicides in the National Violent Death Reporting System (NVDRS) demonstrated that sex and sexual orientation were critical predictors of method used in suicide. The primary finding that emerged from this analysis was that hanging is the most common method of suicide utilized among sexual minorities. As well, sexual minority men are more likely to die by drug/poisoning ingestion than other men who die by suicide, and sexual minority women are more likely to die by firearm than other women who die by suicide. This work underscores that gender differences present in the general population (e.g., men are at elevated risk of death by firearm) are sometimes vice versa among sexual minorities; thus, there is an imperative to gender-stratify behavioral risk research in this population. This study also highlights that circumspection is required when analyzing sexual orientation data in the NVDRS, including careful consideration of an appropriate reference group of which to compare sexual minority suicide decedents.²¹⁷

Findings revealed that hanging is disproportionately utilized as a method of suicide among sexual minorities. Given that a majority of suicides occur in the home, and household materials that can be used to suffocate oneself are ubiquitous, legislative or community-based method restriction interventions are unlikely to be successful in reducing hanging as a primary method of suicide.^{34,52,183} Because hanging is widely used as a method of suicide among sexual minorities but is a private and highly-lethal method, research employing qualitative methods can explore motivations for hanging among sexual minorities with suicidal intent. One qualitative study with 22 presumably-heterosexuals who had survived a near-lethal suicide attempt (eight with hanging) found that hanging was adopted for two primary reasons: accessibility of method and the view that the death would be “clean”, quick and painless.²²¹ However, suicide attempt

survivors who did not choose hanging recognized that it could be “messy”, slow and painful, and believed that technical knowledge was necessary to complete the hanging. As aforementioned, reducing hanging by restricting access to the method in the general population would be unreasonable given the wide availability of materials that can be used to hang oneself. However, the socio-cultural acceptability of hanging seems to be associated with its use as a primary method of suicide. For instance, the elimination of hanging as the method of judicial execution has been linked to the subsequent rise of hangings in the United Kingdom given that hanging was no longer linked to the stigma of execution.^{222,223} Qualitative research with sexual minorities should explore socio-cultural influences that might impact hanging as an acceptable suicide method, including the portrayal of hanging in the media,²²² news coverage of high-profile suicides,²²⁴ and the influence of social media and social networking sites on suicidal behavior including suicide method.²²⁵ A more refined understanding of socio-cultural influences on method of suicide can inform targeted awareness-raising and media messaging campaigns specific to sexual minorities.

Prior research has documented that sexual minority women are more likely than heterosexual women to be personal gun owners;²¹⁶ the current work extends these findings to demonstrate that, among women who died by suicide, lesbians/bisexual women demonstrate increased odds of death by firearm. Public health partnerships with gun rights/gun owner groups and gun shops are critical suicide prevention strategies that might be extended to sexual minority women. Indeed, campaigns to engage gun shops in suicide prevention efforts through awareness-raising about suicide risk and reducing access to firearms among individuals at risk for suicide have demonstrated feasibility, acceptability, and effectiveness.^{226,227} Dubbed “Gun Shop Projects,” these community-public health partnerships are currently underway in more than 20 states.²²⁶

Research is needed to understand sexual minority women’s association with gun owning groups that might be appropriate suicide prevention partners. For instance, Pink Pistols is a gun rights and self-defense group specific to sexual minorities with over 50 chapters in the United States and Canada.^{228,229} Groups like Pink Pistols that engage sexual minority gun owners can be key partners in public health collaborations to prevent suicide through strategies similar to those employed in “Gun Shop Projects”.

Results showed that one-in-five sexual minority men die by drug/poison ingestion as compared to just 6% of heterosexual men. Targeted public health interventions to reduce the disproportionately high tobacco use among sexual minorities can serve as a model on which to base suicide prevention efforts targeting drug/poison ingestion and overdose among sexual minority men. Indeed, tobacco-related awareness-raising and education-based interventions have successfully reduced smoking among sexual minorities through venue-specific tailored messaging,²³⁰ policy/advocacy campaigns,²³¹ and awareness-raising through sexual minority-specific media and news sources.²³² Similar multi-pronged interventions can be applied to drug- and overdose-related suicide prevention efforts among at-risk sexual minority men.

Beyond findings specific to lethal method, the current study also demonstrated that almost half of sexual minorities had been engaged in mental health treatment prior to their suicide. This finding parallels results from population-based studies demonstrating that sexual minorities are more likely to engage with mental health services than non-sexual minorities.^{90,233} However, despite greater mental healthcare utilization, sexual minorities still demonstrate significant disparities in adverse mental health outcomes, including suicide. Recent evidence suggests that sexual minority-affirmative mental health treatment – psychotherapy that is attuned to concerns specific to sexual minorities, including stigmatization and internalized homophobia – is

associated with reduced psychological distress in this population.^{234,235} Future research should seek to investigate the efficacy of sexual minority-affirmative mental health treatment in reducing suicidality among sexual minority patients at-risk for suicide.

Limitations and Conclusions

There are several limitations to the current findings. The primary limitation of this study stems from the coding of sexual orientation in the NVDRS and the large proportion of records for which sexual orientation is unclassified. Estimates of method of suicide among sexual minorities in the sample might not generalize to all sexual minorities at risk for suicide because decedents coded as lesbian, gay or bisexual in the NVDRS are sexual minorities whose sexual orientation was noted – and likely salient – to their death.²¹⁸ Whether or not similar patterns would emerge among the total population of sexual minority suicide decedents is unknown. To understand this would require modernization of U.S. mortality data, including adding sexual orientation to the U.S. federal death certificate and linking electronic health records and medical databases to mortality data.²¹⁷ A second limitation is that, during the time of data collection, not all states were represented in the dataset.²³⁶ As of 2015, 32 states were included in the NVDRS. Thus, the data might not be fully representative of U.S. suicides as a whole. In 2018, the NVDRS expanded to include all 50 states and the District of Columbia. This data is forthcoming, and it will provide a nationally-representative sample of suicides in the U.S. with which to validate the current findings. Third, data included in the NVDRS is abstracted from the medical examiner and law enforcement reports and contains many limitations similar to psychological autopsy studies, including questions around reliability of the information, whether or not the information was garnered systematically, how information was deemed relevant to include, and sampling biases.²³⁷⁻²³⁹ Triangulating findings from the NVDRS with results from other post-mortem data

sources (e.g., National Death Index, international mortality data)^{98-100,217} can be one method by which to demonstrate the validity of these conclusions.

