MA, FANG-YU, Ph.D. Adapting and Testing a Vulnerability Model for Latino/a Sexual and Gender Minorities in a New Settlement State. (2017).
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Sexual health vulnerability among Latino/a sexual and gender minorities is poorly understood, despite high rates of HIV and STDs among Latino/as, particularly in new settlement states in the southern US. The lack of a model specific to Latino/a sexual and gender minorities complicates the study of vulnerability. To move vulnerability research forward with this population, key constructs must be defined and processes for model development described. Clarity in the operationalization of vulnerability, as well as in the approach for adapting a vulnerability model to Latino/a sexual and gender minorities, can improve replicability to other similar populations and standardize a method toward model development. This study tests a new theoretical model of vulnerability for Latino/a sexual and gender minorities by adapting the General Model of Vulnerability.

A community-based participatory research partnership recruited Latino/a sexual and gender minorities (i.e., men who have sex with men and transgender women; N=186) in North Carolina to participate in the HOLA intervention. Using baseline data collected in 2012, I performed latent class analysis to operationalize vulnerability across three domains (i.e., socioeconomic stability, health care, and social) using eight indicators (i.e., educational attainment, employment status, routine check-up, social support, acculturation, racial/ethnic and sexual discrimination, and internalized homonegativity) to identify underlying classes of vulnerability, then tested the association between class membership and three sexual health behaviors (i.e., HIV testing, STD testing, and condom use).

In this sample, I identified three latent classes of vulnerability: High Education and Employment (18.8% of the sample; characterized by high educational attainment and employment status), Low Education and High Social Support (63.4%), and High Education and Discrimination (17.7%; high educational attainment and racial/ethnic and sexual discrimination). Membership in the Low Education and High Social Support class and the High Education and Discrimination class was significantly associated with more condomless anal or vaginal intercourse, whereas membership in the High Education and Employment class was associated with less condomless anal or vaginal intercourse ($p < 0.05$). I found no significant associations between vulnerability and HIV testing nor STD testing.

Overall, the results from this study found that the identification of latent classes of vulnerability differentially predicted a sexual health behavior among Latino/a sexual and gender minorities in NC. These findings highlight the utility of identifying typologies of vulnerability to predict patterns of sexual health behavior. This information can be used to tailor future efforts to specific groups of Latino/a sexual and gender minorities, as well as other vulnerable populations living in other parts of the US. Developing intervention components that harness facilitators (e.g., social support) and address barriers (e.g., discrimination) to health, focusing specifically on those uniquely vulnerable, is critical to increasing the reach and effectiveness of tailored health promotion and HIV/STD prevention programming.

ADAPTING AND TESTING A VULNERABILITY MODEL FOR LATINO/A

SEXUAL AND GENDER MINORITIES

IN A NEW SETTLEMENT STATE

by

Fang-Yu Ma

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LIST OF ABBREVIATIONS

AIC	Akaike information criteria
BIC	Bayesian information criteria
CPBR	Community-based participatory research
FIML	Full information maximum likelihood
LMR (BLRT)	Lo-Mendell-Rubin bootstrapped likelihood ratio test
MSM	Men who have sex with men
NC	North Carolina
SSA-BIC	Sample-size adjusted Bayesian information criteria
US	United States

CHAPTER I

INTRODUCTION

Statement of the Problem

To be vulnerable is to be susceptible to harm or neglect (Aday, 1994). Although

people may be vulnerable at different times in their lives, people are not inherently

vulnerable (Rogers, 1997). Latino/a sexual and gender minorities bear a disproportionate

burden of poverty and poor health outcomes, thus they can be considered a vulnerable

population at heightened risk for poor health status and outcomes (Aday, 2002; Perez-

Escamilla, 2010). Latino/a sexual and gender minorities can also be considered

vulnerable based on their multiple minority statuses, including race/ethnicity and sexual

orientation (Gilbert & Rhodes, 2014). They can experience marginalizations as a result of

these intersecting identities, which undermine positive health outcomes and challenge

access to healthcare services. This vulnerability is particularly concerning given that the

Latino/a population is rapidly growing in the United States (US), including in the South

(Brown & Patten, 2014; Ennis, Rios-Vargas, & Albert, 2011; Gill, 2010; Kochhar, Suro,

& Tafoya, 2005; US Census Bureau, 2016). The South, including North Carolina (NC),

has become an important new settlement area for immigrant Latino/as, characterized by

limited immigration histories from foreign-born populations (Ennis et al., 2011; Terrazas,

2011; US Census Bureau, 2016).

The South has also been characterized as a major HIV epicenter with high HIV infection rates (Carpenter, 2013; Wiltz, 2014). Latino/as residing in the South are disproportionately affected by HIV and STDs (NC DHHS, 2015; Turra & Goldman, 2007; Vanable et al., 2006). The intersections of minority identities among Latino/a sexual and gender minorities can intensify sexual health risks. Reducing disparities in HIV and STD rates include focusing on populations who are particularly vulnerable to poor sexual health, including Latino/a sexual and gender minorities (CDC, 2015; NC DHHS, 2015; Turra & Goldman, 2007; Vanable, Carey, Blair, & Littlewood, 2006).

Despite the burden of poor sexual health, the health status and needs of Latino/a sexual and gender minorities are poorly understood (Gilbert & Rhodes, 2014). Existing literature has identified determinants of health that may contribute to their vulnerability, particularly across three domains: financial (e.g., education and employment), health care (e.g., accessing routine care), and social (e.g., social support, acculturation to US/Anglo-American culture, racial/ethnic and sexual discrimination, and internalized homonegativity) (Derose, Escarce, & Lurie, 2007; Dovidio, Gluszek, John, Ditlmann, & Lagunes, 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Tanner et al., 2014). However, these determinants have not been conceptualized together nor tested in a specific analytic model of vulnerability.

The lack of a vulnerability model specific to Latino/a sexual and gender minorities complicates the study of vulnerability in this population. To move vulnerability research forward, key constructs must be defined and processes for model development described. Clarity in the operationalization of vulnerability, as well as in the

approach and process for adapting a vulnerability model to Latino/a sexual and gender

minorities, can improve replicability to other similar populations and standardize a

method toward model development. Advancing a vulnerability model to predict sexual

health behaviors can serve as a powerful tool to promote sexual health and better identify

the needs of the target population (Flaskerud & Winslow, 1998).

Study Purpose and Specific Aims

The purpose of this analysis was to advance a vulnerability model for Latino/a

sexual and gender minorities in NC, by adapting the General Model of Vulnerability (Shi

et al., 2008). I conducted a secondary analysis of data gathered from Latino/a sexual and

gender minorities. I developed a specific model by operationalizing the latent construct of

vulnerability, then tested the utility of eight selected indicators (e.g., education, social

support, and discrimination) grounded in theory and prior research across three domains

of vulnerability (i.e., socioeconomic stability, health care, and social) on three sexual

health behaviors (i.e., HIV testing, STD testing, and condom use). Using latent class

analysis as a multi-step process, I accomplished the following two specific aims:

Aim 1: Operationalize vulnerability among a subset of Latino/a sexual and gender

minorities using selected indicators to identify latent classes of vulnerability.

Hypothesis 1: At least two latent classes of vulnerability will emerge from

salient indicators of vulnerability.

Hypothesis 1a: The latent classes will include subgroups who are

high in indicators of vulnerability, low in indicators of

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vulnerability, and potentially a combination of responses indicating mixed or specific vulnerabilities.

Aim 2: Test the latent classes derived from the salient indicators (from Specific Aim 1) as predictors of sexual health behaviors (i.e., HIV testing, STD testing, and condom use).

Hypothesis 2: The different subgroups of vulnerability identified in Specific Aim 1 will differentially predict sexual health behaviors.

Hypothesis 2a: Groups categorized as high vulnerability will be significantly negatively associated with sexual health-promoting behaviors compared to low vulnerability groups, which will be positively associated with sexual health-promoting behaviors.

Conclusion

As the construct of vulnerability has not been clearly defined nor measured in the literature, the nature of vulnerability for specific populations is unknown (Arora, Shah, Chaturvedi, & Gupta, 2015). The implications of findings from this study are two-fold: They (1) fill a gap in the limited literature on vulnerability by testing a specific model of vulnerability for a particular population; and (2) extend the emerging research on Latino/a sexual and gender minorities living in a new settlement state by identifying typologies of vulnerability that predict sexual health behaviors. These findings have the potential for more targeted and effective sexual health promotion efforts for specific subgroups of Latino/a sexual and gender minorities, as well as other vulnerable populations living in other parts of the US.

CHAPTER II

REVIEW OF THE LITERATURE

Chapter 2 presents a review of the literature on two areas related to the present study: (1) a general vulnerable populations conceptual framework, and (2) the sexual health of Latino/a sexual and gender minorities. This chapter builds to a description and justification for a vulnerability framework for Latino/a sexual and gender minorities in NC and potentially other parts of the US.

I begin with a description of Shi and colleagues' (2008) General Model of Vulnerability and discuss its strengths and limitations. As this model is a general framework of vulnerable populations, I delineate the need for and utility of advancing a specific model of vulnerability, particularly for Latino/a sexual and gender minorities living in a new settlement state. Based on constructs from the General Model of Vulnerability, I propose and discuss three domains of vulnerability salient to this population: socioeconomic stability (i.e., education and employment), health care (i.e., routine care), and social (i.e., social support, acculturation, discrimination, and homonegativity). Next, I describe the need for a specific health vulnerability model framed across these domains. Lastly, I provide evidence of HIV and STD disparities among Latino/a sexual and gender minorities.

Vulnerability and Vulnerable Populations

Defining vulnerability and vulnerable populations. In its most general sense, vulnerability is the degree to which a population, individual, or organization is unable to anticipate, cope with, resist, and recover from the impacts of poor health outcomes (World Health Organization [WHO], 2012). To be vulnerable is to be susceptible to harm or neglect (Aday, 1994). Although people may be vulnerable at different times in their lives, people are not inherently vulnerable (Rogers, 1997). Nonetheless, some people may be more susceptible to vulnerability than others – and thus are at greater risk of poor health. Link and Phelan (1995) argue that people may be at "risk of risks" to poor health as a result of social factors, including socioeconomic status and social support (p. 80).

Vulnerable populations are defined as those who are at greater risk for poor health status or outcomes (Aday, 1994; Flaskerud & Winslow, 1998; Link & Phelan, 1996; Shi & Stevens, 2005). Vulnerable populations are typically categorized by one primary vulnerability, such as by health issue (e.g., HIV-positive), age group (e.g., adolescents), or other sociodemographic characteristic (e.g., low socioeconomic status) (Aday, 1994; Flaskerud & Winslow, 1998; Shi & Stevens, 2005; Shi, Stevens, Faed, et al., 2008). Although focusing on a primary vulnerability is a useful starting point, vulnerable populations typically share common traits and experience similar individual and social-environmental factors that contribute to their vulnerability. For instance, the contributors to vulnerability among Latino/as may include low socioeconomic status and limited primary care clinics in neighborhoods where Latino/as tend to live. These individual and social-environmental factors are often related to social determinants of health. In general,

commonly cited determinants that contribute to vulnerability include: low socioeconomic

status in general (Derose et al., 2007; Flaskerud & Winslow, 1998; Link & Phelan, 1996;

Phelan et al., 2010), low educational attainment (Aday, 1994; Link & Phelan, 1996; Shi,

Stevens, Lebrun, Faed, & Tsai, 2008), limited access to care (e.g., limited or no health

care) (Derose et al., 2007; Shi & Stevens, 2005), and discrimination and homonegativity

(Derose et al., 2007).

Construct of vulnerability. Although the literature tends to use similar

definitions of vulnerable populations, the broader construct of vulnerability is less well

defined. This obscurity is exemplified by Shi and colleagues' (2008) description of

vulnerability: "A multidimensional construct reflecting a convergence of many risk

factors at both the individual and community levels, which influence health and

healthcare experiences" (p. S45). This description provides a useful foundation for

understanding the construct of vulnerability. However, it raises questions about the

specific dimensions of vulnerability, the relative importance of some dimensions over

others, the types of health outcomes and behaviors experienced by vulnerable persons,

and the appropriate indicator variables to measure vulnerability in quantitative analysis.

Vulnerability is difficult to measure, in part, because it is multidimensional, with limited

research dedicated to its operationalization (Shi & Stevens, 2005).

Compared to other populations, vulnerable populations experience inequality and

persistent health disparities (e.g., sexual healthcare) (Shi et al., 2008). One strategy to

reduce these health disparities is to identify indicators (e.g., education) of vulnerability

for specific populations (Shi et al., 2008). Investigating indicators of vulnerability and

recognizing that these indicators may vary across different populations considered vulnerable advances understanding of both the population of interest and the latent construct of vulnerability (Furman et al., 2009; Gilbert & Rhodes, 2014). Efforts are needed to identify salient indicators of vulnerability, and determine whether there is heterogeneity in vulnerability among the population of interest. The utility in identifying indicators is to define, then test, the latent construct of vulnerability that future research can then replicate to particular populations or that interventions can address in their programming (Flaskerud & Winslow, 1998). These findings would help providers and program planners to better use resources and better target their efforts to vulnerable subgroups.

A population who would benefit from identification of salient indicators of vulnerability is Latino/a sexual and gender minorities. Although a generalized tool is useful for enhancing research and intervention work with Latino/as, developing a specific model for a subpopulation can illuminate within- and between-subgroup variation in health behaviors and outcomes, such as sexual health behaviors (Derose et al., 2007). In clearly operationalizing the indicators of vulnerability, we can observe unique response patterns, or typologies, associated with differentially vulnerable subgroups and compare these differences across subgroups. These subgroups can then be used to compare engagement in critical sexual health behaviors, such as those that promote sexual health (e.g., HIV testing). Developing a specific model of vulnerability to predict health behaviors can serve as a powerful tool to promote sexual health and better serve the needs of the target population (Flaskerud & Winslow, 1998).

The General Model of Vulnerability

To begin developing a specific model of vulnerability, a general vulnerable populations conceptual model must be identified. Shi and colleagues (2008) proposed a General Model of Vulnerability that serves as a more comprehensive model for vulnerable populations compared to prior frameworks. The model posits that risk factors at the individual and community levels lead to vulnerability. Vulnerability directly affects healthcare access, healthcare quality, and health outcomes at both the individual and community levels.

A key distinguishing characteristic of the General Model of Vulnerability, in contrast to older vulnerability models, is its inclusion of both individual and community risk factors that lead to vulnerability and, in turn, health outcomes (Aday, 1994; Flaskerud & Winslow, 1998). At both levels, three types of risk factors are included: predisposing characteristics, enabling characteristics, and need factors (Shi & Stevens, 2010).

Predisposing. At the individual level, predisposing characteristics are attributes related to the likelihood of people using services, including demographic characteristics (e.g., gender) and belief systems (e.g., health attitudes and beliefs) (Shi & Stevens, 2010). At the community level, predisposing characteristics include residence or geographical location (e.g., urban), neighborhood demographic composition (e.g., racial/ethnic segregation), physical environment (e.g., crime rates), political, legal, and economic systems (e.g., industrialization), and cultural and social norms and beliefs (e.g., religious beliefs).

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Enabling. At the individual level, enabling characteristics are the resources people have available to use services, including those specific to individuals, families, communities, or regions (e.g., income level and healthcare services) (Shi & Stevens, 2010). At the community level, enabling characteristics include socioeconomic status and social class (e.g., county unemployment rate), resource inequalities (e.g., distribution of income), workplace environment (e.g., job opportunities), social capital and social cohesion (e.g., family structure and friendship ties), and healthcare delivery system (e.g., availability and accessibility of medical care).

Need. At the individual level, need factors are specific illnesses, health needs, or perceived health statuses that may motivate people to seek health care (e.g., mental health issues, including depression) (Shi & Stevens, 2010). At the community level, need factors include community health risk factors, health-promoting community behaviors, and trends in health status and disparities (e.g., rates of depression among racial/ethnic minorities).

Although the immediate effects of vulnerability can include reduced access to health care and lower quality of care for those able to access care, the ultimate effect of vulnerability is poorer health outcomes or health status (Shi & Stevens, 2010). Similar to the conceptualization of multilevel risk factors, at the other end of the model are health outcomes that can be measured at both the individual and community levels. Various outcomes can be examined: physical, mental, social, or emotional health dimensions. Further, general health status can serve as an outcome that broadly reflects the sum total of these health dimensions.

Applications in Research

With the relatively recent development of the General Model of Vulnerability, references in the literature are limited. The existing references and applications of the model primarily involve theoretical perspectives on the conceptualization and usefulness of vulnerability frameworks in health disparity/equity research (De Witte et al., 2013; Grabovschi et al., 2013; Saunders, Hale, & Harris, 2016) or applications of the model by the original authors (Shi & Stevens, 2007; Shi, Stevens, & Politzer, 2007; Stevens, Seid, & Halfon, 2006; Stevens, Seid, Mistry, & Halfon, 2006).

Much of the original authors' applications of the model examined health care access among young children. In particular, they emphasized the usefulness of the model in patient care (Shi et al., 2008). They examined the influence of multiple individual-level risk factors (e.g., race/ethnicity, health insurance coverage, income, and education) on young children's health status and primary care access (Stevens, 2006; Stevens, Seid, & Halfon, 2006; Stevens, Seid, Mistry, et al., 2006). To analyze vulnerability, they typically conducted multiple logistic regression models to examine profiles of multiple risk factors. The risk profiles depicted how risk factors combine to affect primary care through an additive approach. These studies suggest that endorsing more risk factors are associated with poorer health outcomes than fewer risk factors (i.e., dose–response relationship). Although the original authors' backgrounds are grounded in both public health and medicine, these recent studies lean toward applications in the medical field (e.g., primary care research and practice). However, applications of the General Model of Vulnerability in public health should continue to be explored given its utility for advancing research

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with vulnerable populations and improving health promotion and risk prevention programming.

Strengths and Limitations

  Strengths. The primary strengths of the General Model of Vulnerability include the recognition of risk factors and health outcomes at multiple levels and explicit synthesis of prior vulnerability models (Shi & Stevens, 2010; Shi et al., 2008). First, both risk factors and health outcomes are understood at the individual and community levels. Rather than a sole focus on individual-level risk factors, the model recognizes the convergence of individual, social, community, and access-to-care factors that contribute to vulnerability. The convergence of these factors acknowledges that vulnerability status is a multidimensional construct that can have additive or multiplicative impacts on health (Shi et al., 2008). That is, people endorsing more risk factors may be more vulnerable to poor health outcomes than those who endorse fewer factors. Alternatively, people endorsing a particular combination of risk factors can result in specific vulnerabilities. Recognizing that factors can operate on multiple levels is important in the development of comprehensive, integrated health promotion efforts to improve population-level health.