Despite these methodological limitations, this study is innovative in the use of a dataset of suicide deaths. As aforementioned, in the U.S., an individual's sexual orientation is not included as a recorded field on the federal death certificate, a rich source for mortality data; thus, drawing from the unique coding in the NVDRS represents an important addition to the sexual minority suicide research landscape. As well, the focus on method of suicide is an advancement of current suicide-related research involving sexual minorities. Findings from this study showed that the higher rate of suicide mortality among sexual minorities, as compared to heterosexuals, is likely driven by hanging, a method of suicide that to date has not been seen as vulnerable to restricted access approaches. These findings suggest that common means restriction interventions which aim to restrict firearms at the population-level, while important, might be less likely to reduce suicide among sexual minorities. Future research should utilize both qualitative and quantitative methods to investigate motivations for hanging among sexual minorities with suicidal intent, as well as focus on developing gender-specific interventions to target safe firearm ownership among sexual minority women and reduce drug/poisoning ingestion among sexual minority men. As well, sexual minority-affirmative mental health interventions should seek to reduce suicidality among sexual minorities engaged in mental health treatment.

Chapter 5

Global Conclusion

This dissertation sought to clarify the unique role of several risk factors for suicide among sexual minorities. Findings from these studies highlighted that sexual orientation, and specifically sexual minority status, differentially impacts both distal (i.e., psychological responses to structural stigma) and proximal (i.e., access to firearms, use of lethal method in suicide) risk factors for suicide. Three key implications emerged from these findings.

First, while these studies provided incremental insight into specific risk factors for suicide among sexual minorities, the findings as a whole showed that many of these risks are not yet well-understood and some are exceptionally challenging to prevent. For example, the first study's hypothesis, drawn from currently accepted theoretical views of structural stigma – that residing in a more stigmatizing neighborhood would result in increased psychological distress among sexual minorities immediately after a same-sex marriage ban – was unsupported in the first study. There a contradictory finding challenged the central theoretical tenets of a structural stigma theory. As well, the second and third studies showed that sexual minorities – especially sexual minority men – are protected from suicide by firearm because they are less likely to have firearms in their homes. Instead, the higher rate of suicide mortality among sexual minorities, as compared to heterosexuals, is likely driven by hanging, a method of suicide that to date has not been seen as vulnerable to restricted access approaches. These findings suggest that common suicide prevention interventions which aim to restrict firearms at the population-level, while important, might be unlikely to reduce suicide among sexual minorities.

Second, these studies underscored the diversity of risk within the sexual minority population as related to suicide and suicidality. Indeed, in the first study, local environment influenced

psychological responses to structural stigma; in the second study, gender modified sexual orientation differences in gun ownership; and, in the third study, gender also moderated sexual orientation differences in the method used in suicide. Together, these results underscore that the sexual minority population is heterogeneous. Efforts to explore these diversities may offer critical insights that are not captured by analyses focused on sexual minorities as a whole.

Third, these studies highlighted several methodological challenges associated with researching suicide risk factors among sexual minorities. Specifically, methodological limitations included: issues surrounding the coding of sexual orientation, as well as the lack of systematic coding of sexual orientation across datasets; power constraints, including the inability to investigate within-group sexual orientation risk differences (e.g., bisexual vs. gay) due to the representation of sexual minority status at the population level; and, finally, limitations associated with secondary data analysis, including the use of datasets that are restricted in the questions collected, especially around firearms (e.g., inability to assess firearm storage practices). Indeed, these methodological limitations highlight the importance of bias circumspection when analyzing sexual orientation in collected data as well as the need to develop better methods of identifying factors related to suicide in this vulnerable population.

The underlying goal of this dissertation was to respond to critical research gaps outlined in the 2011 Institute of Medicine (IOM) Report's recommendations to advance understanding of sexual minority population health and the 2012 National Strategy for Suicide Prevention's aspiration of *Zero Suicides*.^{96,240} Results from the research reported here can inform public health and clinical interventions to reduce suicide risk among sexual minorities.

REFERENCES:

1. World Health Organization (WHO). *World Health Statistics 2017: Monitoring health for the SDGs* Geneva, Switzerland 2017.
2. Parks SE, Johnson LL, McDaniel DD, Gladden M. Surveillance for violent deaths—national violent death reporting system, 16 states, 2010. *Morbidity and Mortality Weekly Report: Surveillance Summaries*. 2014;63(1):1-33.
3. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry*. 2016;3(7):646-659.
4. McGarrell EF, Chermak S, Wilson JM, Corsaro N. Reducing homicide through a “lever-pulling” strategy. *Justice Quarterly*. 2006;23(02):214-231.
5. Braga AA. Pulling levers focused deterrence strategies and the prevention of gun homicide. *Journal of Criminal Justice*. 2008;36(4):332-343.
6. Haas AP, Eliason M, Mays VM, et al. Suicide and suicide risk in lesbian, gay, bisexual, and transgender populations: review and recommendations. *Journal of homosexuality*. 2010;58(1):10-51.
7. King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC psychiatry*. 2008;8(1):70.
8. Heron M. *Deaths: Leading Causes for 2016*. U.S. Department of Health and Human Services: Centers for Disease Control and Prevention (CDC);2016.
9. Stone DM, Simon TR, Fowler KA, et al. Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015. *Morbidity and Mortality Weekly Report (MMWR)*. 2018;67(22):617-624.

10. Ahrensbrak R, Bose J, Hedden SL, Lipari RN, Park-Lee E. *Key Substance Use and Mental Health Indicators in the United States: Results from the 2016 National Survey on Drug Use and Health*. Substance Abuse and Mental Health Services Administration (SAMHSA), 2016.
11. Miller M, Azrael D, Hemenway D. The epidemiology of case fatality rates for suicide in the northeast. *Annals of emergency medicine*. 2004;43(6):723-730.
12. Spicer RS, Miller TR. Suicide acts in 8 states: incidence and case fatality rates by demographics and method. *American Journal of Public Health*. 2000;90(12):1885.
13. Knox KL, Conwell Y, Caine ED. If suicide is a public health problem, what are we doing to prevent it? *American Journal of Public Health*. 2004;94(1):37-45.
14. Durkheim E. *Suicide: a study in sociology* [1897]. *Translated by JA Spaulding and G Simpson (Glencoe, Illinois: The Free Press, 1951)*. 1951.
15. Chesney E, Goodwin GM, Fazel S. Risks of all-cause and suicide mortality in mental disorders: a meta-review. *World Psychiatry*. 2014;13(2):153-160.
16. Pokorny AD. Suicide rates in various psychiatric disorders. *Journal of Nervous and Mental Disease*. 1964.
17. Schneider B. Substance use disorders and risk for completed suicide. *Archives of suicide research*. 2009;13(4):303-316.
18. Runeson B, Åsberg M. Family history of suicide among suicide victims. *American Journal of Psychiatry*. 2003;160(8):1525-1526.
19. Brent DA, Bridge J, Johnson BA, Connolly J. Suicidal behavior runs in families: a controlled family study of adolescent suicide victims. *Archives of general psychiatry*. 1996;53(12):1145-1152.