  Second, the model is a comprehensive framework that synthesizes prior vulnerability work. The two primary frameworks informing the General Model of Vulnerability are from Aday (1994) and Flaskerud and Winslow (1998). Aday's (1994) seminal work describes an individual and community interaction model that incorporates multilevel risk factors affecting individual and community well-being. Flaskerud and Winslow (1998) also incorporated individual- and community-level determinants of

vulnerability in their model. The primary focus is in the interrelationships of community social resources, and how they contribute to the health of communities and, therefore, the health of individuals living in those communities. Given the extension of the General Model of Vulnerability from these prior frameworks, the original authors posit their model as the next evolutionary step of conceptual frameworks for vulnerable populations (Shi, Stevens, Faed, et al., 2008). If this model is the next evolution of vulnerable populations frameworks, then future efforts should explicitly define the constructs in the model, including of vulnerability itself, and explicitly elucidate the process to which the model can be adapted to specific populations.

Limitations. The primary limitations of the General Model of Vulnerability include the unclear operationalization of the latent construct of vulnerability, the omission of health behaviors, and the extent of true generalizability to specific vulnerable populations. First, Shi and colleagues (2008) do not clearly operationalize vulnerability, the main construct, in their General Model of Vulnerability. If future research should continue to use and adapt the General Model of Vulnerability, then the key construct of vulnerability should first be adequately operationalized. Further, some constructs include overlapping definitions, and thus, also lack specificity. For instance, need factors are specific illnesses or health needs, yet these can also be the target of health outcomes (e.g., depression). Income level or educational attainment can both be predisposing characteristics (i.e., demographics) and enabling resources to use services (i.e., socioeconomic status).

Second, the omission of health behaviors may be a detriment to the model given its close association with health outcomes. The determinants of both health behaviors and more distal health outcomes can be similar (e.g., low socioeconomic status can be associated with lower health-seeking behaviors and poorer mental health) (Chen & Miller, 2013; Richardson, Allen, Xiao, & Vallone, 2012). Additionally, vulnerability can affect both health behaviors and outcomes; health behaviors can serve as a proxy or intermediary step to health outcomes.

Third, the extent of the generalizability of the model to different population groups is unclear. Although the general framework of the model can be used to guide study development, can researchers use the same indicators that they identify as contributors to vulnerability across different vulnerable populations (e.g., populations living in different US regions)? Different populations inevitably will have unique factors that contribute to their vulnerability. Ultimately, the General Model of Vulnerability serves as a generalized tool or framework to advance research with vulnerable populations, rather than a conceptual and analytical tool for understanding specific populations.

Advancing a Specific Model of Vulnerability

Notably, the authors emphasized that the General Model of Vulnerability is a general model, thus it is limited in the extent to which it can be applied to specific population groups. The model focuses on attributes of vulnerability for the total population, rather than serving as a specific model focusing on the vulnerable traits of subpopulations (Shi & Stevens, 2010). Thus, advancing a more specific model of

vulnerability for a particular population would be the next evolutionary step to Shi and colleagues' (2008) General Model of Vulnerability. Developing a specific model allows for the identification of vulnerable subgroups who may need more attention, more resources, and/or interventions that go beyond individual behavior-change strategies (Arora et al., 2015; Derose et al., 2007; Grabovschi et al., 2013; Witte et al., 2013).

This specific model would need to operationalize key constructs and include indicators of vulnerability salient to the target population grounded in theory and prior research. Given that vulnerability is not well defined, this adapted model should first operationalize vulnerability, then identify typologies that contribute to the latent construct of vulnerability for a specific population. Once an adapted model is developed and identified for the target population, this model can be tested to predict health behaviors or outcomes. This approach and process can serve as a foundation for how future applications of the model may be adapted to other target populations in other locales. Without explicit and interpretable constructs, the General Model of Vulnerability, in essence, is a generalized tool to examine health outcomes among vulnerable populations overall. The exact approach and process for adapting the model to a target population is unclear and must be delineated before the model can be fully utilized in vulnerability research efforts. An explicit operationalization of key constructs for a specific population, such as Latino/a sexual and gender minorities in NC, would benefit future adaptations of the model for efforts with similar populations. Clarity in the approach and process for adapting the model to Latino/a sexual and gender minorities can improve replicability

with other populations and standardize a method to develop a specific vulnerability model.

Adapting the General Model of Vulnerability to Latino/a Sexual and Gender Minorities

        Latino/a sexual and gender minorities as a vulnerable population. The Latino/a population is rapidly growing in the US. In particular, the Latino/a population has increased rapidly in the South, including in NC (Brown & Patten, 2014; Ennis et al., 2011; Gill, 2010; Kochhar et al., 2005; US Census Bureau, 2016). The South has become an important new settlement area for immigrant Latino/as (Ennis et al., 2011; US Census Bureau, 2016). New settlement areas are characterized by limited immigration histories from foreign-born populations (Terrazas, 2011).

        Latino/as bear a disproportionate burden of poverty and poor health outcomes, thus they can be considered a vulnerable population at greater risk for poor health status and outcomes (Aday, 2002; Perez-Escamilla, 2010). Within the Latino/a population, Latino/a sexual and gender minorities can be considered additionally vulnerable. They constitute a vulnerable subgroup who are marginalized along multiple dimensions, including immigration status, race/ethnicity, gender identity, and sexual orientation (Gilbert & Rhodes, 2014). Those who identify as sexual and gender minorities crosses sexual identity, behavior, and preferences and gender identity. They can include gay-identified persons, men who have sex with men (MSM) but who do not self-identify as gay, and gender variant/minority or transgender persons (e.g., persons assigned male at birth who identify as female [male-to-female transgender]). Despite their presumed high

vulnerability, it is unclear what combination of factors contribute to the vulnerability of Latino/a sexual and gender minorities (i.e., salient indicators), and how that vulnerability differentially affects health behaviors and outcomes (e.g., sexual health behaviors). To advance research with Latino/a sexual and gender minorities in the field of vulnerability, salient indicators to the latent construct of vulnerability among this population should first be established. These indicators of vulnerability can help discern differentially vulnerable subgroups, which can then be used to predict health outcomes or behaviors, such as sexual health behaviors. Developing a specific vulnerability model that predicts sexual health behaviors advances understanding of vulnerability and contributes to emerging research with Latino/a sexual and gender minorities.

Sexual health disparities. Previously, the National HIV/AIDS Strategy identified goals to reduce disparities in HIV incidence experienced by several groups, including Latino men, transgender women, and people living in the South (ONAP, 2015). Despite the dissolution of the strategy, national goals to end the HIV epidemic need to continue to emphasize efforts for vulnerable groups who experience sexual health disparities. Focusing on the sexual health behaviors of Latino/a sexual and gender minorities living in NC remains timely and urgent.

Latino/as bear a disproportionate burden of HIV and STDs (CDC, 2015; ONAP, 2015; Turra & Goldman, 2007; Vega et al., 2009). For immigrant Latino/as, the immigration process is often linked to increased health risk behaviors, including sex as a coping strategy for loneliness and depression (Rhodes, Hergenrather, Zometa, Lindstrom, & Montaño, 2008). The intersections of minority identities across race/ethnicity and

sexual and gender minority statuses can further intensify health risks and reduce care-seeking behaviors. The following sections present epidemiological evidence of the sexual health disparities related to HIV and STDs among Latino/a sexual and gender minorities, then describe data on sexual health promotion behaviors related to three behaviors: HIV testing, STD testing, and condom use.

Epidemiological data: HIV and STDs. Latino/as experience high HIV infection rates. Latino/as constituted 21% of estimated new HIV diagnoses in the US, despite representing approximately 17% of the US population (CDC, 2015c). In particular, Latino/as who live in the southern US are disproportionately affected by HIV (Turra & Goldman, 2007; Vanable et al., 2006). The South, including NC, is characterized as a major HIV epicenter given its high HIV infection rates (Carpenter, 2013; Wiltz, 2014).

In NC, HIV incidence remains high among Latino/as. From 2010 to 2014, the percentage of newly diagnosed HIV infections remained approximately 21% (NC DHHS, 2015). In 2012, HIV incidence rates in NC were 40% higher than the national rate, and HIV infection rates for Latino/as were three times that of Whites (NC DHHS, 2013). Latino/as have the second highest percentage of being newly diagnosed with AIDS after Black/African Americans (24.7% and 11.7%, respectively) (NC DHHS, 2015).

Latino/a sexual and gender minorities are particularly affected by HIV. Among all MSM, Latinos accounted for approximately 22% of estimated new HIV infections in 2010 (CDC, 2015b). A study found that newly diagnosed HIV among Latinos was most strongly associated with being an MSM (adjusted odds ratio = 6.8; 95% confidence interval = 6.1–7.6) (Duran et al., 2016). In NC, the percentage of newly diagnosed HIV

infections among Latino MSM, compared to their heterosexual counterparts, increased from 2010 to 2014 (59.7% to 77.3% versus 34.3% to 18.2%) (NC DHHS, 2015).

Additionally, Latino/as are increasingly affected by STDs. From 2010 to 2014, chlamydia rates increased 5.6% among Latino/as in the US (CDC, 2015a). In 2014, the chlamydia rate was 380.6 cases per 100,000 Latino/as, approximately 2.1 times the rate among Whites. From 2010 to 2014, gonorrhea rates increased 51.1% among Latino/as (CDC, 2015a). In 2014, the gonorrhea rate was 73.3 cases per 100,000 Latino/as, approximately 1.9 times the rate among Whites. The disparity in gonorrhea rates across US regions was second highest in the South, behind the Northeast. From 2010 to 2014, primary and secondary syphilis rates increased 80.2% (CDC, 2015a). In 2010, 16.2% of all syphilis cases reported were among Latino/as. In 2014, the primary and secondary syphilis rate was 7.6 cases per 100,000 Latino/as, approximately 2.2 times the rate among Whites.

In NC, STD incidence has increased among Latino/as. From 2010 to 2014, the annual incidence of newly diagnosed chlamydia ranged from 5.3% to 6.4% (NC DHHS, 2015). During the same time period, the percentage of newly diagnosed gonorrhea ranged from 2.2% to 2.7%. The percentage of newly diagnosed primary and secondary syphilis ranged from 1.6% to 5.1%. The percentage of newly diagnosed early latent syphilis ranged from 0.6% to 3.5%.

Sexual health behaviors: Testing and condom use. High rates of HIV can be reduced through testing to identify (and treat) HIV by reducing viral load and encouraging changes in sexual or drug-use practices, thus reducing the spread of new

infections (CDC, 2016a; Gallant, 2004). HIV testing allows informed decision-making about sexual behaviors regardless of HIV status (e.g., condom use with new partners) and treatment decisions to decrease HIV transmission risk if HIV-positive (e.g., treatment as prevention) (Gallant, 2004; ONAP, 2015). Early treatment of HIV promotes improved health outcomes for those infected and reduces transmission risk to their partners (Cohen et al., 2011; ONAP, 2015). In a study with Latino/a sexual and gender minorities in NC, 68% reported an HIV test in the past year, and nearly half (43%) reported having multiple HIV tests in their lifetime (Gilbert & Rhodes, 2013). In another study with Latino/a sexual and gender minorities, more than half (57.2%) received an HIV test in the past year (Tanner et al., 2014). These studies suggest HIV testing may be high among Latino/a sexual and gender minorities in NC.

Although these percentages of HIV testing appear high, they are within the range presented by other studies with Latino men and sexual minorities (Cohall et al., 2010; Fernandez, Perrino, Royal, Ghany, & Bowen, 2002; Glasman, Weinhardt, & Hackl, 2011; Helms et al., 2009; Robinson & Ross, 2013; Solorio & Galvan, 2009). Across these studies, HIV testing ranged from 19% to 76%. In light of this large range, it is important to note these studies may have limited relevance to the proposed study in three critical ways: failure to disaggregate Latino/a samples by sexual orientation, failure to disaggregate sexual minority samples by Latino/a identity, and failure to sample Latino/as in new settlement areas (Gilbert & Rhodes, 2013). Despite these limitations, these studies provide a general pattern of HIV testing among Latino/a sexual and gender minorities.

Similar to the mechanisms to reduce HIV transmission through HIV testing, increasing rates of STDs can be reduced through testing to identify (and treat) STDs, thus reducing the spread of new infections. However, few studies solely examine STD testing behaviors among Latino/a sexual and gender minorities, with most studies concurrently examining HIV and STD testing. Although STD testing behaviors cannot be isolated from these studies' findings, HIV testing may serve as a generalized proxy of STD testing. High proportions of HIV testing may suggest similarly high proportions of testing for STDs. Indeed, 57.9% of Latino MSM in New York City reported testing for HIV and 60.2% tested for STDs in the past 12 months (Spadafino et al., 2016). Given that a range of STDs can be tested simultaneously, Latino/a sexual and gender minorities may be more likely to test for STDs if they test for HIV or vice versa. However, HIV testing may be a more stigmatizing behavior compared to STD testing, resulting in less testing (Katz et al., 2016).

In addition to testing as part of a sexual health regimen, condom use remains critical in the prevention of HIV and STDs. Recent representative estimates of condom use are limited for Latino/a sexual and gender minorities, particularly those living in new settlement areas such as the South. The studies that do exist suggest low proportions of consistent condom use. Research with Latino/a sexual and gender minorities in NC found that approximately one-third (36.5%) used condoms the last time they had insertive and/or receptive anal sex with a man (Tanner et al., 2014). Although this percentage suggests low condom use, other studies suggest that patterns of long-term condom use may be higher. A study with Latino/a sexual and gender minorities in NC found

approximately half (51.5%) reported consistent condom use during insertive and/or receptive anal sex with male partners during the past three months (Rhodes & McCoy, 2015). Among Latino/a sexual and gender minorities who engaged in insertive anal sex in the past three months, 64% reported consistent condom use; among those engaged in receptive anal sex, 63% reported consistent condom use (Gilbert & Rhodes, 2013).

Studies in other US regions suggest that consistent condom use is higher. A study with Latino sexual minorities in Chicago and San Francisco found that the majority (89.4%) reported condom use during receptive anal sex in the past two months (Bruce, Ramirez-Valles, & Campbell, 2008). Another study found that 75% of Latino sexual minorities used condoms during anal sex in the past 12 months (Ramirez-Valles, Garcia, Campbell, Diaz, & Heckathorn, 2008). In comparison, older studies typically report higher proportions of unprotected insertive or receptive anal sex than more recent studies. For instance, 72% of Latino gay men in Los Angeles, Miami, and New York City used condoms during anal sex in the past two months and 63% in the past 12 months (Díaz, Ayala, Bein, Henne, & Marin, 2001). Another study with Latino MSM in New York City found that 43% used condoms during anal sex (Dolezal, Carballo-Diéguez, Nieves-Rosa, & Díaz, 2000). However, whether regional differences exist across these percentages – and whether the percentages have changed – is unclear.

Vulnerability domains and sexual health behaviors. The social determinants that affect sexual health behaviors are often cross-cutting, with few determinants unique to one behavior. Existing literature related to Latino/a sexual and gender minorities and immigrant populations have identified determinants of health contributing to their

vulnerability. Across various health outcomes and behaviors, common determinants include: socioeconomic stability (e.g., education and employment), health care (e.g., accessing routine care), and social (e.g., social support, acculturation to US/Anglo-American culture, racial/ethnic and sexual discrimination, and internalized homonegativity) (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Tanner et al., 2014). These determinants of health can be used to understand and identify indicators of vulnerability and their effect on sexual health behaviors.

*Socioeconomic stability***.** One of the most important predictors of sexual health is socioeconomic status (i.e., having financial resources) (Phelan et al., 2010). Low educational attainment and unemployment can challenge the ability to protect and maintain sexual health (CDC, 2015c; Harling, Subramanian, Bärnighausen, & Kawachi, 2013). Those who cannot afford basic necessities may not prioritize sexual health care or have issues accessing and affording sexual health services. In general, Latino/a sexual and gender minorities with higher educational attainment are more likely to test for HIV and STDs than those with lower attainment (CDC, 2015, 2015, 2016b; Gilbert & Rhodes, 2013; Spadafino et al., 2016). However, a study with Latino MSM in New York City found no significant correlates of STD testing, including for educational attainment, which suggests that socioeconomic status may be a stronger predictor for HIV than STD testing (Spadafino et al., 2016).

The association between socioeconomic status and condom use reveals counterintuitive findings. Studies suggest that highly educated Latino/as are more likely

to engage in unprotected sex than those with lower educational attainment (Gilbert &

Rhodes, 2014; Ramirez-Valles et al., 2008). One explanation for this finding is that more

highly educated Latino/as may not see themselves at risk for HIV and STDs due to

greater feelings of self-confidence and invincibility associated with being more highly

educated (Ramirez-Valles et al., 2008). Further, they may not see their sexual partners at

risk, who may have similarly high educational attainment and express similar views on

risk and condom use (Ramirez-Valles et al., 2008).

Health care. Routine care is another important predictor of HIV and STD testing.

The CDC recommends that healthcare providers test all persons between the ages of 13

and 64 at least once per year as part of routine healthcare (HIV.gov, 2016a; CDC, 2016a).

During routine health appointments, providers may be more likely to remind patients of

the importance of HIV and STD testing, which can encourage patients to test. In a

population study, Latino/as who engaged in routine care were more likely to test for HIV

compared to those who had not seen a health professional in the past year (Lopez-

Quintero, Shtarkshall, & Neumark, 2005). In addition, 40% of Latino/as reported testing

for HIV because a healthcare provider suggested testing (Kaiser Family Foundation,

2011).

Social. Broadly, the presence of positive social forces (e.g., social support and

acculturation) and the absence of negative social forces (e.g., discrimination and

homonegativity) can promote engagement in sexual health care. Social support and

acculturation are interpersonal factors that can promote utilization and navigation of

health care services through having supportive relationships and the language skills

needed to communicate health needs (Gallo, Penedo, Espinosa de los Monteros, & Arguelles, 2009). More social support in the form of greater numbers of close friends or more social interactions with these friends is positively associated with HIV testing and consistent condom use (Carlos et al., 2010; Fekete et al., 2009; Gilbert & Rhodes, 2013; Lopez-Quintero et al., 2005; Lauby et al., 2011; Solorio, Forehand, & Simoni, 2013; Vega, Spieldenner, DeLeon, Nieto, & Stroman, 2010). High levels of acculturation to the US is associated with HIV and STD testing by promoting engagement in health-seeking services (Lopez-Quintero et al., 2005; Solorio et al., 2013).