20. Pompili M, Mancinelli I, Tatarelli R. Stigma as a cause of suicide. *The British Journal of Psychiatry*. 2003;183(2):173-174.
21. Poijula S, Wahlberg K-E, Dyregrov A. Adolescent suicide and suicide contagion in three secondary schools. *International Journal of Emergency Mental Health*. 2001;3(3):163-170.
22. Gould MS, Wallenstein S, Davidson L. Suicide clusters: A critical review. *Suicide and Life-Threatening Behavior*. 1989;19(1):17-29.
23. Mościcki EK. Epidemiology of suicide. *International Psychogeriatrics*. 1995;7(2):137-148.
24. Mościcki EK. Identification of suicide risk factors using epidemiologic studies. *Psychiatric Clinics of North America*. 1997;20(3):499-517.
25. Spirito A, Esposito-Smythers C. Attempted and completed suicide in adolescence. *Annu Rev Clin Psychol*. 2006;2:237-266.
26. Suominen K, Isometsä E, Suokas J, Haukka J, Achte K, Lönnqvist J. Completed suicide after a suicide attempt: a 37-year follow-up study. *American Journal of Psychiatry*. 2004;161(3):562-563.
27. Mościcki EK. Epidemiology of completed and attempted suicide: toward a framework for prevention. *Clinical Neuroscience Research*. 2001;1(5):310-323.
28. Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner Jr TE. The interpersonal theory of suicide. *Psychological review*. 2010;117(2):575.
29. Smith PN, Cukrowicz KC, Poindexter EK, Hobson V, Cohen LM. The acquired capability for suicide: A comparison of suicide attempters, suicide ideators, and non-suicidal controls. *Depression and anxiety*. 2010;27(9):871-877.

30. Chu C, Buchman-Schmitt JM, Stanley IH, et al. The interpersonal theory of suicide: A systematic review and meta-analysis of a decade of cross-national research. *Psychological bulletin*. 2017;143(12):1313.
31. Van Orden KA, Witte TK, Gordon KH, Bender TW, Joiner Jr TE. Suicidal desire and the capability for suicide: Tests of the interpersonal-psychological theory of suicidal behavior among adults. *Journal of consulting and clinical psychology*. 2008;76(1):72.
32. Joiner TE, Van Orden KA, Witte TK, et al. Main predictions of the interpersonal–psychological theory of suicidal behavior: Empirical tests in two samples of young adults. *Journal of abnormal psychology*. 2009;118(3):634.
33. Jordan JT, Samuelson KW, Tiet QQ. Impulsivity, painful and provocative events, and suicide intent: testing the interpersonal theory of suicide. *Suicide and Life-Threatening Behavior*. 2018.
34. Barber CW, Miller MJ. Reducing a suicidal person’s access to lethal means of suicide: a research agenda. *American journal of preventive medicine*. 2014;47(3):S264-S272.
35. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow M-j, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide and Life-Threatening Behavior*. 2001;32(Supplement to Issue 1):49-59.
36. Anestis MD, Soberay KA, Gutierrez PM, Hernández TD, Joiner TE. Reconsidering the link between impulsivity and suicidal behavior. *Personality and social psychology review*. 2014;18(4):366-386.
37. Brown LK, Overholser J, Spirito A, Fritz GK. The correlates of planning in adolescent suicide attempts. *Journal of the American Academy of Child & Adolescent Psychiatry*. 1991;30(1):95-99.

38. Lewiecki EM, Miller SA. Suicide, guns, and public policy. *American journal of public health*. 2013;103(1):27-31.
39. Sloan JH, Rivara FP, Reay DT, Ferris JA, Kellermann AL. Firearm regulations and rates of suicide: a comparison of two metropolitan areas. *New England Journal of Medicine*. 1990;322(6):369-373.
40. Kapusta ND, Etzersdorfer E, Krall C, Sonneck G. Firearm legislation reform in the European Union: impact on firearm availability, firearm suicide and homicide rates in Austria. *The British Journal of Psychiatry*. 2007;191(3):253-257.
41. Andrés AR, Hempstead K. Gun control and suicide: The impact of state firearm regulations in the United States, 1995–2004. *Health Policy*. 2011;101(1):95-103.
42. Hamilton D, Kposowa AJ. Firearms and violent death in the United States: gun ownership, gun control, and mortality rates in 16 states, 2005–2009. *British Journal of Education, Society & Behavioural Science*. 2015;7:84-98.
43. Nordentoft M, Qin P, Helweg-Larsen K, Juel K. Restrictions in means for suicide: an effective tool in preventing suicide: the Danish experience. *Suicide and Life-Threatening Behavior*. 2007;37(6):688-697.
44. Nordentoft M. Restrictions in availability of drugs used for suicide. *Crisis*. 2007;28(S1):44-49.
45. McClure G. Changes in suicide in England and Wales, 1960–1997. *The British Journal of Psychiatry*. 2000;176(1):64-67.
46. Brown JH. Suicide in Britain: more attempts, fewer deaths, lessons for public policy. *Archives of General Psychiatry*. 1979;36(10):1119-1124.

47. Pridemore WA, Chamlin MB, Andreev E. Reduction in male suicide mortality following the 2006 Russian alcohol policy: an interrupted time series analysis. *American journal of public health*. 2013;103(11):2021-2026.
48. Pridemore WA, Snowden AJ. Reduction in suicide mortality following a new national alcohol policy in Slovenia: An interrupted time-series analysis. *American journal of public health*. 2009;99(5):915-920.
49. Bennewith O, Nowers M, Gunnell D. Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention. *The British Journal of Psychiatry*. 2007;190(3):266-267.
50. O'Carroll PW, Silverman MM, Berman AL. Community suicide prevention: the effectiveness of bridge barriers. *Suicide and Life-Threatening Behavior*. 1994;24(1):89-99.
51. Reisch T, Schuster U, Michel K. Suicide by jumping and accessibility of bridges: results from a national survey in Switzerland. *Suicide and Life-Threatening Behavior*. 2007;37(6):681-687.
52. Betz ME, Miller M, Barber C, et al. Lethal means restriction for suicide prevention: beliefs and behaviors of emergency department providers. *Depression and anxiety*. 2013;30(10):1013-1020.
53. Daigle MS. Suicide prevention through means restriction: assessing the risk of substitution: a critical review and synthesis. *Accident Analysis & Prevention*. 2005;37(4):625-632.

54. Miller M, Azrael D, Barber C. Suicide mortality in the United States: the importance of attending to method in understanding population-level disparities in the burden of suicide. *Annual review of public health*. 2012;33:393-408.
55. Canetto SS, Sakinofsky I. The gender paradox in suicide. *Suicide and Life-Threatening Behavior*. 1998;28(1):1-23.
56. Tsirigotis K, Gruszczynski W, Tsirigotis M. Gender differentiation in methods of suicide attempts. *Medical science monitor: international medical journal of experimental and clinical research*. 2011;17(8):PH65.
57. Stark C, Hopkins P, Gibbs D, Rapson T, Belbin A, Hay A. Trends in suicide in Scotland 1981–1999: age, method and geography. *BMC public health*. 2004;4(1):49.
58. Conwell Y, Rotenberg M, Caine ED. Completed suicide at age 50 and over. *Journal of the American Geriatrics Society*. 1990;38(6):640-644.
59. Stack S, Wasserman I. Race and method of suicide: culture and opportunity. *Archives of Suicide Research*. 2005;9(1):57-68.
60. McIntosh JL, Santos JF. Methods of suicide by age: Sex and race differences among the young and old. *The International Journal of Aging and Human Development*. 1986;22(2):123-139.
61. Ulrichs KH. *The riddle of "man-manly love": the pioneering work on male homosexuality*. Vol 2: Prometheus Books; 1994.
62. Sell RL. Defining and measuring sexual orientation for research. *The health of sexual minorities*: Springer; 2007:355-374.
63. Coleman E. Developmental stages of the coming out process. *Journal of homosexuality*. 1982;7(2-3):31-43.

64. Corrigan P, Matthews A. Stigma and disclosure: Implications for coming out of the closet. *Journal of mental health*. 2003;12(3):235-248.
65. Troiden RR. Homosexual identity development. *Journal of Adolescent Health Care*. 1988;9(2):105-113.
66. Milton HL, MacDonald GJ. Homosexual identity formation as a developmental process. *Journal of Homosexuality*. 1984;9(2-3):91-104.
67. Sophie J. A critical examination of stage theories of lesbian identity development. *Journal of Homosexuality*. 1986;12(2):39-51.
68. Cass V. Sexual orientation identity formation: A Western phenomenon. In: Cabaj R, Stein T, eds. *Textbook of Homosexuality and Mental Health*. Washington, DC: American Psychiatric Press; 1996:227–252.
69. Rotheram-Borus MJ, Langabeer KA. Developmental trajectories of gay, lesbian, and bisexual youths. *Lesbian, gay, and bisexual identities and youth: Psychological perspectives*. 2001:97-128.
70. Friedman MS, Marshal MP, Stall R, Cheong J, Wright ER. Gay-related development, early abuse and adult health outcomes among gay males. *AIDS and Behavior*. 2008;12(6):891-902.
71. Calzo JP, Antonucci TC, Mays VM, Cochran SD. Retrospective recall of sexual orientation identity development among gay, lesbian, and bisexual adults. *Developmental psychology*. 2011;47(6):1658.
72. Crocker J, Major B, Steele C. Social stigma: the psychology of marked relationships. *The handbook of social psychology*. 1998;2:504-553.
73. Goffman E. Stigma: Notes on a spoiled identity. *Jenkins, JH & Carpenter*. 1963.

74. Pachankis JE, Hatzenbuehler ML, Wang K, et al. The burden of stigma on health and well-being: A taxonomy of concealment, course, disruptiveness, aesthetics, origin, and peril across 93 stigmas. *Personality and Social Psychology Bulletin*. 2018;44(4):451-474.
75. Bockting WO, Miner MH, Swinburne Romine RE, Hamilton A, Coleman E. Stigma, mental health, and resilience in an online sample of the US transgender population. *American Journal of Public Health*. 2013;103(5):943-951.
76. Herek GM. Hate crimes and stigma-related experiences among sexual minority adults in the United States prevalence estimates from a national probability sample. *Journal of interpersonal violence*. 2009;24(1):54-74.
77. White Hughto JM, Reisner SL, Pachankis JE. Transgender stigma and health: A critical review of stigma determinants, mechanisms, and interventions. *Social Science & Medicine*. 2015;147:222-231.
78. Lewis RJ, Derlega VJ, Griffin JL, Krowinski AC. Stressors for gay men and lesbians: Life stress, gay-related stress, stigma consciousness, and depressive symptoms. *Journal of Social and Clinical Psychology*. 2003;22(6):716-729.
79. Almeida J, Johnson RM, Corliss HL, Molnar BE, Azrael D. Emotional distress among LGBT youth: The influence of perceived discrimination based on sexual orientation. *Journal of youth and adolescence*. 2009;38(7):1001-1014.
80. Hatzenbuehler ML. Structural stigma and the health of lesbian, gay, and bisexual populations. *Current Directions in Psychological Science*. 2014;23(2):127-132.
81. Greene B. Lesbian women of color: Triple jeopardy. *Journal of Lesbian Studies*. 1996;1(1):109-147.

82. Bowleg L, Huang J, Brooks K, Black A, Burkholder G. Triple jeopardy and beyond: Multiple minority stress and resilience among Black lesbians. *Journal of Lesbian Studies*. 2003;7(4):87-108.
83. Herek GM. Sexual stigma and sexual prejudice in the United States: A conceptual framework. *Contemporary perspectives on lesbian, gay, and bisexual identities*: Springer; 2009:65-111.
84. Herek GM. Anti-equality marriage amendments and sexual stigma. *Journal of Social Issues*. 2011;67(2):413-426.
85. Corrigan PW, Markowitz FE, Watson AC. Structural levels of mental illness stigma and discrimination. *Schizophrenia bulletin*. 2004;30(3):481-491.
86. Hatzenbuehler ML, Nolen-Hoeksema S, Erickson SJ. Minority stress predictors of HIV risk behavior, substance use, and depressive symptoms: results from a prospective study of bereaved gay men. *Health Psychology*. 2008;27(4):455.
87. Kuyper L, Fokkema T. Minority stress and mental health among Dutch LGBs: examination of differences between sex and sexual orientation. *Journal of Counseling Psychology*. 2011;58(2):222.
88. Lehavot K, Simoni JM. The impact of minority stress on mental health and substance use among sexual minority women. *Journal of consulting and clinical psychology*. 2011;79(2):159.
89. Meyer IH. Minority stress and mental health in gay men. *Journal of Health and Social Behavior*. 1995:38-56.

90. Cochran SD, Sullivan JG, Mays VM. Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *Journal of consulting and clinical psychology*. 2003;71(1):53.
91. Mays VM, Cochran SD. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *American Journal of Public Health*. 2001;91(11):1869-1876.
92. Pachankis JE, Hatzenbuehler ML, Starks TJ. The influence of structural stigma and rejection sensitivity on young sexual minority men's daily tobacco and alcohol use. *Social Science & Medicine*. 2014;103:67-75.
93. Hatzenbuehler ML. How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological bulletin*. 2009;135(5):707.
94. Nurius PS. Mental health implications of sexual orientation. *Journal of Sex Research*. 1983;19(2):119-136.
95. Gonsiorek JC. Mental health issues of gay and lesbian adolescents. *Journal of adolescent health care*. 1988;9(2):114-122.
96. Office of the Surgeon General. 2012 National Strategy for Suicide Prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
97. Nordström P, Samuelsson M, Åsberg M. Survival analysis of suicide risk after attempted suicide. *Acta Psychiatrica Scandinavica*. 1995;91(5):336-340.
98. Mathy RM, Cochran SD, Olsen J, Mays VM. The association between relationship markers of sexual orientation and suicide: Denmark, 1990–2001. *Social psychiatry and psychiatric epidemiology*. 2011;46(2):111-117.