Despite contrasting findings, acculturation demonstrates some association with condom use (Díaz, Bein, & Ayala, 2006; Gilbert & Rhodes, 2014; Lescano, Brown, Raffaelli, & Lima, 2009; Rhodes & McCoy, 2015; Warren et al., 2008). A study with Latino/a sexual and gender minorities found that higher acculturation levels (e.g., speaking English and Spanish and having greater proportions of US/American friends) were associated with more consistent condom use than those with lower acculturation levels (Gilbert & Rhodes, 2014).

Even when sexual health care services are available, living in a new settlement area with historically low immigrant populations can be difficult for accessing and engaging in sexual health care. These areas may lack the infrastructure to meet the unique needs and priorities of Latino/as (e.g., lack of bilingual and bicultural services) or may be characterized by high levels of anti-immigration sentiment (Barrington, Messias, & Weber, 2012; Kochhar et al., 2005; Rhodes et al., 2011, 2015). Further, Latino/as may be concerned about the level of confidentiality and privacy available at healthcare facilities,

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particularly when engaging in stigmatizing behaviors such as HIV and STD testing. If they perceive a lack of Latino/a-friendly services and recognize high anti-immigration sentiment in the community, Latino/as may be hesitant to access and engage in sexual health care due to fear of discrimination or general distrust of healthcare personnel (CDC, 2015c; Smedley, Stith, & Nelson, 2002).

In addition to positive social forces, the absence of negative social forces can promote engagement in sexual health care. Experiencing discrimination and homonegativity on the individual-level suggests oppressive social structures and inequalities that may exacerbate risky sexual behaviors (Halkitis, 2012). Research suggests that experiencing more discrimination and internalized homonegativity may prevent Latino/a sexual and gender minorities from obtaining HIV and STD testing and challenge condom use (Brooks et al., 2006; CDC, 2015; Erausquin et al., 2009; Harrison-Quintana & Perez, 2012; IOM, 2011; Meyer & Champion, 2010; Rhodes et al., 2010, 2011). They may fear negative social consequences from obtaining HIV or STD testing or perceive testing as evidence of engaging in a stigmatized sexual behavior (Brooks et al., 2006). This is partly due to remaining inextricable associations between HIV/STDs and homosexuality (Brooks et al., 2006; Diaz, 2013; Herek & Capitanio, 1999). HIV transmission, in particular, remains associated with stigmatized groups (e.g., gay and bisexual men, sex workers, and substance abusers) and stigmatizing behaviors (e.g., men who have sex with men, promiscuity and casual sex, and substance abuse) (Brooks et al., 2006). A study with Latino/a sexual and gender minorities found that among those who did not obtain an HIV test in the past year, frequently endorsed reasons included the fear

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that people might treat them differently (32%) or think they were gay (10%) (Gilbert &

Rhodes, 2013).

A specific model of vulnerability for Latino/a sexual and gender minorities.

Figure 1 presents the full, hypothesized specific model of vulnerability for Latino/a

sexual and gender minorities in NC, adapted from Shi and colleagues' (2008) General

Model of Vulnerability. Instead of explanatory pathways leading from the indicators to

vulnerability and health outcomes or behaviors (denoted by dotted lines), this specific

model seeks to begin to advance the original model by operationalizing vulnerability

first, then testing the association between the latent construct of vulnerability and sexual

health behaviors (denoted by solid lines).

Figure 1. A Specific Model of Vulnerability for Latino/a Sexual and Gender Minorities in
a New Settlement State
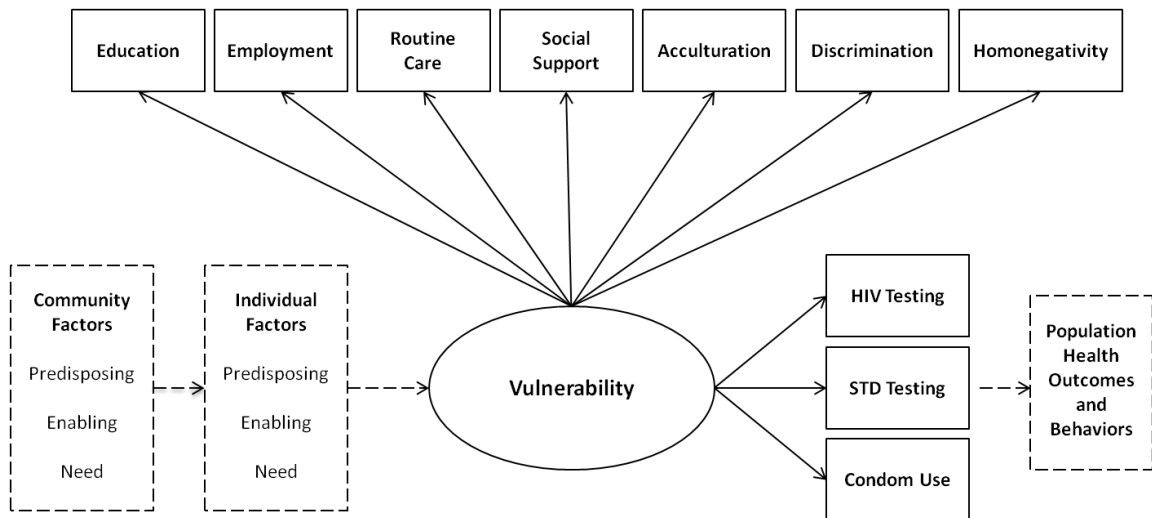
Presented in the top part of the model, selected indicators are hypothesized to

operationalize the latent construct of vulnerability (**Specific Aim 1**). Given that

vulnerable populations often share common traits and experience similar contributors or risk factors to vulnerability, I used prior research and constructs from the General Model of Vulnerability to help identify and select potentially salient indicators of vulnerability. Commonly cited indicators to vulnerability among Latino/a sexual and gender minorities include socioeconomic stability (e.g., education), health care (e.g., acessing routine care), and social forces (e.g., social support and discrimination) that enable – or challenge – the use of sexual health services (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Shi & Stevens, 2010; Tanner et al., 2014). Many of these indicators reflect the construct of enabling characteristics from the original model (i.e., resources people have available to use services, such as education and employment). This reflection may be due to the link between vulnerability and the overall health and resources of individuals and communities (Phelan et al., 2010; Shi & Stevens, 2010). Although I do not intend to suggest that all enabling characteristics are indicators of vulnerability, the operationalization of vulnerability in the present study is loosely guided by the construct of enabling resources in particular. Using the concept of enabling characteristics may illuminate resource disparities among differentially vulnerable groups. Additionally, enabling characteristics may be more amenable to intervention than predisposing characteristics or need factors.

As an extension of existing applications of the General Model of Vulnerability (Shi & Stevens, 2007; Shi et al., 2007; Stevens, 2006; Stevens, Seid, & Halfon, 2006; Stevens, Seid, Mistry, et al., 2006), I focused on individual-level factors across the indicators and health behaviors. Although the inclusion of community-level factors (e.g.,

transportation and location of clinics) is imperative for future research, focusing on the individual level will provide a critical foundation for future multilevel or hierarchical analyses based on this adapted model. Eight indicators of vulnerability are included across three proposed domains of vulnerability: (1) socioeconomic stability (i.e., educational attainment and employment status), (2) health care (i.e., routine check-ups), and (3) social (i.e., social support, acculturation, racial/ethnic and sexual discrimination, and internalized homonegativity). These indicators were used to identify subgroups of different typologies of vulnerability among Latino/a sexual and gender minorities in NC.

Once vulnerability is operationalized, this construct then can be used to predict health behaviors. On the right side of the model, the vulnerable subgroups identified from the combination of indicators can be used to predict three sexual health behaviors: HIV testing, STD testing, and condom use (**Specific Aim 2**). Vulnerability to reduced sexual health (e.g., HIV and STD acquisition) was operationalized through sexual health promotion or safe sex behaviors. Together, testing and condom use comprise a sexual health regimen that can directly (and immediately) reduce the risk of contracting or spreading HIV and STDs. HIV and STD testing suggest that Latino/a sexual and gender minorities recognize the importance of testing to reduce the spread of infections. Condom use suggests they are practicing safe sex and reducing their risk of contracting and spreading infections.

Two purposes are served by first identifying vulnerable subgroups of Latino/a sexual and gender minorities using indicators of vulnerability (**Specific Aim 1**), then testing the association between these subgroups and sexual health behaviors (**Specific**

Aim 2). First, the utility of the selected operationalization of vulnerability can be examined. Once vulnerability is explicitly operationalized, we can then examine the utility of the entire specific model of vulnerability by testing how vulnerability can differentially predict sexual health behaviors. Although this specific model does not examine community- and individual-level factors to predict vulnerability, as presented in the original General Model of Vulnerability (denoted by dotted lines on the left side of the model), this model extends a critical component missing from the original model: vulnerability must first be operationalized before future applications can be performed. Once vulnerability is operationalized, important predictors of vulnerability can be examined – including predisposing (e.g., age) and need characteristics (e.g., depression) – in a more comprehensive specific model. The present study delineates the approach or process to which the latent construct of vulnerability can be operationalized and tested on sexual health behaviors among a subset of Latino/a sexual and gender minorities in NC.

CHAPTER III

METHODOLOGY

Chapter 3 presents the methodological approach used in the present study. I describe my approach in the following six sections: (1) research design, (2) HOLA recruitment and sampling, (3) conceptual model, (4) measures, (5) analytic plan, and (6) preliminary results.

Research Design

The purpose of the present study is to advance a vulnerability model for Latino/a sexual and gender minorities in NC, by adapting Shi and colleagues' (2008) General Model of Vulnerability. I developed a specific model by operationalizing the latent construct of vulnerability, then tested the utility of eight selected indicators of vulnerability (e.g., routine care and social support) on three sexual health behaviors (i.e., HIV testing, STD testing, and condom use). I conducted secondary analyses of data gathered from Latino/a sexual and gender minorities in 2011–2012. I utilized baseline data from HOLA (originally, *Hombres Ofreciendo Liderazgo y Ayuda* [Men Offering Leadership and Help]), an intervention that used a lay health advisor approach to harness existing social networks to increase HIV testing and condom use among Latino/a sexual minority men and Latina transgender women (Rhodes et al., 2013; Sun et al., 2014).

Using the HOLA dataset, I reached the following two specific aims:

(1) Operationalize vulnerability to poor sexual health using selected indicators to identify latent classes of vulnerability.

Hypothesis 1: At least two latent classes of vulnerability will emerge from salient indicators of vulnerability.

Hypothesis 1a: The latent classes will include subgroups who are high in indicators of vulnerability, low in indicators of vulnerability, and potentially a combination of responses indicating mixed or specific vulnerabilities.

(2) Test the latent classes derived from the salient indicators (from Specific Aim 1) as predictors of sexual health behaviors (i.e., HIV testing, STD testing, and condom use).

Hypothesis 2: The different groups of vulnerability identified in Specific Aim 1 will differentially predict sexual health behaviors.

Hypothesis 2a: Groups categorized as high vulnerability will be negatively associated with sexual health-promoting behaviors compared to low vulnerability groups, which will be positively associated with sexual health-promoting behaviors.

I used latent class analysis as a multi-step process to reach Specific Aims 1 and 2. To reach Aim 1, I conducted a latent class analysis to identify subgroups using selected indicators (e.g., education) related to the latent construct of vulnerability across three domains of vulnerability (i.e., socioeconomic stability, health care, and social). I assessed salient indicators of vulnerability to uncover different typologies of vulnerability. To

reach Aim 2, I conducted separate latent class analyses for each binary distal outcome to test the utility of the different subgroups of vulnerability to independently predict three sexual health behaviors (i.e., HIV testing, STD testing, and condom use). I then used the subgroups identified from Specific Aim 1 to examine the extent to which they were associated with each of the sexual health behaviors. See **Appendix A** for definitions of specialized terms used in the analyses.

The original research partnership was and continues to be committed to community-based participatory research (CBPR) to develop, implement, refine, and disseminate the HOLA intervention (Rhodes et al., 2006, 2013; Sun et al., 2014). As an extension of CBPR principles and the existing partnership, I developed professional relationships with key members of the original team (e.g., principal investigator, research associate, and program coordinator) by collaborating on manuscripts, conference presentations, and learning about the HOLA intervention. I presented the results of the present study to the full CBPR partnership team for their feedback, addressed comments and issues that arose, and made the appropriate revisions as needed. I also asked the research team for their feedback on subsequent manuscripts and conference presentations that arose from the study. I remained open and sensitive to the original team's feedback to ensure the implementation and dissemination of my dissertation study were sound and upheld the principles of CBPR and the values of the team.

The Wake Forest School of Medicine Institutional Review Board approved the original study protocol (#00013197). The University of North Carolina at Greensboro

Institutional Review Board approved the secondary data analysis using the HOLA dataset (#16-0130).

HOLA Recruitment and Sampling

HOLA was a lay health advisor and social network intervention designed to increase HIV testing and condom use among Latino/as. The HOLA intervention targeted Latino/as who identified as sexual and gender minorities (e.g., gay, bisexual, and transgender) (Rhodes et al., 2013; Sun et al., 2014). See **Appendix B** for an overview of the HOLA intervention and more detailed information on the recruitment process.

The HOLA intervention recruited 21 Navegantes to participate in the study, who then each recruited 8 Latino/as from their social networks. A total of 186 Latino sexual minority men and Latina transgender women participated in the intervention study and completed baseline, 12-month, and 24-month follow-up surveys. Eligibility to participate in the HOLA intervention as a Navegante included the following: (a) self-identify as Latino; (b) be at least 18 years of age; (c) report MSM behavior since at least age 18; (d) have some Spanish language literacy; and (e) provide informed consent. Eligibility as a social network member included similar criteria, excluding Spanish language literacy. Three participants were removed from the study after enrollment and data collection due to ineligibility (e.g., less than 18 years of age).

As part of the HOLA intervention, the Navegantes and their social network members completed baseline surveys using a self-reported format administered by the program coordinator. The CBPR partnership developed the survey iteratively based on formative research and literature review. Participants completed surveys by native

Spanish-speaking male intervention team members who read aloud survey items to address potential issues with low literacy and poor vision. This approach was used to increase engagement with the interviewer, who could establish rapport and trust and enhance *personalismo* (i.e., stresses warm and friendly interactions) with the participant. Participants completed surveys with data collectors in locations convenient to them.

Most items in the survey instrument were close-ended, with binary, categorical, or Likert-scale response options. Participants reported their sociodemographic characteristics (e.g., age and educational attainment), HIV and STD knowledge, sexual and condom use behaviors, and psychosocial assessments (e.g., condom use efficacy and acculturation) using previously validated measures. All scales have been validated in Spanish. Further information on the measures included in the study is detailed below.

Conceptual Model

Figure 2 presents the components of a specific model of vulnerability for Latino/a sexual and gender minorities in a new settlement state, adapted from Shi and colleagues' (2008) General Model of Vulnerability. This figure is an abridged, or trimmed, version of **Figure 1** (from Chapter 2) that includes only the variables emphasized in the present study.

Figure 2. A Vulnerability Model for Latino/a Sexual and Gender Minorities in a New Settlement State
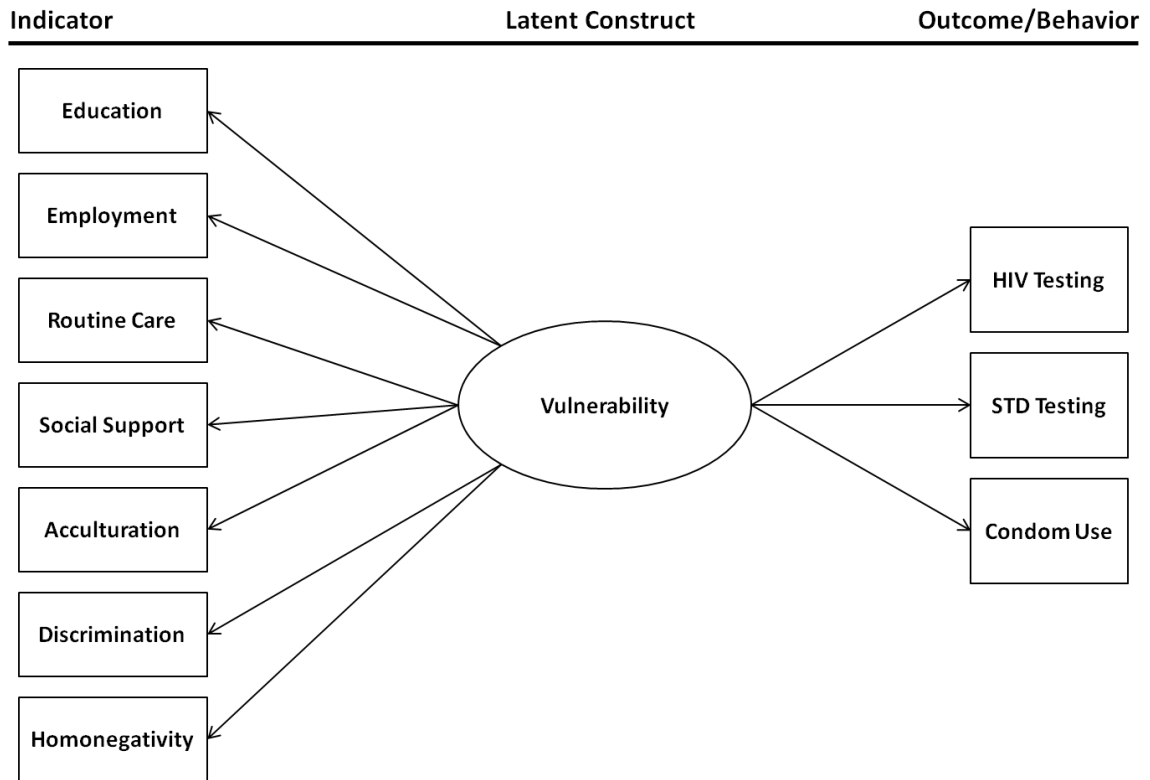
Specific Aim 1 examines the seven selected indicators of vulnerability presented on the left side of the model. This hypothesized model includes three domains of vulnerability: (1) socioeconomic stability (i.e., educational attainment and employment status); (2) health care (i.e., routine check-ups); and (3) social (i.e., social support, acculturation, racial/ethnic and sexual discrimination, and internalized homonegativity). I used these indicators to operationalize vulnerability and identify subgroups of vulnerability among Latino/a sexual and gender minorities.