99. Cochran SD, Mays VM. Mortality risks among persons reporting same-sex sexual partners: Evidence from the 2008 General Social Survey—National Death Index Data Set. *American journal of public health*. 2015;105(2):358-364.
100. Björkenstam C, Andersson G, Dalman C, Cochran S, Kosidou K. Suicide in married couples in Sweden: Is the risk greater in same-sex couples? *European journal of epidemiology*. 2016;31(7):685-690.
101. O'Reilly J, Robinson S. The negative impact of ostracism on thwarted belongingness and workplace contributions. Paper presented at: Academy of management proceedings 2009.
102. Baumeister RF, Brewer LE, Tice DM, Twenge JM. Thwarting the need to belong: Understanding the interpersonal and inner effects of social exclusion. *Social and Personality Psychology Compass*. 2007;1(1):506-520.
103. Anestis MD, Bagge CL, Tull MT, Joiner TE. Clarifying the role of emotion dysregulation in the interpersonal-psychological theory of suicidal behavior in an undergraduate sample. *Journal of psychiatric research*. 2011;45(5):603-611.
104. Christensen H, Batterham PJ, Soubelet A, Mackinnon AJ. A test of the interpersonal theory of suicide in a large community-based cohort. *Journal of Affective Disorders*. 2013;144(3):225-234.
105. Hill RM, Pettit JW. Suicidal ideation and sexual orientation in college students: The roles of perceived burdensomeness, thwarted belongingness, and perceived rejection due to sexual orientation. *Suicide and Life-Threatening Behavior*. 2012;42(5):567-579.
106. Rostosky SS, Owens GP, Zimmerman RS, Riggle ED. Associations among sexual attraction status, school belonging, and alcohol and marijuana use in rural high school students. *Journal of Adolescence*. 2003;26(6):741-751.

107. Factor RJ, Rothblum ED. A study of transgender adults and their non-transgender siblings on demographic characteristics, social support, and experiences of violence. *Journal of LGBT Health Research*. 2008;3(3):11-30.
108. Bauerband LA, Galupo MP. The gender identity reflection and rumination scale: Development and psychometric evaluation. *Journal of Counseling & Development*. 2014;92(2):219-231.
109. Borders A, Guillén LA, Meyer IH. Rumination, sexual orientation uncertainty, and psychological distress in sexual minority university students. *The Counseling Psychologist*. 2014;42(4):497-523.
110. Hatzenbuehler ML, Nolen-Hoeksema S, Dovidio J. How does stigma “get under the skin”? The mediating role of emotion regulation. *Psychological Science*. 2009;20(10):1282-1289.
111. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. *American journal of public health*. 2013;103(5):813-821.
112. Herek GM, Chopp R, Strohl D. Sexual stigma: Putting sexual minority health issues in context. *The health of sexual minorities*: Springer; 2007:171-208.
113. Liu RT, Mustanski B. Suicidal ideation and self-harm in lesbian, gay, bisexual, and transgender youth. *American journal of preventive medicine*. 2012;42(3):221-228.
114. Clements-Nolle K, Marx R, Katz M. Attempted suicide among transgender persons: The influence of gender-based discrimination and victimization. *Journal of homosexuality*. 2006;51(3):53-69.
115. Hershberger SL, Pilkington NW, D'Augelli AR. Predictors of suicide attempts among gay, lesbian, and bisexual youth. *Journal of Adolescent Research*. 1997;12(4):477-497.

116. Mustanski B, Liu RT. A longitudinal study of predictors of suicide attempts among lesbian, gay, bisexual, and transgender youth. *Archives of sexual behavior*. 2013;42(3):437-448.
117. Ribeiro JD, Witte TK, Van Orden KA, et al. Fearlessness about death: The psychometric properties and construct validity of the revision to the Acquired Capability for Suicide Scale. *Psychological assessment*. 2014;26(1):115.
118. Bender TW, Gordon KH, Bresin K, Joiner Jr TE. Impulsivity and suicidality: The mediating role of painful and provocative experiences. *Journal of affective disorders*. 2011;129(1-3):301-307.
119. Bradford J, Reisner SL, Honnold JA, Xavier J. Experiences of transgender-related discrimination and implications for health: results from the Virginia Transgender Health Initiative Study. *American Journal of Public Health*. 2013;103(10):1820-1829.
120. Burks AC, Cramer RJ, Henderson CE, Stroud CH, Crosby JW, Graham J. Frequency, nature, and correlates of hate crime victimization experiences in an urban sample of lesbian, gay, and bisexual community members. *Journal of Interpersonal Violence*. 2015:1-19.
121. Hatzenbuehler ML, O'cleirigh C, Grasso C, Mayer K, Safren S, Bradford J. Effect of same-sex marriage laws on health care use and expenditures in sexual minority men: A quasi-natural experiment. *American journal of public health*. 2012;102(2):285-291.
122. Raifman J, Moscoe E, Austin SB, Hatzenbuehler ML, Galea S. Association of State Laws Permitting Denial of Services to Same-Sex Couples With Mental Distress in Sexual Minority Adults: A Difference-in-Difference-in-Differences Analysis. *JAMA psychiatry*. 2018.

123. Raifman J, Moscoe E, Austin SB, McConnell M. Difference-in-differences analysis of the association between state same-sex marriage policies and adolescent suicide attempts. *JAMA pediatrics*. 2017;171(4):350-356.
124. Frye V, Koblin B, Chin J, et al. Neighborhood-level correlates of consistent condom use among men who have sex with men: a multi-level analysis. *AIDS and Behavior*. 2010;14(4):974-985.
125. Duncan DT, Hatzenbuehler ML, Johnson RM. Neighborhood-level LGBT hate crimes and current illicit drug use among sexual minority youth. *Drug and alcohol dependence*. 2014;135:65-70.
126. Everett BG. Changes in neighborhood characteristics and depression among sexual minority young adults. *Journal of the American Psychiatric Nurses Association*. 2014;20(1):42-52.
127. Hayslett KL, Kane MD. "Out" in Columbus: A Geospatial Analysis of the Neighborhood-Level Distribution of Gay and Lesbian Households. *City & Community*. 2011;10(2):131-156.
128. Ghaziani A. *There goes the gayborhood?* Vol 68: Princeton University Press; 2014.
129. Perales F, Todd A. Structural stigma and the health and wellbeing of Australian LGB populations: Exploiting geographic variation in the results of the 2017 same-sex marriage plebiscite. *Social Science & Medicine*. 2018;208:190-199.
130. McGhee E, Krimm D. *California's Political Geography*. San Francisco, CA: Public Policy Institute of California (PPIC) 2012.

131. Salas R. In re Marriage Cases: The Fundamental Right to Marry and Equal Protection Under the California Constitution and the Effects of Proposition 8. *Hastings Const LQ*. 2008;36:545.
132. Sayre B, Bode L, Shah D, Wilcox D, Shah C. Agenda setting in a digital age: Tracking attention to California Proposition 8 in social media, online news and conventional news. *Policy & Internet*. 2010;2(2):7-32.
133. Thorson K, Ekdale B, Borah P, Namkoong K, Shah C. YouTube and Proposition 8: A case study in video activism. *Information, Communication & Society*. 2010;13(3):325-349.
134. Maisel NC, Fingerhut AW. California's ban on same-sex marriage: The campaign and its effects on gay, lesbian, and bisexual individuals. *Journal of Social issues*. 2011;67(2):242-263.
135. Cochran SD, Grella CE, Mays VM. Do substance use norms and perceived drug availability mediate sexual orientation differences in patterns of substance use? Results from the California Quality of Life Survey II. *Journal of Studies on Alcohol and Drugs*. 2012;73(4):675-685.
136. Cochran SD, Mays VM. Physical health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: results from the California Quality of Life Survey. *American journal of public health*. 2007;97(11):2048-2055.
137. Cochran SD, Mays VM. Burden of psychiatric morbidity among lesbian, gay, and bisexual individuals in the California Quality of Life Survey. *Journal of abnormal psychology*. 2009;118(3):647.

138. Blosnich JR, Nasuti LJ, Mays VM, Cochran SD. Suicidality and sexual orientation: Characteristics of symptom severity, disclosure, and timing across the life course. *American Journal of Orthopsychiatry*. 2016;86(1):69.
139. Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological medicine*. 2002;32(6):959-976.
140. Andrews G, Slade T. Interpreting scores on the Kessler psychological distress scale (K10). *Australian and New Zealand journal of public health*. 2001;25(6):494-497.
141. Lea T, de Wit J, Reynolds R. Minority stress in lesbian, gay, and bisexual young adults in Australia: Associations with psychological distress, suicidality, and substance use. *Archives of sexual behavior*. 2014;43(8):1571-1578.
142. Lyons A, Pitts M, Grierson J. Sense of coherence as a protective factor for psychological distress among gay men: a prospective cohort study. *Anxiety, Stress, & Coping*. 2014;27(6):662-677.
143. United States Census Bureau. ZIP Code™ Tabulation Areas (ZCTAs™). 2018; <https://www.census.gov/geo/reference/zctas.html>.
144. Dulin-Keita A, Casazza K, Fernandez JR, Goran MI, Gower B. Do neighbourhoods matter? Neighbourhood disorder and long-term trends in serum cortisol levels. *J Epidemiol Community Health*. 2012;66(1):24-29.
145. Currie J, Tekin E. Is there a link between foreclosure and health? *American Economic Journal: Economic Policy*. 2015;7(1):63-94.
146. Gresenz CR, Rogowski J, Escarce JJ. Community demographics and access to health care among US Hispanics. *Health services research*. 2009;44(5p1):1542-1562.

147. Dinwiddie GY, Gaskin DJ, Chan KS, Norrington J, McCleary R. Residential segregation, geographic proximity and type of services used: evidence for racial/ethnic disparities in mental health. *Social science & medicine*. 2013;80:67-75.
148. Mauck DE, Sheehan DM, Fennie KP, Maddox LM, Trepka MJ. Role of Gay Neighborhood Status and Other Neighborhood Factors in Racial/Ethnic Disparities in Retention in Care and Viral Load Suppression Among Men Who Have Sex with Men, Florida, 2015. *AIDS and behavior*. 2018:1-16.
149. Semega J. *Median Household Income for States: 2007 and 2008 American Community Surveys*. <https://www2.census.gov/library/publications/2009/acs/acsbr08-02.pdf>: U.S. Census Bureau;2009.
150. Lechner M. The estimation of causal effects by difference-in-difference methods. *Foundations and Trends® in Econometrics*. 2011;4(3):165-224.
151. Dimick JB, Ryan AM. Methods for evaluating changes in health care policy: the difference-in-differences approach. *Jama*. 2014;312(22):2401-2402.
152. Cook TD, Campbell DT. The design and conduct of true experiments and quasi-experiments in field settings. *Reproduced in part in Research in Organizations: Issues and Controversies*: Goodyear Publishing Company; 1979.
153. Torche F. The effect of maternal stress on birth outcomes: exploiting a natural experiment. *Demography*. 2011;48(4):1473-1491.
154. Columbia University Mailman School of Public Health. Difference-in-Difference Estimation 2018; <https://www.mailman.columbia.edu/research/population-health-methods/difference-difference-estimation#courses>.

155. Basu S, Meghani A, Siddiqi A. Evaluating the health impact of large-scale public policy changes: classical and novel approaches. *Annual review of public health*. 2017;38:351-370.
156. DuGoff EH, Schuler M, Stuart EA. Generalizing observational study results: applying propensity score methods to complex surveys. *Health services research*. 2014;49(1):284-303.
157. Garrido MM, Kelley AS, Paris J, et al. Methods for constructing and assessing propensity scores. *Health services research*. 2014;49(5):1701-1720.
158. Austin PC, Stuart EA. Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. *Statistics in medicine*. 2015;34(28):3661-3679.
159. Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate behavioral research*. 2011;46(3):399-424.
160. Burton CL, Bonanno G, Hatzenbuehler M. Familial social support predicts a reduced cortisol response to stress in sexual minority young adults. *Psychoneuroendocrinology*. 2014;47:241-245.
161. Van Dam M. Lesbian Disclosure, Social Support, and Depression: A Geopolitical Perspective. *Sexuality Research and Social Policy*. 2014;11(3):233-244.
162. Hill RM, Rooney EE, Mooney MA, Kaplow JB. Links Between Social Support, Thwarted Belongingness, and Suicide Ideation among Lesbian, Gay, and Bisexual College Students. *Journal of Family Strengths*. 2017;17(2):6.