Specific Aim 2 tests predictors of the sexual health behaviors presented on the right side of the model. Three sexual health behaviors – HIV testing, STD testing, and

condom use – are the primary outcomes in the present study. I tested whether the latent classes derived from the salient indicators from Specific Aim 1 predicted these three sexual health behaviors among Latino/a sexual and gender minorities.

Measures

      Appendix C presents a table of the key variables of interest using the HOLA dataset. The following describes the measures used for Specific Aims 1 and 2.

      Specific Aim 1. *Demographics*. Participants reported their demographic information, including: current age in years, approximate monthly income on a 7-point scale (i.e., none, $1–$99, $100–$499, $500–$999, $1000–$1999, $2000–$2999, and $3000 or more), country of origin, sexual orientation with five response items (i.e., heterosexual, gay, bisexual, transgender, and other), relationship status with five response items (i.e., single and not dating anyone special, dating someone special but have sex with other people also, dating someone special but don't have sex with other people, partnered or married but have sex with other people also, and partnered or married but don't have sex with other people), and current perceived health status on a 5-point scale (from "excellent" to "poor") (CDC, 2011).

      Indicator variables of vulnerability. The indicator variables of the latent construct of vulnerability include eight total variables across three domains related to vulnerability (i.e., socioeconomic stability, health care, and social): educational attainment, employment status, routine check-ups, social support level, acculturation level, perceived racial/ethnic and sexual discrimination, and internalized homonegativity.

Socioeconomic stability. In terms of the socioeconomic stability domain, participants reported their highest level of education on a 7-point scale (i.e., less than 5 years of school, 5–8 years of school, less than high school diploma or equivalent [GED], high school diploma or equivalent [GED], some college, 2-year college degree, 4-year college degree, and Master's degree, professional degree, or more). I dichotomized educational attainment (i.e., less than high school and at least high school) to reflect the treatment of this variable in similar studies using the same data (Sun, Ma, et al., 2015; Tanner et al., 2014) and improve interpretability in analyses.

Participants reported their employment status with seven response items (i.e., employed year-round, employed in seasonal work but not year-round, retired, unemployed since arrived in the US, unemployed seasonal worker, other unemployed status, and disabled and not working). I dichotomized employment status (i.e., employed year-round and not employed year-round) to reflect the treatment of this variable in similar studies (Sun, Ma, et al., 2015) and improve interpretability in analyses.

Health care. In terms of the health care domain, participants reported when they last saw a healthcare provider for a routine check-up that excluded an emergency department visit on a 5-point scale (i.e., never, within past 6 months, within the past year, 1–2 years ago, and over 2 years ago). I dichotomized routine check-up into two categories (i.e., within the past year and more than 1 year) to distinguish between participants who engaged in routine (annual) care and those who engaged in care less routinely or not at all.

Social. In terms of the social domain, participants identified their level of social support by completing the 18-item Index of Sojourner's Social Support (ISSS) (Ong & Ward, 2005). For each item, participants reported how many people would provide socio-emotional support and instrumental support on a 5-point scale from "no one would do this" to "many people would do this." The question stem was introduced as, "Tell me if you know persons in NC or outside NC, with whom you are maintaining some form of regular contact, who would perform each helpful behavior." An example question for each factor included: "Comfort you whenever you feel homesick" (socio-emotional support); and "Provide necessary information to help orient you to your new surroundings" (instrumental support). The Cronbach's alpha for the ISSS scale in the original study was 0.94 (Ong & Ward, 2005). The Cronbach's alpha in this sample is 0.98.

Participants identified their level of acculturation by completing the 12-item Short Acculturation Scale for Hispanics (Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987). This scale consists of three dimensions of acculturation (i.e., language use, media, and ethnic social relations or socialization) on a 5-point scale. Depending on the question, the scale ranged from "only Spanish" to "only English" or "all Latinos/Hispanics" to "all Americans." An example question for each dimension included: "What was the language(s) you used as a child?" (language use); "In what language(s) are the TV programs you usually watch?" (media); and "Your close friends are..." (ethnic social relations or socialization). The Cronbach's alpha in this sample is 0.87.

Participants reported their level of perceived racial/ethnic and sexual discrimination by completing a modified version of The Everyday Discrimination Scale (Williams, Yu, Jackson, & Anderson, 1997), which has been validated across ethnic/racial groups (Kim, Sellbom, & Ford, 2014). Participants reported in the past 12 months whether they had experienced 10 different types of discrimination (e.g., treated with less courtesy than other people, been called names or insulted) because of their race, ethnicity, or color (ethnic/racial discrimination) and because of their sexual identity or same-sex sexual behavior (sexual discrimination) with a "yes" or "no" response. I summed the number of "yes" responses so that higher scores reflect greater experiences of discrimination. The Cronbach's alpha for the scale in the original study was 0.88 (Williams et al., 1997). The Cronbach's alpha in this sample for racial/ethnic discrimination is 0.81 and for sexual discrimination 0.83.

Participants reported their level of internalized homonegativity by completing a shortened version of the Reactions to Homosexuality Scale (Smolenski, Diamond, Ross, & Rosser, 2010). Participants rated their agreement to seven statements on a 7-point scale from "strongly disagree" to "strongly agree." An example statement included: "I feel comfortable being a homosexual man." The Cronbach's alpha for the scale in the original study was 0.84 (Smolenski et al., 2010). The Cronbach's alpha in this sample is 0.65.

Specific Aim 2. *Behavioral outcomes of vulnerability*. The primary outcomes in the present study are three behaviors related to sexual health: HIV testing, STD testing, and condom use.

HIV testing. In terms of HIV testing, participants reported whether they were tested for HIV at a clinic, hospital, health department, or doctor's office in the past 12 months (yes/no).

STD testing. In terms of STD testing, participants reported whether they were tested for STDs at a clinic, hospital, health department, or doctor's office in the past 12 months (yes/no).

Condom use. In terms of condom use, participants reported how often they used condoms during their most recent sexual intercourse across a variety of sexual behaviors: insertive anal intercourse with a man, receptive anal intercourse with a man, vaginal intercourse with a woman, and anal intercourse with a woman. They reported their consistent condom use on a 5-point scale from "never" to "always." We used an aggregate measure that dichotomized condom use across these four sexual behaviors to examine whether they used condoms during their most recent instance of insertive or receptive anal sex with men and insertive vaginal or anal sex with women (yes/no). Consistency needed to be across all sexual behaviors reported.

Analytic Plan

Data preparation. Across Specific Aims 1 and 2, I first explored the HOLA dataset and performed data cleaning as appropriate (e.g., recoded variables and identified missing data). I performed power analysis for the prediction of the study outcomes. Secondly, I performed descriptive statistics to describe the sample (e.g., country of origin and relationship status) and assessed variable heterogeneity, including frequencies, percentages and ranges, and means and standard deviations. Third, I performed bivariate

analyses to describe the relationships between key variables and assess correlations to confirm local independence ($r < 0.70$). Finally, I performed cluster analyses to describe preliminary homogenous groups of individuals using an array of variables (i.e., indicator variables) (Aldenderfer & Blashfield, 1984; Kaufman & Rousseeuw, 2009).

I performed a two-step cluster analysis using fit and clustering criteria (i.e., Euclidean distance, Bayesian information criterion [BIC], and 5% noise handling) to derive subgroups based on the indicator variables that were used in the latent class analysis (Aldenderfer & Blashfield, 1984). I identified the best fit cluster model and reported its cluster structure, including the cluster distribution, mean and standard deviation or frequency and percentages of each indicator variable for each cluster, and bar graphs depicting cluster profiles. Although these clusters may not fully align with the number and quality of subgroups from the latent class analysis results, such clusters can provide a preliminary understanding of the potential subgroups that may result and provide evidence of the feasibility of conducting the latent class analysis.

I conducted analyses using IBM SPSS version 23 (Armonk, NY) and Mplus version 7.4 (Los Angeles, CA). I used SPSS to prepare the data and gather descriptive statistics, and conducted most inferential analyses in Mplus. I conducted power analysis with PASS version 14 (Kaysville, Utah).

Specific Aim 1. To address Specific Aim 1, I operationalized vulnerability among a subset of Latino/a sexual and gender minorities using selected indicators to identify latent classes of vulnerability. I examined one primary hypothesis:

(1) At least two latent classes of vulnerability will emerge on salient indicators of vulnerability.

(1a) The latent classes will include subgroups who are high in indicators of vulnerability, low in indicators of vulnerability, and potentially a combination of responses indicating mixed or specific vulnerabilities.

Statistical analysis. I identified latent classes of vulnerability through a multi-step model fitting process: (1) latent class identification, and (2) latent class specification. Latent class analysis is a mixed-model technique to identify a latent, or unobserved, construct using categorical observed, or manifest, variables that represent response patterns in the data (Collins & Lanza, 2013; McCutcheon, 1987; Nylund, Asparouhov, & Muthén, 2007). It is a statistical method which posits that homogenous latent classes (subgroups) can be identified within a larger heterogeneous group using a set of observed (indicator) variables. Latent class analysis estimates the response, or endorsement, pattern within each latent class. It also estimates the proportion of individuals within a sample who are expected to belong to each latent class. Each individual is assigned a probability of being in each latent class for each indicator variable (e.g., education) and is then assigned to the class with the highest conditional probability (estimate) for subsequent analysis (e.g., Class 1). Broadly, latent class analysis can use select observed indicators of the latent construct of vulnerability to create subgroups. Latent class analysis is often considered a person-centered approach due to its emphasis on identifying subgroups of individuals who exhibit similar response patterns (Bergman & Magnusson, 1997; Bergman & Trost, 2006; Collins & Lanza, 2013). Person-centered approaches are in

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contrast to traditional analyses characterized by variable-centered approaches to identify relationships between variables (e.g., factor analysis) (Collins & Lanza, 2013).

I used latent class analysis to empirically identify and estimate the prevalence of different latent class memberships of vulnerability by identifying typologies of vulnerability using select indicators (e.g., education). This was accomplished using two primary steps. In Step 1, I performed latent class identification to determine the within-individual pattern of responses across indicators to identify latent classes of vulnerability. I determined the number of latent classes by identifying the most well-defined, differentiated profiles (Lubke & Muthén, 2005; Muthén & Muthén, 2000). I interpreted the latent classes based on conditional probabilities and compared their means. I also assessed the classification quality of the latent classes. As specific standardizations and conventions do not exist on the selection of the correct number of latent classes, I compared the varying number of latent classes using likelihood ratio tests (i.e., compared *k* versus *k*–1 classes). I selected the latent classes most pertinent and appropriate in relation to theory, prior research, the nature of the subgroups, and interpretation of the results. Additionally, I used goodness-of-fit indices and tests of statistical significance.

To assess the overall quality of the specific vulnerability model, I assessed latent class separation, class homogeneity, and class proportions (Masyn, 2013). To assess class separation, I ensured a particular item response was consistent in at least one of the observed latent classes in the model using estimated class-specific item probability. That is, I observed whether a particular response appeared to typify or be a characteristic of that class (e.g., individuals in Class 1 are more likely endorse low educational attainment

than in other classes). To assess class homogeneity, I ensured the item responses were differentiated across at least one pair of classes in the model using the odds ratio of item response. That is, I observed whether different responses characterized different classes (e.g., low educational attainment will be more likely to be endorsed by Class 1 compared to the other classes). To assess class proportions, I observed the distribution of the latent classes in the sample.

In Step 2, I used the latent classes identified from Step 1 to conduct latent class specification. I performed cross-tabulations on the latent class scores and indicators to determine which indicator variables best represented the latent classes. I assessed descriptive statistics for the indicator variables by each latent class. That is, given each latent class membership, I observed the estimated probability of an individual in a certain class endorsing a categorical item. I assessed this variation across the classes to guide my labeling of classes. I categorized the different classes to reflect the endorsements (response of "yes" or "1") of indicator items, along with language used in theory and prior research.

The eight indicator variables entered into the latent class analysis included: educational attainment, employment status, routine check-up, social support, acculturation, racial/ethnic and sexual discrimination, and internalized homonegativity. I determined the number of latent classes through a stepwise model fitting process that tested multiple models (i.e., different numbers of latent classes) to arrive at the best fit model. I considered model interpretability and model fit using the Akaike information criterion (AIC) (Akaike, 1974), Bayesian information criterion (BIC) (Schwarz, 1978),

sample-size adjusted BIC (SSA-BIC) (Sclove, 1987), G^2 fit statistic (Agresti, 1990), and the difference in the likelihood ratio test and its alternative based on bootstrapping (LMR [BLRT]) (Lo, Mendell, & Rubin, 2001; McLachlan & Peel, 2004). Participants do not need to have complete data on all indicator variables to be included in the latent class analysis, which enables maximum use of all data (Collins & Lanza, 2013). In the latent class analysis, missing data were handled with a full-information maximum likelihood (FIML) technique that assumes data are missing at random (Collins & Lanza, 2013).

Proper interpretation of the best fit model requires running multiple class model tests and accepting the model with the lowest BIC value. Although the AIC is calculated and observed alongside the BIC, the BIC may provide a superior interpretation of class fit (Jedidi, Jagpal, & DeSarbo, 1997; Roeder & Wasserman, 1997). I identified the best fit model using both the AIC and BIC values.

Specific Aim 2. To address Specific Aim 2, I tested the association between latent classes derived from the select indicators of vulnerability (from Specific Aim 1) and sexual health behaviors (i.e., HIV testing, STD testing, and condom use) among a subset of Latino/a sexual and gender minorities. I examined one primary hypothesis:

(2) The different vulnerable subgroups identified from Specific Aim 1 will differentially predict sexual health behaviors.

(2a) Groups categorized as high vulnerability will be negatively associated with sexual health-promoting behaviors compared to low vulnerability groups, which will be positively associated with sexual health-promoting behaviors.

Statistical analysis. The primary distal outcomes in the present study are three

sexual health behaviors: HIV testing, STD testing, and condom use. To test latent class

membership on each of the three sexual health behaviors, I conducted three separate

latent class analyses with binary distal outcomes. That is, I used the identified latent

classes from Specific Aim 1 to independently predict the likelihood of HIV testing, STD

testing, and condom use. I conducted group comparisons by assessing mean differences

across the identified latent classes and using the chi-square equality test of means across

the classes for each sexual health behavior ($p < 0.05$).

Preliminary Results

I present the results from preliminary data analyses on the HOLA dataset,

including power analysis, descriptive statistics, correlations between the selected

indicator and outcome variables, and cluster analysis using the selected indicator

variables.

The sample size for this study is 186 Latino/a sexual and gender minorities living

in NC who participated in the HOLA intervention. **Table 1** presents the results of the chi-

square test power analysis. I conducted power analysis to predict the analysis outcomes

(yes/no) in terms of the sexual health behaviors (i.e., HIV testing, STD testing, and

condom use) in this sample. Therefore, I performed only one set of power analysis as

each of the outcomes are binary. Based on the hypothesis that at least two latent classes

will emerge from salient indicators of vulnerability (Specific Aim 1), I performed a chi-

square test analysis for three latent classes on a binary outcome (Cohen, 1988). I

estimated the proportions of the sample who would endorse a binary-level outcome

across three latent classes. I compared power estimates at different sample sizes and proportions. For instance, a sample size of 100 achieves 91.7% power to detect an effect size of 0.366 using a 2 degrees of freedom chi-square test with a significance level (alpha) of 0.05.

Table 1. Chi-Square Test Power Analysis for Three Latent Classes

Sample Size	Alpha		
	0.01	0.05	0.10
50			
Power	0.396	0.635	0.746
Effect Size	0.366	0.366	0.366
Chi-Square	6.706	6.706	6.706
100			
Power	0.782	0.917	0.955
Effect Size	0.366	0.366	0.366
Chi-Square	13.411	13.411	13.411
200			
Power	0.988	0.998	1.000
Effect Size	0.366	0.366	0.366
Chi-Square	26.822	26.822	26.822

Table 2 summarizes descriptive statistics for the analytic sample (n = 98). On average, participants were 30 years old (range = 18–61). Over half of the sample attained at least a high school education (59.2%) and were employed year-round (75.5%). However, nearly three-quarters (72.4%) earned a monthly income of less than $2,000. Participants reported moderate general health (2.5; range = 1–5) and over half obtained a routine check-up within the past year (68.4%). More than half received an HIV test in the past year (59.2%), whereas slightly less received an STD test in the past year (46.9%). Approximately one-third used a condom during the most recent time they had anal or vaginal intercourse with a man or woman (31.6%).

Table 2. Characteristics and Behaviors of Latino/a Sexual and Gender Minorities

Characteristic or Behavior	*n* (%) or Mean ± SD (Range)	Variance
Age (years)	30.1 ± 7.4 (18–61)	54.15
Income level (monthly)		0.20
Less than $2,000	71 (72.4)	-
At least $2,000	27 (27.6)	-
Educational attainment		0.24
Less than high school	40 (40.8)	-
At least high school	58 (59.2)	-
Employment status		1.65
Not employed year-round	24 (24.5)	-
Employed year-round	74 (75.5)	-
Country of origin		-
Mexico	74 (75.5)	-
Sexual orientation		0.53
Gay	73 (75.3)	-
Bisexual	12 (12.4)	-
Relationship status		2.58
Single, not dating anyone special	44 (44.9)	-
Dating someone special, partnered, or married but sex with others	20 (20.4)	-
Dating someone special, partnered, or married and no sex with others	34 (34.7)	-
Health status	2.5 ± 1.0 (1–5)	0.93
Routine check-up		1.32
Within the past year	67 (68.4)	-
More than one year	22 (22.4)	-
Never	9 (9.2)	-
Social support	55.3 ± 17.4 (18–90)	303.08
Acculturation	24.6 ± 7.2 (11–44)	51.24
Racial/ethnic discrimination	3.5 ± 2.5 (0–10)	6.38
Sexual discrimination	2.5 ± 2.6 (0–8)	6.81
Internalized homonegativity	36.2 ± 9.2 (12–49)	83.82
HIV testing (past 12 months)	58 (59.2)	0.24
STD testing (past 12 months)	46 (46.9)	0.25
Condom use (most recent)	31 (31.6)	0.22

This sample included Latina transgender women (n = 21), who may differ in their sociodemographic characteristics and behaviors from the overall sample. I conducted a

subgroup analysis to examine how transgender women differed from the overall analytic

sample. As depicted in **Table 3**, on average, the subsample of transgender women were

31 years old (range = 22–43). The majority earned a monthly income of less than $2,000

(93.3%) and attained less than a high school education (80.0%). However, two-thirds

were employed year-round (66.7%). They reported low general health (1.3; range = 1–2)

and over half obtained a routine check-up within the past year (61.9%). More than half

received an HIV test in the past year (52.4%), whereas one-third received an STD test in

the past year (33.3%). Nearly half used a condom during the most recent time they had

anal or vaginal intercourse with a man or woman (44.4%). In general, the results from the

subgroup analysis indicate that the Latina transgender women endorsed similarly low

income levels, employment year-round, single relationship status, and routine check-ups

within the past year as the overall analytic sample. However, the Latina transgender

women endorsed lower educational attainment, slightly lower health status, acculturation,

racial/ethnic and sexual discrimination, and internalized homonegativity than the overall

analytic sample. They endorsed similarly more HIV than STD testing than the overall

analytic sample.

Table 3. Characteristics and Behaviors of Latina Transgender Women

Characteristic or Behavior	n (%) or Mean ± SD (Range)	Variance
Age (years)	30.9 ± 6.4 (22–43)	40.4
Income level (monthly)		0.1
Less than $2,000	14 (93.3)	-
At least $2,000	1 (6.7)	-
Educational attainment		0.2
Less than high school	16 (80.0)	-
At least high school	4 (20.0)	-
Employment status		0.2
Not employed year-round	6 (33.3)	-
Employed year-round	12 (66.7)	-
Country of origin		-
Mexico	18 (85.7)	-
Relationship status		2.7
Single, not dating anyone special	9 (42.9)	-
Dating someone special, partnered, or married but sex with others	4 (19.0)	-
Dating someone special, partnered, or married and no sex with others	8 (38.1)	-
Health status	1.3 ± 0.5 (1–2)	1.1
Routine check-up		1.5
Within the past year	13 (61.9)	-
More than one year	4 (19.0)	-
Never	4 (19.0)	-
Social support	55.0 ± 21.1 (24–88)	443.8
Acculturation	21.8 ± 4.2 (15–30)	17.8
Racial/ethnic discrimination	2.3 ± 2.3 (0–8)	5.3
Sexual discrimination	1.3 ± 2.2 (0–8)	5.0
Internalized homonegativity	35.9 ± 12.0 (12–49)	144.5
HIV testing (past 12 months)	11 (52.4)	0.3
STD testing (past 12 months)	7 (33.3)	0.2
Condom use (most recent)	8 (44.4)	0.3

Tables 4 and 5 present the correlations between indicator and outcome variables.

I performed Spearman rank correlations for ordinal-level variables (e.g., educational

attainment) (n = 166) and Pearson product moment correlations for continuous-level

variables (e.g., social support) (n = 154). The correlation between educational attainment

and employment status was significant ($r = -0.16$). Additionally, the correlation between

racial/ethnic discrimination and sexual discrimination was significant ($r = 0.71$).

Table 4. Correlation Matrix Among Select Indicator Variables ($n = 166$)

		Correlations		
		1	2	3
1	Educational attainment	1		
2	Employment status	-0.16*	1	
3	Routine check-up	0.03	0.06	1

Note. These are Spearman rank correlations. * $p < 0.05$.

Table 5. Correlation Matrix Among Select Indicator Variables ($n = 154$)

		Correlations				
		1	2	3	4	5
1	Social support	1				
2	Acculturation	0.12	1			
3	Racial/ethnic discrimination	-0.15	0.10	1		
4	Sexual discrimination	-0.11	0.04	0.71*	1	
5	Internalized homonegativity	0.06	0.11	-0.06	0.02	1

Note. These are Pearson product moment correlations. * $p < 0.05$.

Table 6 and Figure 3 present the results of the cluster analysis of the indicator

variables of vulnerability in table and graphical form. The cluster analysis revealed a two-

cluster solution (n = 141). Overall, educational attainment and engaging in routine check-

ups contributed most to the distinction between the identified clusters. Given the

importance of these two indicator variables, the naming conventions for the two clusters

were based on the endorsement pattern for these variables: More Educated and Engaged

in Care (Cluster 1); and Less Educated and Engaged in Care (Cluster 2).

Participants in the More Educated and Engaged in Care cluster (Cluster 1) demonstrated high educational attainment (i.e., attained at least high school education; 84.6% of the cluster), with a larger percentage obtaining a routine check-up within the past year (62.1%) compared to the other cluster. Additionally, participants endorsed comparatively high levels across variables in the social domain, including social support (59.6), acculturation (27.1), racial/ethnic discrimination (3.5), sexual discrimination (2.3), and internalized homonegativity (37.5).

Participants in the Less Educated and Engaged in Care cluster (Cluster 2) demonstrated low educational attainment (i.e., attained less than high school education; 98.4% of the cluster), with a larger percentage obtaining a routine check-up more than one year ago or not at all (75.9%) compared to the other cluster. Additionally, participants endorsed comparatively low levels across variables in the social domain, including social support (53.5), acculturation (21.1), racial/ethnic discrimination (2.7), sexual discrimination (1.9), and internalized homonegativity (35.2).

Table 6. Cluster Analysis Results of Indicator Variables of Vulnerability Among Latino/a Sexual and Gender Minorities ($n = 141$)

Indicator	More Educated & Engaged in Care (Cluster 1; $n=67$)	Less Educated & Engaged in Care (Cluster 2; $n=74$)
	n (%) or Mean ± SD	n (%) or Mean ± SD
Educational attainment		
Less than high school	1 (1.6)	62 (98.4)
At least high school	66 (84.6)	12 (15.4)
Employment status		
Not employed year-round	13 (39.4)	20 (60.6)
Employed year-round	53 (49.5)	54 (50.5)
Routine check-up		
Within the past year	54 (62.1)	33 (37.9)
More than one year or never	13 (24.1)	41 (75.9)
Social support	59.6 ± 17.1	53.5 ± 16.9
Acculturation	27.1 ± 6.5	21.1 ± 6.6
Racial/ethnic discrimination	3.5 ± 2.6	2.7 ± 2.6
Sexual discrimination	2.3 ± 2.5	1.9 ± 2.5
Internalized homonegativity	37.5 ± 8.4	35.2 ± 9.6

Figure 3. Cluster Analysis Results of Indicator Variables of Vulnerability Among Latino/a Sexual and Gender Minorities (*n* = 141)
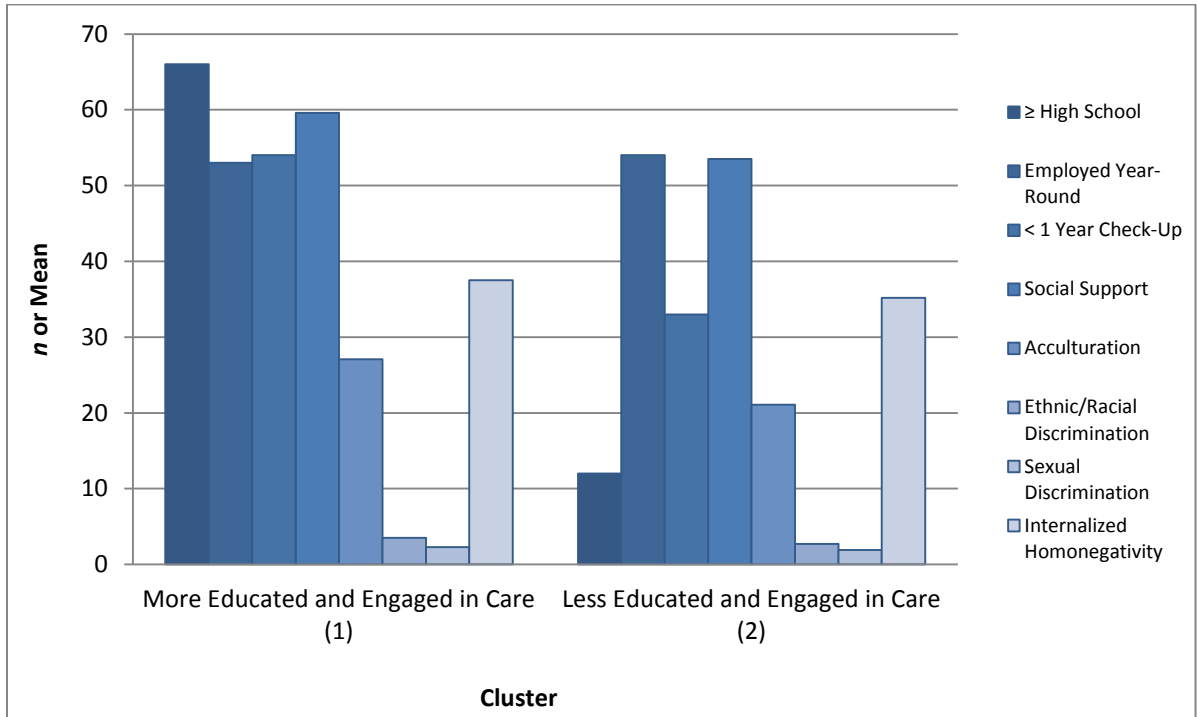
CHAPTER IV

A VULNERABILITY MODEL FOR LATINO/A SEXUAL AND GENDER
MINORITIES: VULNERABLE TYPOLOGIES WITH FINANCIAL, HEALTH CARE,
AND SOCIAL INDICATORS

(Ma, Erausquin, Tanner, Song, Garcia, Alonzo, Mann, Strack, & Rhodes,
in progress)

Introduction

Vulnerable populations are defined as those who are at greater risk for poor health
status or outcomes compared to the general population (Aday, 1994; Flaskerud &
Winslow, 1998; Shi & Stevens, 2005) as they are more likely to be exposed to risks that
potentially lead to poor health outcomes (Arora et al., 2015). Although the literature
provides definitions of vulnerability, the construct itself lacks specificity and remains
challenging to measure. Shi and colleagues (2008) broadly describe vulnerability as: "A
multidimensional construct reflecting a convergence of many risk factors at both the
individual and community levels, which influence health and healthcare experiences" (p.
S45). This description provides a useful foundation for understanding the construct, but
the indicators and typologies of vulnerability remain unclear. Measurable criteria are
needed to advance the utility of vulnerability in research and practice. Measuring
vulnerability through indicators can aid in developing conceptual frameworks as tools to
help identify those who are uniquely vulnerable.

Measurable criteria for vulnerability must be identified within the context of the vulnerable population itself, such as Latino/a sexual and gender minorities (e.g., gay-identified persons, men who have sex with men [MSM] but who do not self-identify as gay, and gender-nonconforming or transgender persons). Latino/a sexual and gender minorities experience health disparities and bear a disproportionate burden of poverty, thus they can be considered a vulnerable population at heightened risk for poor health status and outcomes (Aday, 2002; Perez-Escamilla, 2010). They can be considered vulnerable based on their multiple minority statuses, including race/ethnicity and sexual orientation (Gilbert & Rhodes, 2014). They can experience marginalizations as a result of these intersecting identities, which can undermine positive health outcomes and challenge access to healthcare services.

Vulnerability to poor health is particularly concerning given that the Latino/a population is rapidly growing in the United States (US) and settling in areas characterized by limited immigration histories from foreign-born populations, such as the southern US (Brown & Patten, 2014; Ennis et al., 2011; Gill, 2010; Kochhar et al., 2005; Terrazas, 2011; US Census Bureau, 2016). New settlement areas may lack the infrastructure to meet the unique needs and priorities of Latino/as (e.g., lack of bilingual and bicultural services) or may be characterized by high levels of anti-immigration sentiment (Barrington et al., 2012; Flippen & Parrado, 2015; Kochhar et al., 2005; Rhodes et al., 2011, 2015). For Latino/as in these areas, living within the context of anti-immigration sentiment, homonegativity, and stigma from more visible characteristics (e.g., race/ethnicity) or less visible characteristics (e.g., sexual identity) can contribute to their

vulnerability (Diaz, 2013; Thing, 2010) and may exacerbate poor health outcomes (Dolwick Grieb, Desir, Flores-Miller, & Page, 2015; Flippen & Parrado, 2015).

The indicators of vulnerability for Latino/a sexual and gender minorities can be identified based on existing literature, determinants of health common among Latino/a sexual and gender minorities, and vulnerable populations theory (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Tanner et al., 2014). First, vulnerable populations may share common traits and experience similar individual and social-environmental factors that combine to shape a unique risk for a more generalized level of vulnerability. For instance, the indicators of vulnerability among Latino/as can include the compounded risks of low socioeconomic status and limited bicultural and bilingual primary care clinics in the community that can restrict healthcare engagement and access to services. Although low socioeconomic status and living in a medically underserved area do not ensure that a population is classified as vulnerable, they can contribute to a context that shapes an even greater risk for, or susceptibility to, poor health outcomes. Second, the individual and social-environmental factors that shape vulnerability are often related to social determinants of health (Braveman et al., 2011; Marmot, 2005, 2007; Phelan et al., 2010). Finally, the General Model of Vulnerability (2008) provides a useful theoretical framework for understanding the link between vulnerability and health. The determinants of health common among Latino/a sexual and gender minorities reflect the construct of enabling characteristics (i.e., resources that people have available for the use of services, such as education and employment) in the General Model of Vulnerability (2008). This reflection may be due to the link between

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vulnerability and the overall health and resources of people and communities (Phelan et al., 2010; Shi & Stevens, 2010). Using the concept of enabling characteristics may illuminate resource disparities among differentially vulnerable groups.

Although Latino/a sexual and gender minorities, in general, may be considered vulnerable, subgroups within this population may demonstrate different typologies of vulnerability (Arora et al., 2015). These typologies may be characterized by unique vulnerabilities with different facilitators and barriers to health. However, the indicators of vulnerability and how they work together within typologies of vulnerability are unknown for Latino/as. Identifying indicators of vulnerability and examining how they vary across different typologies advances understanding of both the population of interest and the construct of vulnerability (Furman et al., 2009; Gilbert & Rhodes, 2014).

We adapted Shi and colleagues' (2008) General Model of Vulnerability to develop a specific health vulnerability model for Latino/a sexual and gender minorities. We expand the General Model of Vulnerability to include indicators of vulnerability that serve to operationalize this construct and apply it to Latino/a sexual and gender minorities.

A variety of indicators are included across three proposed domains of vulnerability based on pertinent determinants of health, existing literature, and the General Model of Vulnerability (2008): (1) socioeconomic stability (i.e., educational attainment and employment status); (2) health care (i.e., routine check-ups); and (3) social (i.e., social support, acculturation, racial/ethnic and sexual discrimination, and internalized homonegativity) (Derose et al., 2007; Dovidio et al., 2010; Furman et al.,

2009; Gilbert & Rhodes, 2014; Tanner et al., 2014). Socioeconomic status is one of the

most important predictors of health-promoting behaviors; those with low educational

attainment and unemployment are more likely to not have the resources to maintain

health (e.g., limited health literacy and insurance coverage) (CDC, 2015c; Harling et al.,

2013). Further, engaging in routine care increases interactions with healthcare providers

who may influence health-promoting behaviors (Kaiser Family Foundation, 2011; Lopez-

Quintero, Shtarkshall, & Neumark, 2005). Routine check-ups provide important

opportunities for engaging in preventive health services and screenings (e.g., vaccines)

and accessing health education (CDC, 2015d). Finally, the presence of social forces

generally considered as positive (e.g., social support and acculturation) (Carlos et al.,

2010; Fekete et al., 2009; Gilbert & Rhodes, 2012; Gilbert & Rhodes, 2013; Lopez-

Quintero et al., 2005; Solorio et al., 2013) and the absence of social forces considered

negative (e.g., discrimination and homonegativity) can promote engagement in health

care (Brooks et al., 2006; Erausquin et al., 2009; Harrison-Quintana & Perez, 2012;

Hernandez & Blazer, 2006; Institute of Medicine, 2011; Los Angeles County Department

of Public Health, 2013; Meyer & Champion, 2010). Social support and acculturation are

interpersonal factors that can encourage utilization and navigation of healthcare services

through supportive relationships and language skills needed to communicate health needs

(Gallo et al., 2009). Experiences of discrimination (i.e., a behavioral manifestation of

negative attitudes, judgment, or unfair treatment toward members of a particular group)

and homonegativity (i.e., negative attitudes toward homosexuality) suggest that

oppressive social structures and inequalities may exacerbate health risk behaviors (Halkitis, 2012).

Advancing a vulnerability model tailored to Latino/a sexual and gender minorities can help identify within- and across-subgroup patterns in health outcomes and behaviors (Derose et al., 2007). Development of a health vulnerability model can serve as a powerful tool to better understand and address the needs of the target population and promote health (Flaskerud & Winslow, 1998). This analysis delineates the approach to operationalize the construct of vulnerability using selected indicators among a subset of Latino/a sexual and gender minorities to identify potential typologies of vulnerability.

Methods

Participants and data collection. We examined baseline survey data from the HOLA intervention collected from November 2011 to July 2012 in North Carolina (NC). HOLA was a social network intervention, which used lay health advisors called "Navegantes." HOLA was designed to increase HIV testing and condom use among Spanish-speaking Latino/as who were sexual and gender minorities (i.e., gay or bisexual men, other MSM, and male-to-female transgender) (Rhodes et al., 2013; Sun et al., 2014). The HOLA intervention recruited 21 Navegantes to participate in the study, who then each recruited 8 Latino/as from their social networks. A total of 186 Latino sexual minority men and Latina transgender women participated in the intervention study. Three participants were removed from the study after enrollment and data collection due to ineligibility (e.g., less than 18 years of age). The intervention and evaluation plans were developed in response to community-identified needs and priorities by a community-

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based participatory research (CBPR) partnership, comprised of lay community members, organization representatives, and university health professionals and researchers (Rhodes, Mann, et al., 2014). The assessment, which was read aloud in Spanish by a male native Spanish-speaking staff member who was originally from Mexico to assist with challenges associated with low literacy rates and was completed by the participant, took 45 to 120 minutes to complete, depending on the skip pattern of the participant. The Institutional Review Boards at the Wake Forest School of Medicine and the University of North Carolina at Greensboro approved the study protocols.

Measures. *Sociodemographic characteristics*. Participants reported their demographic information, including: age; country of origin; sexual orientation; relationship status; approximate monthly income; and perceived health status on a 5-point scale from "excellent" (5) to "poor" (1) (CDC, 2011).