163. Williams T, Connolly J, Pepler D, Craig W. Peer victimization, social support, and psychosocial adjustment of sexual minority adolescents. *Journal of Youth and Adolescence*. 2005;34(5):471-482.
164. Ueno K. Sexual orientation and psychological distress in adolescence: Examining interpersonal stressors and social support processes. *Social Psychology Quarterly*. 2005;68(3):258-277.
165. McConnell EA, Birkett MA, Mustanski B. Typologies of social support and associations with mental health outcomes among LGBT youth. *LGBT health*. 2015;2(1):55-61.
166. Sherbourne CD, Stewart AL. The MOS social support survey. *Social science & medicine*. 1991;32(6):705-714.
167. Rostosky SS, Riggle ED, Horne SG, Denton FN, Huellemeier JD. Lesbian, gay, and bisexual individuals' psychological reactions to amendments denying access to civil marriage. *American Journal of Orthopsychiatry*. 2010;80(3):302.
168. Riggle ED, Rostosky SS, Horne SG. Marriage amendments and lesbian, gay, and bisexual individuals in the 2006 election. *Sexuality Research & Social Policy*. 2009;6(1):80.
169. Rostosky SS, Riggle ED, Horne SG, Miller AD. Marriage amendments and psychological distress in lesbian, gay, and bisexual (LGB) adults. *Journal of Counseling Psychology*. 2009;56(1):56.
170. Fingerhut AW, Riggle ED, Rostosky SS. Same-sex marriage: The social and psychological implications of policy and debates. *Journal of Social Issues*. 2011;67(2):225-241.

171. Russell GM, Richards JA. Stressor and resilience factors for lesbians, gay men, and bisexuals confronting antigay politics. *American journal of community psychology*. 2003;31(3-4):313-328.
172. Swank E, Frost DM, Fahs B. Rural location and exposure to minority stress among sexual minorities in the United States. *Psychology & Sexuality*. 2012;3(3):226-243.
173. Fisher CM, Irwin JA, Coleman JD. LGBT health in the midlands: A rural/urban comparison of basic health indicators. *Journal of Homosexuality*. 2014;61(8):1062-1090.
174. Kazyak E. Disrupting cultural selves: Constructing gay and lesbian identities in rural locales. *Qualitative Sociology*. 2011;34(4):561-581.
175. Gray ML. *Out in the country: Youth, media, and queer visibility in rural America*. NYU Press; 2009.
176. Stein A. *The stranger next door: The story of a small community's battle over sex, faith, and civil rights*. 2001.
177. Kiley J, Maniam S. *Lesbian, gay and bisexual voters remain a solidly Democratic bloc*. Washington, DC: Pew Research Center 2016.
178. Tourangeau R, Yan T. Sensitive questions in surveys. *Psychological bulletin*. 2007;133(5):859.
179. Gani F, Sakran JV, Canner JK. Emergency Department Visits For Firearm-Related Injuries In The United States, 2006–14. *Health Affairs*. 2017;36(10):1729-1738.
180. Wintemute GJ. The epidemiology of firearm violence in the twenty-first century United States. *Annual review of public health*. 2015;36:5-19.

181. Kalesan B, Adhikarla C, Pressley JC, et al. The hidden epidemic of firearm injury: increasing firearm injury rates during 2001–2013. *American journal of epidemiology*. 2017;185(7):546-553.
182. Kellermann AL, Rivara FP, Somes G, et al. Suicide in the home in relation to gun ownership. *New England journal of medicine*. 1992;327(7):467-472.
183. Yip PS, Caine E, Yousuf S, Chang S-S, Wu KC-C, Chen Y-Y. Means restriction for suicide prevention. *The Lancet*. 2012;379(9834):2393-2399.
184. Kellermann AL, Rivara FP, Rushforth NB, et al. Gun ownership as a risk factor for homicide in the home. *New England Journal of Medicine*. 1993;329(15):1084-1091.
185. Siegel M, Rothman EF. Firearm ownership and suicide rates among US men and women, 1981–2013. *American journal of public health*. 2016;106(7):1316-1322.
186. Blosnich J, Bossarte R, Silver E, Silenzio V. Health care utilization and health indicators among a national sample of US veterans in same-sex partnerships. *Military medicine*. 2013;178(2):207-212.
187. Gruskin EP, Greenwood GL, Matevia M, Pollack LM, Bye LL. Disparities in smoking between the lesbian, gay, and bisexual population and the general population in California. *American Journal of Public Health*. 2007;97(8):1496-1502.
188. Simoni JM, Smith L, Oost KM, Lehavot K, Fredriksen-Goldsen K. Disparities in physical health conditions among lesbian and bisexual women: A systematic review of population-based studies. *Journal of homosexuality*. 2017;64(1):32-44.
189. Geffen S, Kelman E. *Gun Violence and LGBT Health*. Boston, Massachusetts: Fenway Institute;2016.

190. Stonehem B. *Orlando nightclub shooting: The worst mass shooting in United States history*. Vol 1: First Rank Publishing; 2016.
191. Geffen S. Why Gun Control Needs to be an LGBT Priority. *Advocate*2016.
192. Corliss HL, Wadler BM, Jun H-J, et al. Sexual-orientation disparities in cigarette smoking in a longitudinal cohort study of adolescents. *Nicotine & Tobacco Research*. 2012;15(1):213-222.
193. Wilsnack SC, Hughes TL, Johnson TP, et al. Drinking and drinking-related problems among heterosexual and sexual minority women. *Journal of Studies on Alcohol and Drugs*. 2008;69(1):129-139.
194. Farmer GW, Jabson JM, Bucholz KK, Bowen DJ. A population-based study of cardiovascular disease risk in sexual-minority women. *American journal of public health*. 2013;103(10):1845-1850.
195. Cleveland EC, Azrael D, Simonetti JA, Miller M. Firearm ownership among American veterans: findings from the 2015 National Firearm Survey. *Injury epidemiology*. 2017;4(1):33.
196. Rubin DB. Multiple imputation after 18+ years. *Journal of the American statistical Association*. 1996;91(434):473-489.
197. Pederson J, Hall TL, Foster B, Coates JE. Gun ownership and attitudes toward gun control in older adults: Re-examining self interest theory. *American Journal of Social Science Research*. 2015;1(5):273-281.
198. Hepburn L, Miller M, Azrael D, Hemenway D. The US gun stock: results from the 2004 national firearms survey. *Injury Prevention*. 2007;13(1):15-19.

199. Kleck G, Kovandzic T, Saber M, Hauser W. The effect of perceived risk and victimization on plans to purchase a gun for self-protection. *Journal of Criminal Justice*. 2011;39(4):312-319.
200. Lippa RA. Gender-related traits of heterosexual and homosexual men and women. *Archives of sexual behavior*. 2002;31(1):83-98.
201. Fleming PJ, Agnew-Brune C. Current trends in the study of gender norms and health behaviors. *Current opinion in psychology*. 2015;5:72-77.
202. Gruskin EP, Hart S, Gordon N, Ackerson L. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *American Journal of Public Health*. 2001;91(6):976.
203. Yancey AK, Cochran SD, Corliss HL, Mays VM. Correlates of overweight and obesity among lesbian and bisexual women. *Preventive Medicine*. 2003;36(6):676-683.
204. Becher EC, Christakis NA. Firearm injury prevention counseling: are we missing the mark? *Pediatrics*. 1999;104(3):530-535.
205. Albright TL, Burge SK. Improving firearm storage habits: impact of brief office counseling by family physicians. *The Journal of the American Board of Family Practice*. 2003;16(1):40-46.
206. Coyne-Beasley T, Baccaglioni L, Johnson RM, Webster B, Wiebe DJ. Do partners with children know about firearms in their home? Evidence of a gender gap and implications for practitioners. *Pediatrics*. 2005;115(6):e662-e667.
207. Edwards KM, Sylaska KM, Neal AM. Intimate partner violence among sexual minority populations: A critical review of the literature and agenda for future research. *Psychology of Violence*. 2015;5(2):112.

208. Smith TW, Laken F, Son J. *Gun ownership in the United States: Measurement issues and trends*. NORC at the University of Chicago; 2014.
209. Urbatsch R. Gun-shy: Refusal to answer questions about firearm ownership. *The Social Science Journal*. 2018.
210. Haas AP, Lane A. Collecting sexual orientation and gender identity data in suicide and other violent deaths: A step towards identifying and addressing LGBT mortality disparities. *LGBT health*. 2015;2(1):84-87.
211. Mann JJ, Apter A, Bertolote J, et al. Suicide prevention strategies: a systematic review. *Jama*. 2005;294(16):2064-2074.
212. Ream GL. What's unique about lesbian, gay, bisexual, and transgender (LGBT) youth and young adult suicides? Findings from the National Violent Death Reporting System. *Journal of Adolescent Health*. 2019.
213. Clark KA, Blosnich JR, Haas AP, Cochran SD. Estimate of Lesbian, Gay, Bisexual, and Transgender Youth Suicide Is Inflated. *Journal of Adolescent Health*. 2019;64(6):810.
214. Lyons BH, Walters ML, Jack SP, Petrosky E, Blair JM, Ivey-Stephenson AZ. Suicides among lesbian and gay male individuals: findings from the National Violent Death Reporting System. *American journal of preventive medicine*. 2019;56(4):512-521.
215. Mize KD, Shackelford TK. Intimate partner homicide methods in heterosexual, gay, and lesbian relationships. *Violence and victims*. 2008;23(1):98-114.
216. Clark K, Blosnich J, Coulter RW, Bamwine P, Bossarte R, Cochran S. Sexual orientation differences in gun ownership and beliefs about gun safety policy, General Social Survey 2010-2016. *Under Review*. 2019.

217. Mays VM, Cochran SD. Challenges and Opportunities for Modernizing the National Violent Death Reporting System. American Public Health Association; 2019.
218. Clark K, Blosnich J, Haas A, Cochran S. Estimate of Lesbian, Gay, Bisexual and Transgender Youth Suicide is Inflated. *Journal of Adolescent Health*. 2019.
219. Gates GJ. *How many people are lesbian, gay, bisexual and transgender?* Los Angeles, CA: Williams Institute;2011.
220. Möller-Leimkühler AM. The gender gap in suicide and premature death or: why are men so vulnerable? *European archives of psychiatry and clinical neuroscience*. 2003;253(1):1-8.
221. Biddle L, Donovan J, Owen-Smith A, et al. Factors influencing the decision to use hanging as a method of suicide: qualitative study. *The British Journal of Psychiatry*. 2010;197(4):320-325.
222. Gunnell D, Bennewith O, Hawton K, Simkin S, Kapur N. The epidemiology and prevention of suicide by hanging: a systematic review. *International Journal of Epidemiology*. 2005;34(2):433-442.
223. Pounder DJ. Why are the British hanging themselves? *The American journal of forensic medicine and pathology*. 1993;14(2):135-140.
224. Cheng AT, Hawton K, Chen TH, et al. The influence of media coverage of a celebrity suicide on subsequent suicide attempts. *Journal of Clinical Psychiatry*. 2007;68(6):862-866.
225. Luxton DD, June JD, Fairall JM. Social media and suicide: a public health perspective. *American journal of public health*. 2012;102(S2):S195-S200.

226. Barber C, Frank E, Demicco R. Reducing suicides through partnerships between health professionals and gun owner groups—beyond docs vs glocks. *JAMA internal medicine*. 2017;177(1):5-6.
227. Vriniotis M, Barber C, Frank E, Demicco R, Coalition NHFS. A Suicide Prevention Campaign for Firearm Dealers in New Hampshire. *Suicide and Life-Threatening Behavior*. 2015;45(2):157-163.
228. About The Pink Pistols. 2019; <http://www.pinkpistols.org/about-the-pink-pistols/>.
229. Branson-Potts H. Going against the grain after Orlando shooting, LGBT group embraces guns. *Los Angeles Times* 2016; <https://www.latimes.com/local/lanow/la-me-ln-lgbt-guns-pink-pistols-20200809-snap-story.html>.
230. Leibel K, Lee JG, Goldstein AO, Ranney LM. Barring intervention? Lesbian and gay bars as an underutilized venue for tobacco interventions. *Nicotine & Tobacco Research*. 2011;13(7):507-511.
231. Fallin A, Davis B. LGBT organisation successfully advocated for ban on tobacco promotions in San Jose, California. BMJ Publishing Group Ltd; 2016.
232. Lee JG. Keeping the community posted: Lesbian, gay, bisexual, and transgender blogs and the tobacco epidemic. *LGBT health*. 2014;1(2):113-121.
233. Williams KA, Chapman MV. Comparing health and mental health needs, service use, and barriers to services among sexual minority youths and their peers. *Health & social work*. 2011;36(3):197-206.
234. Pachankis JE, Hatzenbuehler ML, Rendina HJ, Safren SA, Parsons JT. LGB-affirmative cognitive-behavioral therapy for young adult gay and bisexual men: A randomized

- controlled trial of a transdiagnostic minority stress approach. *Journal of consulting and clinical psychology*. 2015;83(5):875.
235. Chaudoir SR, Wang K, Pachankis JE. What reduces sexual minority stress? A review of the intervention “toolkit”. *Journal of Social Issues*. 2017;73(3):586-617.
236. Centers for Disease Control and Prevention (CDC). *CDC's National Violent Death Reporting System (NVDRS)* National Center for Injury Prevention and Control 2019.
237. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide and Life-Threatening Behavior*. 2006;36(5):491-510.
238. Hawton K, Appleby L, Platt S, et al. The psychological autopsy approach to studying suicide: a review of methodological issues. *J Affect Disord*. 1998;50(2-3):269-276.
239. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psychological medicine*. 2003;33(3):395-405.
240. Graham R, Berkowitz B, Blum R, et al. *The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding*. Institute of Medicine; Washington, DC;2011.