Indicators of vulnerability. The indicator variables for the latent construct of vulnerability included eight variables across three domains (i.e., socioeconomic stability, health care, and social): educational attainment, employment status, routine check-ups, social support level, acculturation level, perceived racial/ethnic and sexual discrimination, and internalized homonegativity.

Socioeconomic stability domain. Participants reported their highest level of education (dichotomized as less than high school and at least high school) and employment status (dichotomized as employed year-round and not employed year-round).

Health care domain. Participants reported when they last saw a healthcare provider for a routine (not emergency) check-up (e.g., physical exam) on a 5-point scale from "never" to "over 2 years ago." Routine check-up was dichotomized as within the past year and more than one year ago or never.

Social domain. Participants completed the 18-item Index of Sojourner's Social Support (ISSS) (Ong & Ward, 2005), which has been explored for Latino sexual minorities (Gilbert & Rhodes, 2012). For each item, participants reported how many people would provide socio-emotional support and instrumental support on a 5-point scale from "no one would do this" to "many people would do this." Cronbach's alpha was 0.98.

Participants completed the 12-item Short Acculturation Scale for Hispanics (Marin et al., 1987). This scale consists of three dimensions of acculturation (i.e., language use, media, and ethnic social relations or socialization) on a 5-point scale: Depending on the item, from "only Spanish" to "only English" or from "all Latinos/Hispanics" to "all Americans." Cronbach's alpha was 0.87.

Participants rated their level of perceived racial/ethnic and sexual discrimination by completing a modified version of The Everyday Discrimination Scale (Williams et al., 1997), which has been validated across ethnic/racial groups (Kim et al., 2014). Participants reported in the past 12 months whether they had experienced 10 different types of discrimination (e.g., treated with less courtesy than other people) because of their race, ethnicity, or color (ethnic/racial discrimination) and because of their sexual identity or same-sex sexual behavior (sexual discrimination) with a "yes" or "no" response. We

summed the number of "yes" responses such that higher scores reflect greater experiences of discrimination. Cronbach's alpha for racial/ethnic discrimination was 0.81, and for sexual discrimination 0.83.

Participants completed a shortened version of the Reactions to Homosexuality Scale (Smolenski et al., 2010). Participants rated their agreement to seven statements on a 7-point scale from "strongly disagree" (1) to "strongly agree" (7). Cronbach's alpha was 0.65.

Analysis. We conducted latent class analysis (LCA) to identify typologies of vulnerability in our sample of Latino/a sexual and gender minorities. LCA is a statistical modeling method to identify a latent construct using observed (indicator) variables that represent response patterns in the data (Collins & Lanza, 2013; McCutcheon, 1987; Nylund et al., 2007). LCA allows us to examine whether homogenous latent classes (subgroups) can be identified within a larger heterogeneous group. We identified latent classes of vulnerability through a multi-step model fitting process (Lubke & Muthén, 2005; Masyn, 2013; Muthén & Muthén, 2000; Nylund et al., 2007). Model identification was examined by comparing the solution obtained across 1,000 sets of random starting values. The number of latent classes was selected based on information criteria, including the Akaike information criterion (AIC) (Akaike, 1974), Bayesian information criterion (BIC) (Schwarz, 1978), sample-size adjusted BIC (SSA–BIC) (Sclove, 1987), the difference in the likelihood ratio test and its alternative based on bootstrapping (LMR adjusted likelihood ratio test [LRT]) (Lo et al., 2001; McLachlan & Peel, 2004), and entropy (Larose, Harel, Kordas, & Dey, 2016). Optimal models were indicated by

minimum values of AIC, BIC, and SSA–BIC; entropy values greater than 0.8; and a small probability value for LMR adjusted LRT ($p < 0.05$). Participants do not need to have complete data on all indicator variables to be included in the latent class analysis, which enables maximum use of all data (Collins & Lanza, 2013). Missing data were handled with a full-information maximum likelihood (FIML) technique that assumes data are missing at random (Collins & Lanza, 2013). As Latina transgender women may differ in their endorsement of the indicator variables (e.g., less educational attainment), we conducted a subgroup analysis in which only transgender women were included; no significant differences from the overall analytic sample were found. All statistical analyses were performed using IBM SPSS version 23 (Armonk, NY) and Mplus version 7.4 (Los Angeles, CA).

Results

Participant characteristics. On average, participants were 30.1 years of age. Approximately three-fourths (75.5%) were employed year-round, one-fourth (27.6%) earned a monthly income of at least $2,000, and over half (59.2%) had a high school diploma or equivalent. The majority of participants identified as gay (75.3%), with nearly half (44.9%) single and not dating. Table 7 summarizes participant characteristics.

Table 7. Sociodemographics and Behaviors of Latino/a Sexual and Gender Minorities

	n (%) or Mean ± SD (Range)
Age (years)	30.1 ± 7.4 (18–61)
Income level (monthly)	
Less than $2,000	71 (72.4)
At least $2,000	27 (27.6)
Employment status	

Employed year-round	74 (75.5)
Not employed year-round	24 (24.5)
Educational attainment	
Less than high school	40 (40.8)
At least high school	58 (59.2)
Country of origin	
Mexico	74 (75.5)
Sexual orientation	
Gay	73 (75.3)
Bisexual	12 (12.4)
Relationship status	
Single, not dating anyone special	44 (44.9)
Dating someone special, partnered, or married but sex with others	20 (20.4)
Dating someone special, partnered, or married and no sex with others	34 (34.7)
Health status	2.5 ± 1.0 (1–5)
Routine check-up	
Within the past year	67 (68.4)
More than one year	22 (22.4)
Never	9 (9.2)
Social support	55.3 ± 17.4 (18–90)
Acculturation	24.6 ± 7.2 (11–44)
Racial/ethnic discrimination	3.5 ± 2.5 (0–10)
Sexual discrimination	2.5 ± 2.6 (0–8)
Internalized homophobia	36.2 ± 9.2 (12–49)

Latent class analysis. We compared models with two through six latent classes to identify the optimal model based on fit criteria, interpretability, and class separation. Based on the fit statistics, we selected the three-class model for its high class separation, interpretability, and meaningfulness of classes. Table 8 presents the fit statistics comparing latent class models.

Table 8. Fit Statistics for Latent Class Models Reflecting Profiles of Health Vulnerability with Two to Six Latent Classes

Number of Classes	Parameters	Log-likelihood	AIC[a]	BIC[b]	SSA–BIC[c]	p LMR Adjusted LRT[d]	Entropy
2	25	-3204.65	6459.30	6539.94	6460.76	0.004	0.92
3	**35**	**-3170.77**	**6411.53**	**6524.43**	**6413.58**	**0.272**	**0.92**
4	45	-3142.44	6374.89	6520.05	6377.51	0.536	0.94
5	55	-3123.17	6356.34	6533.76	6359.55	0.642	0.90
6	65	-3107.00	6344.01	6553.68	6347.80	0.790	0.91

Note. **Bold** indicates the selected model.
[a] AIC = Akaike's Information Criterion.
[b] BIC = Bayesian Information Criterion.
[c] SSA–BIC = sample size-adjusted Bayesian Information Criteria.
[d] p LMR Adjusted LRT = p-values for Lo–Mendell–Rubin adjusted likelihood ratio test for k versus k–1 classes.

We used the probability of endorsements for each indicator of vulnerability for further model identification. The estimated means or item-response probabilities represent the conditional probability of endorsing an indicator given membership in a latent class. We relied on these probabilities to label the latent classes by identifying those with the highest endorsement and the largest difference across classes. The latent class characterized by the most participants was Class 2 (Low Education and High Social Support; 63.4%), followed by Class 1 (High Education and Employment; 18.8%) and Class 3 (High Education and Discrimination; 17.7%). Table 9 presents the proportions of the sample in each latent class, and the estimated means or item-response probabilities for indicators used in modeling.

Table 9. Latent Class Prevalence and Estimated Means or Item-Response Probabilities for a Three-Class Model of Vulnerability

Indicator	Class 1 (High Education & Employment)	Class 2 (Low Education & High Social Support)	Class 3 (High Education & Discrimination)
Class Size	35 (18.8%)	118 (63.4%)	33 (17.7%)
Financial			
Education	**0.60**	0.43	**0.59**
Employment	**0.79**	**0.78**	0.57
Health Care			
Routine Check-Up	0.52	**0.64**	0.61
Social			
Social Support	51.74	**57.61**	54.47
Acculturation	23.94	22.95	**24.70**
Racial/Ethnic Discrimination	4.41	1.63	**6.34**
Sexual Discrimination	3.48	0.38	**6.37**
Internalized Homonegativity	**37.56**	35.94	36.75

Note. **Bold** indicates the highest endorsed estimated mean or item-response probability across classes.

We labeled Class 1 as High Education and Employment because it contained Latino/a sexual and gender minorities who tended to endorsed high levels of both indicators in the financial domain: high educational attainment (0.60) and employment year-round (0.79). However, Latino/as in this class also had a lower probability of routine check-ups (0.52) and lower social support ($\bar{x} = 51.74$), in addition to higher internalized homonegativity ($\bar{x} = 37.56$), compared to the other classes. Class 2, Low Education and High Social Support, tended to endorse similarly high levels of employment status (0.78) as the High Education and Employment class, but were likely to report low educational attainment (0.43). Latino/as in this class also differed in its higher probability of routine check-ups (0.64), higher average social support ($\bar{x} = 57.61$), and low racial/ethnic and

sexual discrimination ($\bar{x}$ = 1.63 and 0.38). Finally, we labeled Class 3 as High Education and Discrimination because it differentiated from the other two classes by its high endorsement of both racial/ethnic and sexual discrimination ($\bar{x}$ = 6.34 and 6.37). Latino/as in this class were also less likely to be employed year-round (0.57) compared to the other classes, though endorsed similarly high levels of educational attainment (0.59) as the High Education and Employment class.

Discussion

As the construct of vulnerability has not been well defined with measurable criteria in the literature (Arora et al., 2015; Shi & Stevens, 2005), the breadth and depth of the typologies of vulnerability in (and within) specific populations are unknown. This analysis identified three latent classes of vulnerability among a subset of Latino/a sexual and gender minorities in a new settlement state. The Low Education and High Social Support class was the largest among the three latent classes, comprising nearly two-thirds of the participants. This class was characterized by both facilitators (i.e., endorsing routine check-ups and social support) and barriers (i.e., endorsing low educational attainment) to health promotion. Both the High Education and Employment class and the High Education and Discrimination class comprised approximately one-fifth of the participants, and each class displayed salient indicators. The High Education and Employment class was represented by important facilitators to health promotion (e.g., high educational attainment and employment status), whereas the High Education and Discrimination class included barriers to health promotion (e.g., high racial/ethnic and sexual discrimination and low employment status). For these classes, these indicators

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may be the biggest contributors to vulnerability and important to consider in future programming.

To operationalize vulnerability through indicators, we relied on existing literature, determinants of health common among Latino/a sexual and gender minorities, and vulnerable populations theory (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Tanner et al., 2014). Overall, this approach proved useful in latent class identification and meaningful in suggesting salient indicators across typologies of vulnerability. For instance, endorsement of the socioeconomic stability domain varied by typology: those in the High Education and Employment class were more likely to endorse both high educational attainment and employment status, whereas the Low Education and High Social Support class and the High Education and Discrimination class each endorsed one indicator in the socioeconomic stability domain (employment status and educational attainment, respectively).

However, these results also underscore the complexity of vulnerability and the need to consider the unique combination of indicators that produce differing vulnerable typologies. Although understanding vulnerability as gradations is useful (i.e., highly or less vulnerable) (Arora et al., 2015), our results suggest that vulnerability may be better characterized as typologies with varying dimensions of vulnerability. The classes of vulnerability exhibited more qualitative differences than gradations of difference. The endorsements within each class did not all reflect characteristics of low or high vulnerability (e.g., Latino/as in the High Education and Employment class endorsed important facilitators, as well as low routine check-ups and low social support). Thus, the

heterogeneity in vulnerability may be more appropriately related to how subgroups are

vulnerable, rather than which subgroup is more vulnerable. Vulnerable populations may

include classes of people who are vulnerable in different ways (e.g., high discrimination

or low educational attainment). Identifying salient indicators that drive these typologies

can pinpoint the characteristics of those with different vulnerabilities, which can aid in

refining future vulnerability models and inform targeted interventions.

Information on typologies of vulnerability can aid interventions in at least two

ways. First, it can help identify indicators that have been shown through research to

support health (e.g., social support; Carlos et al., 2010; Fekete et al., 2009; Gilbert &

Rhodes, 2013; Lopez-Quintero et al., 2005; Lauby et al., 2011; Solorio, Forehand, &

Simoni, 2013; Vega, Spieldenner, DeLeon, Nieto, & Stroman, 2010) and that seem to be

the biggest contributors to vulnerability. For example, all three classes endorsed

relatively high social support levels. Thus, harnessing social support through social

network-based interventions that include peer social support may be particularly

important in improving health behaviors for Latino/a sexual and gender minorities and

other vulnerable populations. Established efforts have used community lay health

advisors (e.g., *Navegantes* and *Promotores*) to facilitate health promotion and risk

prevention among Latino/as, including Latino/a sexual and gender minorities. These

interventions were developed in partnership with community members and relied on

social networks to diffuse health education messaging (e.g., HIV/STD testing,

mammography screening, and cardiovascular health behaviors) and build participants'

capacity to engage in health promotion activities (Amirkhanian, 2014; Livaudais et al.,

2010; Martinez, Roth, Kelle, Downs, & Rhodes, 2014; Medina, Balcázar, Hollen, Nkhoma, & Mas, 2007; Ramos, Hernandez, Ferreira-Pinto, Ortiz, & Somerville, 2006; Rhodes et al., 2014; Rhodes, Hergenrather, Bloom, Leichliter, & Montaño, 2009; Somerville, Diaz, Davis, Coleman, & Taveras, 2006; Sun et al., 2014; Sun, Mann, Eng, Downs, & Rhodes, 2015; Vissman et al., 2009). Building on the existing strengths that emerge from salient indicators of vulnerability may improve health-promoting behaviors among Latino/a sexual and gender minorities and other vulnerable populations.

Second, interventions can provide targeted efforts for differentially vulnerable classes within an already vulnerable population or community – and thus those who could benefit the most from specific health promotion and risk prevention programming. Although we do not suggest tailoring interventions specifically to vulnerable subgroups of already vulnerable populations, interventions can be tailored during their implementation toward the targeted group (e.g., Latino/a sexual and gender minorities) that includes specific intervention components addressing the unique needs of different subgroups. For example, an intervention that includes Latino/a sexual and gender minorities who experience high racial/ethnic and sexual discrimination may require additional programming on local mental health services and could include a tour of a Latino/a-friendly mental health facility to increase awareness, trust, and comfort in accessing these services (Thornicroft et al., 2016; Thornicroft, Brohan, Kassam, & Lewis-Holmes, 2008). An alternative approach would be to include additional intervention activities (e.g., additional peer education lessons) or increase the intensity of

existing intervention components (e.g., more text message reminders in a social media intervention) (Rhodes et al., 2013; Tanner et al., 2016).

These approaches allow the intervention to target the needs of both the larger group and the uniquely vulnerable subgroup. Thus, more customized and efficacious interventions may be delivered to address everyone's needs and priorities. The development of more generalized interventions for a population that includes a mixture of vulnerabilities may result in uneven reach and effectiveness (Collins, Kugler, & Gwadz, 2016). The more that intervention components can be tailored to address the needs and priorities of subgroups of participants, the more potentially efficacious the intervention.

Several limitations should be considered. Our small, geographically specific sample consisted of Latino/a sexual and gender minorities who were willing to participate in the HOLA intervention; thus, findings may not be generalizable to Latino/as living in other parts of the US. Further, other indicator variables not available for inclusion in the present analysis may be salient for future model-building, such as health insurance coverage (Shi & Stevens, 2005; Shi, Stevens, Lebrun, et al., 2008). The inclusion of structural-level indicators, as suggested in the General Model of Vulnerability (Shi & Stevens, 2010; Shi, Stevens, Lebrun, et al., 2008), in future work is important to move toward testing a comprehensive model that includes multilevel indicators of vulnerability (e.g., neighborhood poverty concentration, proximity to healthcare services, and anti-immigration sentiment) (Bauermeister & Eaton, 2015; Dang, Giordano, & Kim, 2012; Latkin & Knowlton, 2005).

Vulnerability is contextual and dynamic for different populations. What constitutes vulnerability for this subsample of Latino/a sexual and gender minorities in the southern US may be different than those living in other states. Future research should continue to adapt and test health vulnerability models with vulnerable populations to inform and refine promotion and risk prevention interventions, including testing with specific health outcomes to examine model utility. Uncovering typologies of vulnerability affirms heterogeneity within the Latino/a community in the US, who are often considered and measured as a homogenous group. Using innovative methodological approaches to illuminate the ways in which Latino/as are diverse – including in vulnerability – allows for future intervention efforts to be tailored to specific subgroups of Latino/a sexual and gender minorities, as well as other vulnerable populations living in other parts of the US.

CHAPTER V

LATENT CLASSES OF VULNERABILITY AMONG LATINO/A SEXUAL AND
GENDER MINORITIES: ASSOCIATION WITH SEXUAL HEALTH BEHAVIORS

(Ma, Tanner, Erausquin, Song, Garcia, Alonzo, Mann, Strack, & Rhodes,
in progress)

Background

National goals to end the HIV epidemic have highlighted the need to reduce HIV-
related disparities among vulnerable populations at higher risk of HIV infection,

including Latino men, transgender women, and people living in the southern United

States (US) (HIV.gov, 2016b). The intersection of minority identities across

race/ethnicity, immigration status, sexual orientation (e.g., gay-identified persons and

men who have sex with men [MSM] but do not self-identify as gay), and gender-identity

(e.g., transgender persons) can intensify sexual health risks, reduce care-seeking

behaviors, and render some populations more vulnerable than others (Aday, 2002; Gilbert

& Rhodes, 2014; Pérez-Escamilla, Garcia, & Song, 2010; Rhodes et al., 2008; Turra &

Goldman, 2007; Vega et al., 2009). Thus, addressing the sexual health of vulnerable

populations, such as immigrant Latino/a sexual and gender minorities, is both timely and

urgent.

In the US, Latinos/as are disproportionately affected by HIV and STDs; this is

also true among Latinos/as living in the southern US (CDC, 2015; ONAP, 2015; Turra &

Goldman, 2007; Vanable, Carey, Blair, & Littlewood, 2006; Vega et al., 2009). Given

high HIV infection rates, the southern US, including North Carolina (NC), is characterized as a major HIV epicenter (Carpenter, 2013; Wiltz, 2014). Rates of other reportable STDs are also high among Latino/as. For instance, in 2014, Latino/as ranked third, behind Black/African Americans and Whites, in rates of newly diagnosed chlamydia, gonorrhea, and syphilis in NC (NC DHHS, 2015).

Latino/a sexual and gender minorities are particularly burdened by HIV and STDs. Although Latino/as are estimated to comprise 15.9% of all men who have sex with men in the US, they accounted for approximately 22% of new HIV infections among MSM in 2010 (CDC, 2015c; Lieb et al., 2011). Rate ratios of HIV infection in the US were 1.9 times as high for Latino/a MSM as those for White MSM in 2007 (Purcell et al., 2012). Among transgender women diagnosed with HIV infections (N=1,974), 29% were Latina (CDC, 2016b). In NC, Latino/as only comprise approximately 7.3% of MSM, yet are increasingly affected by HIV (Lieb et al., 2011). Further, among NC Latino/as in 2014, 77.3% of new HIV infections were attributable to MSM exposure, and 18.2% of new infections were attributable to heterosexual exposure (NC DHHS, 2015). Approximately half of transgender persons who received an HIV diagnosis from 2009 to 2014 lived in the southern US (43% of transgender women; 54% of transgender men) (CDC, 2016b).

The sexual health disparities highlight the need to better understand the facilitators and barriers to sexual health, particularly among vulnerable populations such as Latino/a sexual and gender minorities. However, not all vulnerable persons are characterized by the same types of vulnerability, and thus may not experience the same

facilitators and barriers to sexual health (Ma et al., under review; Moskowitz, Seal, Rintamaki, & Rieger, 2011; Rice, Turner, & Lanza, 2016). Latino/a sexual and gender minorities, like other heterogeneous populations, are comprised of subgroups who may have unique patterns of characteristics that produce differential engagement in sexual health behaviors. Although emerging research is broadening our understanding of the sexual health behaviors and needs of Latino/a sexual and gender minorities (Gilbert & Rhodes, 2014; Gilbert & Rhodes, 2013; Rhodes & McCoy, 2015; Sun et al., 2016; Tanner et al., 2014), no previous research has specifically examined how typologies of vulnerability affect their sexual health behaviors.

Conceptual Framework

To reduce HIV and STD disparities and decrease new infections, it is important to reach those who are vulnerable. However, the interplay between sexual health and vulnerability is complex. We used Shi and colleagues' (2008) General Model of Vulnerability to undergird the development of our adapted health vulnerability model for Latino/a sexual and gender minorities to understand how they are differentially vulnerable. Briefly, the General Model of Vulnerability posits that risk factors at the individual and community levels lead to vulnerability, which then directly affects healthcare access, healthcare quality, and health outcomes at multiple levels.

We included a variety of indicators of health vulnerability based on the General Model of Vulnerability (2008), pertinent determinants of health, and existing literature across three domains: (1) socioeconomic stability (i.e., educational attainment and employment status); (2) health care (i.e., routine check-ups); and (3) social (i.e., social

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support, acculturation, racial/ethnic and sexual discrimination, and internalized

homonegativity) (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert &

Rhodes, 2014; Tanner et al., 2014). Figure 4 presents the proposed components of a

specific model of health vulnerability for Latino/a sexual and gender minorities, adapted

from the General Model of Vulnerability (2008).

Figure 4. A Health Vulnerability Model for Latino/a Sexual and Gender Minorities
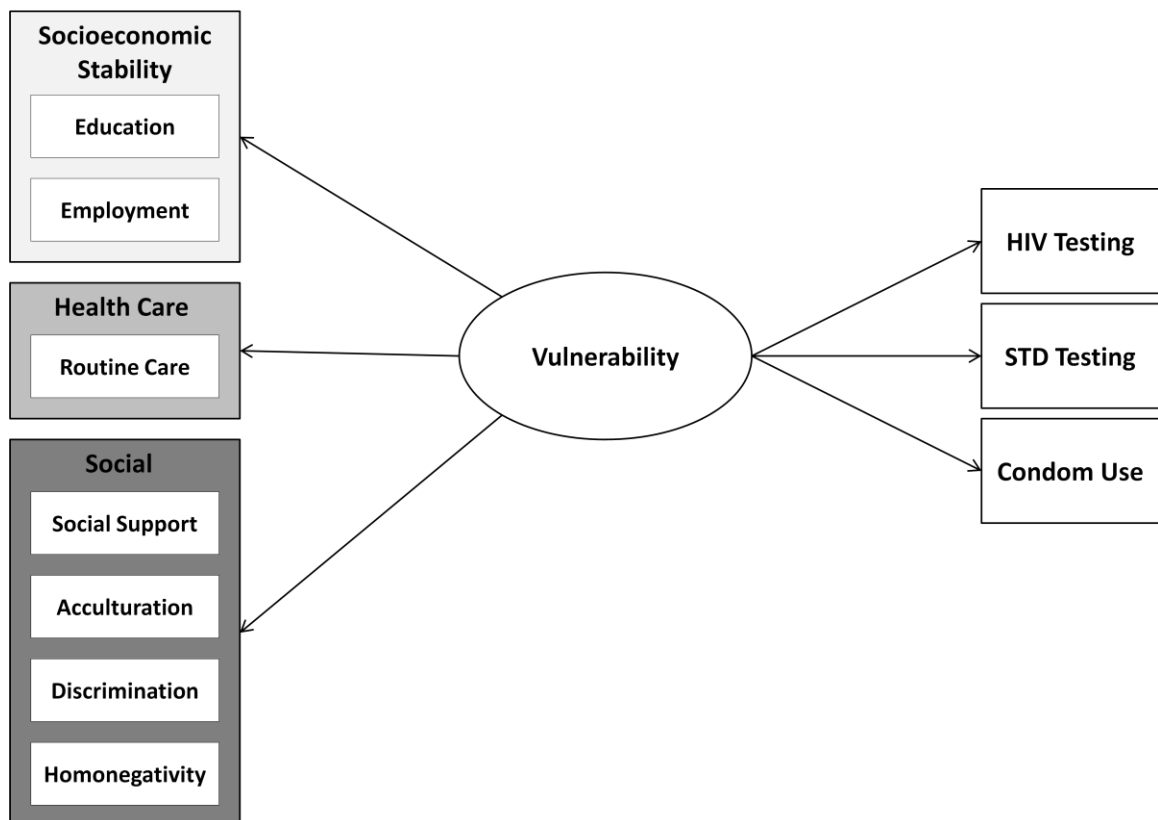
Statistical advances allow for person-centered approaches to identify underlying

subgroups of vulnerability (classes) in a population, which can then be tested with health

behaviors (Collins & Lanza, 2013; Lanza & Rhoades, 2013). This analysis used latent

class analysis with distal outcomes to examine how classes marked by different

typologies of vulnerability differ in their sexual health behaviors (i.e., HIV testing, STD testing, and condom use). We present a health vulnerability model for Latino/a sexual and gender minorities that accounts for three typologies of vulnerability and how they affect sexual health behaviors. We demonstrate how this model can be used as a tool to understand typologies of vulnerability and pinpoint priorities for more targeted and effective sexual health interventions.

Methods

  Participants. We examined HOLA intervention baseline survey data collected from November 2011 to July 2012 in NC. HOLA was a social network intervention, which used lay health advisors called "Navegantes." HOLA was designed to increase HIV testing and condom use among Spanish-speaking Latino/as who were sexual and gender minorities (i.e., gay or bisexual men, other MSM, and male-to-female transgender) (Rhodes et al., 2013; Sun et al., 2014). The intervention recruited 21 Navegantes to participate in the study, who then each recruited 8 Latino/as from their social networks. A total of 186 Latino/a sexual minority men and Latina transgender women participated in the intervention study.

  Data collection. The data collection methods are described elsewhere (Rhodes, Mann, et al., 2014). Briefly, the intervention was developed in response to community-identified needs and priorities by a community-based participatory research (CBPR) partnership, comprised of lay community members, organization representatives, and university health professionals and researchers. The

assessment, which was read aloud in Spanish by a male native Spanish-speaking staff member who was originally from Mexico to assist with challenges associated with low literacy rates and was completed by the participant, took 45 to 120 minutes to complete, depending on the skip pattern of the participant. The Institutional Review Boards at the Wake Forest School of Medicine and the University of North Carolina at Greensboro approved the study protocols.

Measures. *Demographics*. Participants reported their demographic information, including: age; country of origin; sexual orientation; relationship status; approximate monthly income; and perceived health status on a 5-point scale (from "excellent" to "poor") (CDC, 2011).

Indicator variables of vulnerability. *Socioeconomic stability domain.* Participants reported their highest level of education (dichotomized as less than high school and at least high school) and employment status (dichotomized as employed year-round and not employed year-round).

Health care domain. Participants reported when they last saw a healthcare provider for a routine (not emergency) check-up (e.g., physical exam) on a 5-point scale from "never" to "over 2 years ago." Routine check-up was dichotomized as within the past year and more than 1 year or never.

Social domain. Participants completed the 18-item Index of Sojourner's Social Support (ISSS) (Ong & Ward, 2005), which has been explored for Latino sexual minorities (Gilbert & Rhodes, 2012). For each item, participants reported how many people would provide socio-emotional support and instrumental support on a 5-point

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scale from "no one would do this" to "many people would do this." Cronbach's alpha was 0.98.

Participants completed the 12-item Short Acculturation Scale for Hispanics (Marin et al., 1987). This scale consists of three dimensions of acculturation (i.e., language use, media, and ethnic social relations or socialization) on a 5-point scale: Depending on the item, from "only Spanish" to "only English" or "all Latinos/Hispanics" to "all Americans." Cronbach's alpha was 0.87.

Participants rated their level of perceived racial/ethnic and sexual discrimination by completing a modified version of The Everyday Discrimination Scale (Williams et al., 1997), which has been validated across ethnic/racial groups (Kim et al., 2014). Participants reported in the past 12 months whether they had experienced 10 different types of discrimination (e.g., treated with less courtesy than other people) because of their race, ethnicity, or color (ethnic/racial discrimination) and because of their sexual identity or same-sex sexual behavior (sexual discrimination) with a "yes" or "no" response. We summed the number of "yes" responses such that higher scores reflect greater experiences of discrimination. Cronbach's alpha for racial/ethnic discrimination was 0.81, and for sexual discrimination was 0.83.

Participants completed a shortened version of the Reactions to Homosexuality Scale (Smolenski et al., 2010). Participants rated their agreement to seven statements on a 7-point scale from "strongly disagree" to "strongly agree." Cronbach's alpha was 0.65.

Outcomes. *HIV testing.* Participants reported whether they had tested for HIV at a clinic, hospital, health department, or doctor's office in the past 12 months (yes/no).

STD testing. Participants reported whether they had tested for STDs at a clinic, hospital, health department, or doctor's office in the past 12 months (yes/no).

Condom use. Participants reported how often they used condoms during their most recent sexual intercourse across a variety of sexual behaviors: insertive anal intercourse with a man, receptive anal intercourse with a man, vaginal intercourse with a woman, and anal intercourse with a woman. They reported their consistent condom use on a 5-point scale from "never" to "always." We used an aggregate measure that dichotomized condom use across these four sexual behaviors to examine whether they used condoms during their most recent instance of insertive or receptive anal sex with men and insertive vaginal or anal sex with women (yes/no). Consistency needed to be across all sexual behaviors reported.

Analysis

We conducted latent class analysis (LCA) to identify typologies of vulnerability. The development of these typologies is described elsewhere (Ma et al., under review). Briefly, we identified typologies of vulnerability through a multi-step model fitting process that uses shared characteristics to identify latent classes, or subgroups (Lubke & Muthén, 2005; Masyn, 2013; Muthén & Muthén, 2000; Nylund et al., 2007). We identified three latent classes of vulnerability: High Education and Employment (18.8% of the sample; characterized by high education and employment), Low Education and

High Social Support (63.4%), and High Education and Discrimination (17.7%; high

education and racial/ethnic and sexual discrimination).

We then conducted LCA with binary distal outcomes to estimate how latent class

membership to vulnerability was associated with sexual health behaviors, including HIV

testing, STD testing, and condom use. All modeling adjusted for possible within-network

clustering of outcomes using a random effect for social network (Muthén & Muthén,

2015). The one potential confounder we identified of the vulnerability class–sexual health

behavior associations was perceived health status, which was significantly associated

with sexual health behavior in bivariate analysis. We, therefore, included perceived

health status as a control variable. Participants did not need to have complete data on all

indicator variables to be included in the LCA; missing data were handled with a full-

information maximum likelihood (FIML) technique that assumes data are missing at

random (Collins & Lanza, 2013). As transgender women may differ in their endorsement

of the indicator variables (e.g., less educational attainment), we conducted a subgroup

analysis with the transgender women to examine whether they differed with the complete

sample among the indicators; no significant differences from the overall analytic sample

were found. All statistical analyses were performed using IBM SPSS version 23

(Armonk, NY) and Mplus version 7.4 (Los Angeles, CA).

Results

Table 10. Sociodemographics and Behaviors of Latino/a Sexual and Gender Minorities

	n (%) or Mean ± SD (Range)
Age (years)	30.1 ± 7.4 (18–61)
Income level (monthly)	
Less than $2,000	71 (72.4)
At least $2,000	27 (27.6)
Employment status	
Employed year-round	74 (75.5)
Not employed year-round	24 (24.5)
Educational attainment	
Less than high school	40 (40.8)
At least high school	58 (59.2)
Country of origin	
Mexico	74 (75.5)
Sexual orientation	
Gay	73 (75.3)
Bisexual	12 (12.4)
Relationship status	
Single, not dating anyone special	44 (44.9)
Dating someone special, partnered, or married but sex with others	20 (20.4)
Dating someone special, partnered, or married and no sex with others	34 (34.7)
Health status	2.5 ± 1.0 (1–5)
Routine check-up	
Within the past year	67 (68.4)
More than one year	22 (22.4)
Never	9 (9.2)
Social support	55.3 ± 17.4 (18–90)
Acculturation	24.6 ± 7.2 (11–44)
Racial/ethnic discrimination	3.5 ± 2.5 (0–10)
Sexual discrimination	2.5 ± 2.6 (0–8)
Internalized homophobia	36.2 ± 9.2 (12–49)
HIV testing (past 12 months)	58 (59.2)
STD testing (past 12 months)	46 (46.9)
Condom use (most recent)	31 (31.6)

Participant characteristics. Table 10 summarizes participant characteristics. On average, participants were 30.1 years of age. Approximately three-fourths (75.5%) were employed year-round, one-fourth (27.6%) earned a monthly income of at least $2,000, and over half (59.2%) had a high school diploma or equivalent. The majority of participants identified as gay (75.3%), with nearly half (44.9%) single and not dating. More participants reported HIV testing in the past year than STD testing (59.2% versus 46.9%, respectively). Approximately one-third used a condom during their most recent anal or vaginal intercourse (31.6%).

Table 11. Association Between Indicator Variables and Sexual Health Behaviors Using Multiple Logistic Regression

	AOR (95% CI)[a,b]	RR[c]	p
HIV Testing (past 12 months)			
Education	1.20 (-0.64, 1.00)	1.11	0.670
Employment	0.69 (-1.03, 0.28)	0.75	0.256
Routine Check-Up	4.59 (0.82, 2.22)	2.15	<0.001**
Social Support	0.99 (-0.40, 0.02)	-	0.481
Acculturation	1.07 (0.01, 0.12)	-	0.020*
Racial/Ethnic Discrimination	0.82 (-0.42, 0.03)	-	0.084
Sexual Discrimination	1.11 (-0.07, 0.28)	-	0.233
Internalized Homonegativity	1.01 (-0.04, 0.06)	-	0.785
STD Testing (past 12 months)			
Education	1.63 (-0.28, 1.26)	1.30	0.216
Employment	2.28 (0.13, 1.52)	1.74	0.021*
Routine Check-Up	2.00 (-0.18, 1.56)	1.52	0.120
Social Support	1.00 (-0.03, 0.03)	-	0.938
Acculturation	1.05 (0.01, 0.10)	-	0.031*
Racial/Ethnic Discrimination	1.03 (-0.18, 0.24)	-	0.803
Sexual Discrimination	1.09 (-0.12, 0.29)	-	0.419
Internalized Homonegativity	1.03(-0.01, 0.08)	-	0.167
Condom Use (most recent)			
Education	2.08 (-0.18, 1.65)	1.44	0.117
Employment	0.59 (-1.60,0.53)	0.66	0.327
Routine Check-Up	0.85 (-0.94, 0.62)	0.89	0.691
Social Support	0.98 (-0.05, 0.01)	-	0.254

Acculturation	0.998 (-0.07, 0.03)	-	0.396
Racial/Ethnic Discrimination	1.25 (0.00, 0.45)	-	0.053
Sexual Discrimination	0.78 (-0.50, -0.01)	-	0.045*
Internalized Homonegativity	1.02 (-0.03, 0.06)	-	0.470

Note. * $p < 0.05$ and ** $p < 0.001$.
[a] AOR=Adjusted Odds Ratio (95% Confidence Interval).
[b] Adjusted for potential clustering effect (social network).
[c] RR=Risk Ratio.

Association between vulnerability and sexual health behaviors. Table 11

presents the associations between indicator variables of vulnerability and sexual health

behaviors. Multiple logistic regression modeling showed significant associations between

indicator variables of vulnerability and sexual health behaviors in this sample. Latino/a

sexual and gender minorities who engaged in a routine check-up within the past year

were significantly associated with increased odds of HIV testing (adjusted odds ratio

[AOR] = 4.59, 95% confidence interval [CI] = 0.82–2.22, $p < 0.001$) than those who did

not. Those who reported higher acculturation levels were significantly associated with

increased odds of both HIV testing (AOR = 1.07, 95% CI = 0.01–0.12, $p < 0.05$) and

STD testing (AOR = 1.05, 95% CI = 0.01–0.10, $p < 0.05$) than those with lower levels.

Those who were employed year-round were significantly associated with increased odds

of STD testing (AOR = 2.28, 95% CI = 0.13–1.52, $p < 0.05$) than those who were not.

Finally, those who reported more sexual discrimination were marginally associated with

decreased odds of condom use during their most recent anal or vaginal intercourse (AOR

= 0.78, 95% CI = (-0.50–-0.01, $p < 0.05$) than those who reported lower levels.

Table 12. Means Across Latent Classes on Sexual Health Behaviors

Sexual Health Behavior	Class 1 (High Education & Employment)		Class 2 (Low Education & High Social Support)		Class 3 (High Education & Discrimination)	
	Mean	SE[a]	Mean	SE[a]	Mean	SE[a]
HIV Testing	0.57	0.09	0.59	0.04	0.54	0.10
STD Testing	0.49	0.09	0.43	0.04	0.49	0.09
Condom Use	0.54	0.09	0.28	0.04	0.25	0.10

Note.
[a] SE=Standard Error.

Table 13. Chi-Square Equality Test of Means Across Classes on Sexual Health Behaviors

	HIV Testing (past 12 months)		STD Testing (past 12 months)		Condom Use (most recent)	
	χ^2	p	χ^2	p	χ^2	p
Low Education & High Social Support vs.						
High Education & Employment	0.06	0.805	0.54	0.464	8.94	0.003*
High Education & Discrimination	0.36	0.551	0.42	0.519	0.06	0.808
High Education & Employment vs.						
High Education & Discrimination	0.05	0.828	0.00	0.970	4.96	0.026*

*Note. * $p < 0.05$.

Association between latent class membership and sexual health behaviors.

Table 12 presents the means across latent classes on sexual health behaviors; Table 13

presents the chi-square equality test of means across classes. After adjusting for potential

clustering effects based on social network and perceived health status, latent class

membership to certain subgroups of vulnerability was significantly associated with

condom use during their most recent anal or vaginal intercourse. Latino/a sexual and

gender minorities in Class 1 (High Education and Employment) were more likely to

report less condomless anal or vaginal intercourse compared to both Class 2 (Low Education and High Social Support; $\chi^2 = 8.94$, $p < 0.05$) and Class 3 (High Education and Discrimination; $\chi^2 = 4.96$, $p < 0.05$). Compared to the High Education and Employment class, those in the Low Education and High Social Support class and the High Education and Discrimination class were more likely to report more condomless anal or vaginal intercourse. We found no significant associations between vulnerability and HIV testing nor STD testing.

Discussion

We used latent class analysis to examine how typologies of vulnerability differed in their sexual health behaviors among our sample of Latino/a sexual and gender minorities. We identified three typologies of vulnerability that were characterized by different salient indicators: Class 1 (High Education and Employment; 18.8% of the sample), Class 2 (Low Education and High Social Support; 63.4%), and Class 3 (High Education and Discrimination; 17.7%) (Ma et al., under review). The typologies of vulnerability differed in their condom use behaviors during their most recent anal and/or vaginal intercourse. Membership in the Low Education and High Social Support class and the High Education and Discrimination class was significantly associated with more condomless anal or vaginal intercourse, whereas membership in the High Education and Employment class was associated with less condomless intercourse. These findings suggest that condom use may vary among subgroups of Latino/a sexual and gender minorities based on important indicators. Further, the association between educational attainment and condomless intercourse is consistent with previous studies that suggest

that highly educated Latino/as are more likely to engage in unprotected sex than those

with lower educational attainment (Gilbert & Rhodes, 2014; Ramirez-Valles et al., 2008).

Despite the association between education and unprotected sex, the combination of high

education and employment (i.e., high socioeconomic stability) may be protective in

facilitating consistent condom use. Addressing potential barriers and harnessing

facilitators to sexual health behaviors remain important strategies to meet Latino/a sexual

and gender minorities' sexual health needs.

Limited research has operationalized and tested vulnerability with measurable

criteria (Ma et al., under review; Shi & Stevens, 2005). Continuing to test these

operationalizations of vulnerability with specific health outcomes is needed to examine

their utility to inform and refine sexual health promotion and risk prevention

interventions. Although we cannot isolate the indicators that have the most effect on

condom use and other sexual health behaviors, it is important to consider the typologies

of vulnerability as a whole as they can represent a more realistic and comprehensive

assessment of health vulnerability than assessments of individual indicators (e.g.,

education or social support only) (Connell, Gilreath, & Hansen, 2009; Rice et al., 2016;

Vasilenko, Kugler, Butera, & Lanza, 2015). Although some indicators were associated

with sexual health behaviors, the pattern of endorsements of indicators within each class

presents a more comprehensive understanding of vulnerable typologies, including the

important facilitators (e.g., high educational attainment and employment status) and

barriers (e.g., low employment status and high racial/ethnic and sexual discrimination) to

sexual health. To address these barriers characteristic of uniquely vulnerable classes,

sexual health promotion and risk prevention programming can harness existing

facilitators (e.g., social support) to increase sexual health-promoting behaviors.

Encouraging clinicians or peer educators to discuss mental health, along with condom use

and testing, during routine check-ups can aid in addressing the negative effects of

perceived discrimination (e.g., depression) (Sun et al., 2015; Thornicroft et al., 2016;

Thornicroft, Brohan, Kassam, & Lewis-Holmes, 2008).

Unexpectedly, vulnerability class membership was not associated with HIV

testing nor STD testing. Research supports the relationship between HIV and STD testing

and the selected indicators of vulnerability across the socioeconomic stability, health

care, and social domains, including: educational attainment (CDC, 2015, 2015, 2016b;

Gilbert & Rhodes, 2013; Spadafino et al., 2016), engaging in routine care (Kaiser Family

Foundation, 2011; Lopez-Quintero, Shtarkshall, & Neumark, 2005), social support

(Carlos et al., 2010; Fekete et al., 2009; Gilbert & Rhodes, 2013; Lopez-Quintero et al.,

2005; Lauby et al., 2011; Solorio, Forehand, & Simoni, 2013; Vega, Spieldenner,

DeLeon, Nieto, & Stroman, 2010), and experiencing less discrimination and

homonegativity (Brooks et al., 2006; CDC, 2015; Erausquin et al., 2009; Harrison-

Quintana & Perez, 2012; IOM, 2011; Meyer & Champion, 2010; Rhodes et al., 2010,

2011). This unexpected finding may be due to the exclusion of structural-level

contributors that affect HIV and STD testing, including the location of clinics that

provide testing, neighborhood poverty concentration, and anti-immigration sentiment

(Ahmed, Mohammed, & Williams, 2007; Potochnick & Perreira, 2010). Future

adaptations of a health vulnerability model should consider the indicators (e.g., poverty

90

or income level) pertinent to all health behaviors of interest to develop an effective and comprehensive model.

Several limitations should be considered. These findings may be most pertinent to Latino/a sexual and gender minorities in other new settlement states, particularly in the southern US, that have experienced similarly recent immigration influxes (Hernández-León & Zúñiga, 2005; Immigration and the States Project, 2014). We analyzed a relatively small, geographically specific sample consisting of willing Latino/a sexual and gender minorities who participated in the HOLA intervention, thus the generalizability of our findings may not be appropriate to other Latino/as. Further, the selection of the indicator variables to identify the latent classes was based on prior research and was specific to our sample of Latino/a sexual and gender minorities. The salient indicator variables for other vulnerable populations living in different locales may differ. For instance, areas with longer histories of immigration may be characterized by less perceived racial/ethnic discrimination (e.g., New York) and areas with more established sexual and gender minority populations may be characterized by less internalized homonegativity (e.g., California). Examining contextual and community factors will be an important component to extend future work with this model.

Given this analysis examined only three sexual health behaviors, future research should explore the association between vulnerability and other sexual health risk behaviors (e.g., injection drug use and transactional sex) to gain a full purview of sexual health vulnerability. Future research should also examine the longitudinal effects of vulnerability to understand how typologies of vulnerability change over time and how

that affects sexual health behaviors or outcomes. Limited work has examined the ways in which vulnerability may be dynamic and context-specific.

New Contribution to the Literature

The Latino/a community in the US is often considered and measured as a homogenous group. This analysis presents one way to uncover and understand the heterogeneity of a vulnerable population. The implications of our findings are two-fold: They (1) fill a gap in the limited literature on vulnerability by testing a specific model of sexual health vulnerability for a particular population, and (2) extend the emerging research on Latino/a sexual and gender minorities living in a new settlement state by identifying typologies of vulnerability that predict a sexual health behavior. Our sample of Latino/a sexual and gender minorities may experience unique barriers to sexual health care, particularly among those with specific vulnerabilities. Our findings have the potential for more targeted, tailored, and personalized (Tanner et al., 2016) sexual health promotion efforts for specific subgroups of Latino/a sexual and gender minorities, as well as other vulnerable populations living in other parts of the US.

CHAPTER VI

DISCUSSION AND IMPLICATIONS

Summary of Findings

The results from this study resulted in the identification of latent classes of

vulnerability that differentially predicted a sexual health behavior among Latino/a sexual

and gender minorities in NC. I used eight indicator variables to operationalize the latent

construct of vulnerability across three domains (i.e., socioeconomic stability, health care,

and social): educational attainment, employment status, routine check-ups, social support

level, acculturation level, perceived racial/ethnic and sexual discrimination, and

internalized homonegativity.

Using latent class analysis, I found that the three-class model was optimal based

on fit criteria, interpretability, and class separation. I identified three latent classes of

vulnerability: High Education and Employment (18.8% of the sample; characterized by

high educational attainment and employment status), Low Education and High Social

Support (63.4%), and High Education and Discrimination (17.7%; high educational

attainment and racial/ethnic and sexual discrimination). Using latent class analysis with

distal outcomes, I then used these three classes to predict three sexual health behaviors:

HIV testing, STD testing, and condom use. My results showed that membership in the

Low Education and High Social Support class and the High Education and

Discrimination class was significantly associated with more condomless anal or vaginal

intercourse, whereas membership in the High Education and Employment class was associated with less condomless intercourse.

Significance

The results from this study have the potential for informing and refining future sexual health promotion and risk prevention interventions. The implications of this study are two-fold: my findings (1) fill a gap in the limited literature on vulnerability by advancing a specific model for a particular population based on the General Model of Vulnerability (2008), and (2) extend the limited literature on Latino/a sexual and gender minorities living in a new settlement state by identifying indicators of vulnerability to predict sexual health behaviors. Broadly, these findings can strengthen interventions by identifying facilitators (and barriers) to sexual health promotion and tailoring specific intervention components to address the needs of uniquely vulnerable subgroups. Uncovering vulnerable subgroups affirms the heterogeneity within the Latino/a community in the US, who are often considered and measured as a homogenous group. We can use this heterogeneity to then tailor future sexual health programming to specific groups of Latino/a sexual and gender minorities, as well as other vulnerable populations.

Limitations

Limitations of the data are reflected in the small sample size and study design. First, I analyzed a relatively small, geographically specific sample consisting of willing Latino/a sexual and gender minority participants in the HOLA intervention, thus caution must be exercised about the generalizability of my findings. These findings may be most pertinent to Latino/a sexual and gender minorities in other new settlement states,

particularly in the southern US (e.g., Tennessee and Georgia), that have experienced similarly recent immigration influxes (Hernández-León & Zúñiga, 2005; Immigration and the States Project, 2014). Further, the selection of the indicator variables to identify the latent classes were based on pertinent determinants of health, existing literature, and the General Model of Vulnerability, but was also limited by the variables available in the dataset (Derose et al., 2007; Dovidio et al., 2010; Furman et al., 2009; Gilbert & Rhodes, 2014; Shi, Stevens, Lebrun, et al., 2008; Tanner et al., 2014). The salient indicator variables for other vulnerable populations living in other locales may differ. For instance, areas with longer histories of immigration may be characterized by less perceived racial/ethnic discrimination by Latino/a sexual and gender minorities (e.g., New York), and areas with established sexual and gender minority populations may be characterized by less internalized homonegativity (e.g., California).

Second, the selection of variables was restricted to the measures included in the HOLA dataset with primarily individual-level variables available for analysis. To continue to advance the present specific health vulnerability model and adapt additional constructs of the General Model of Vulnerability (2008), broader indicator variables should be included, in addition to individual-level indicators, to understand their association with sexual health behavioral outcomes. The inclusion of structural-level indicators in future work is important to move toward testing a comprehensive model that includes multilevel contributors to vulnerability (e.g., neighborhood poverty concentration, proximity to healthcare services, and anti-immigration sentiment) (Bauermeister & Eaton, 2015; Dang et al., 2012; Latkin & Knowlton, 2005).

Limitations of the analytic approach are related to the process of latent class identification and specification. First, identifying the appropriate number of latent classes is a subjective task with no clear standardizations nor conventions established (Masyn, 2013). Thus, the identified number of latent classes may contrast with the true, though unknown, number of classes. Despite these challenges, I followed typical practices in latent class analysis and balanced evidence-based knowledge (i.e., driven by the General Model of Vulnerability, prior research, and study hypotheses) with analytical evidence (i.e., nature of the subgroups and model interpretability). I explored solutions with varying numbers of subgroups, and I selected the best fit model that was interpretable and best represented the data (Marsh, Lüdtke, Trautwein, & Morin, 2009). Second, the labeling of the classes is also a subjective and iterative task. I relied on the estimated probability of an individual in a certain class endorsing a categorical item and assessed this variation across classes. Initially, I also relied on my study hypotheses to produce naming conventions that reflected gradations of vulnerability (i.e., high, medium, and low). I ultimately labeled the classes to reflect insights from the HOLA research team and the results of the vulnerable typologies that demonstrated dimensionalities of vulnerability, rather than gradations.

Strengths

The HOLA dataset is a robust sample of Latino/a sexual and gender minorities who were recruited through a CBPR approach that used lay health advisors and social networks to enhance trust building in the research process. My findings fill a critical research gap by identifying indicators of vulnerability among a particularly vulnerable

population – marginalized based on ethnic/racial, sexual, and gender minority status. These indicators were used to delineate typologies of vulnerability across subgroups of Latino/a sexual and gender minorities. Recognizing these typologies can help compare the differences and similarities across salient indicators between uniquely vulnerable subgroups.

This information on vulnerable subgroups and sexual health behaviors can aid interventions in two primary ways. First, it can help identify salient indicators of vulnerability that interventions can leverage or address. For example, all three classes endorsed relatively high social support levels. Thus, harnessing social support through social network-based interventions or other efforts that include peer social support may be particularly important in improving sexual health behaviors for Latino/a sexual and gender minorities and possibly other vulnerable populations. Emerging efforts have used community lay health advisors (e.g., *Navegantes* and *Promotores*) to facilitate health promotion and risk prevention among Latino/as, including Latino/a sexual and gender minorities. These interventions were developed in partnership with community members and relied on social networks to diffuse health education messaging (e.g., HIV/STD testing, mammography screening, and cardiovascular health behaviors) and build participants' capacity to engage in health promotion activities (Amirkhanian, 2014; Livaudais et al., 2010; Martinez, Roth, Kelle, Downs, & Rhodes, 2014; Medina, Balcázar, Hollen, Nkhoma, & Mas, 2007; Ramos, Hernandez, Ferreira-Pinto, Ortiz, & Somerville, 2006; Rhodes et al., 2014; Rhodes, Hergenrather, Bloom, Leichliter, & Montaño, 2009; Somerville, Diaz, Davis, Coleman, & Taveras, 2006; Sun et al., 2014;

Sun, Mann, Eng, Downs, & Rhodes, 2015; Vissman et al., 2009). Building on the existing strengths that emerge from salient indicators of vulnerability may improve health behaviors among Latino/a sexual and gender minorities and other vulnerable populations.

Second, interventions can target additional efforts for vulnerable subgroups. Information on typologies of vulnerability can help identify those who are uniquely vulnerable within an already vulnerable population or community – and thus those who could benefit the most from sexual health promotion and risk prevention programming. Although we do not suggest tailoring interventions specifically to vulnerable subgroups, interventions can be tailored during their implementation toward the targeted group (e.g., Latino/a sexual and gender minorities) that includes specific intervention components that address the needs of different vulnerable subgroups. For example, an intervention that includes vulnerable Latino/a sexual and gender minorities who experience high racial/ethnic and sexual discrimination may require additional programming on local mental health services and could include a tour of a Latino/a-friendly mental health facility to increase awareness, trust, and comfort in accessing these services (Thornicroft et al., 2016, 2008). An alternative approach would be to include additional intervention activities (e.g., additional peer education lessons) or increase the intensity of existing intervention components (e.g., more text message reminders in a social media intervention) for certain vulnerable subgroups (Rhodes et al., 2013; Tanner et al., 2016). These approaches allow the intervention to target the needs of both the larger group and the vulnerable subgroups. Thus, more customized and efficacious interventions may be delivered to address both groups' needs and priorities. The development of more

generalized interventions for a population that includes a mixture of vulnerabilities may result in uneven reach and effectiveness (Collins et al., 2016). The more intervention components that can be tailored to address the needs and priorities of subgroups of participants, the more potentially efficacious the intervention.

Implications for Future Research

This study highlights the complexity of operationalizing and testing vulnerability for Latino/a sexual and gender minorities. Future research should include other indicator variables not available for inclusion in the present study that may be salient for other populations, such as health insurance coverage (Shi & Stevens, 2005; Shi, Stevens, Lebrun, et al., 2008). Additionally, inclusion of structural-level indicators in future work is important to move toward testing a comprehensive model that includes multilevel contributors to vulnerability (e.g., neighborhood poverty concentration, proximity to healthcare services, and anti-immigration sentiment) (Bauermeister & Eaton, 2015; Dang et al., 2012; Latkin & Knowlton, 2005). The inclusion of structural-level indicators is important to move toward comprehensive models of vulnerability.

To advance vulnerability research, longitudinal analyses should be performed to examine how vulnerability class membership may change over time and how that affects health outcomes and behaviors. Emerging research is using latent transition analysis to test drug use onset; the approach used in these studies can be used to inform analyses using other health outcomes, including sexual health outcomes (e.g., HIV and STD acquisition) (Collins & Lanza, 2013; Lanza, Patrick, & Maggs, 2010; Maldonado-Molina & Lanza, 2010).

Conclusion

To my knowledge, this study is the first to operationalize, measure, and test vulnerability for Latino/a sexual and gender minorities. Findings from this study illuminate typologies of vulnerability and the potential associations with sexual health behaviors. Developing intervention components that harness facilitators (e.g., social support) and address barriers (e.g., discrimination) to sexual health-promoting behaviors, focusing specifically on those who are uniquely vulnerable, is critical to increasing the reach and effectiveness of tailored sexual health promotion and risk prevention programming.

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APPENDIX A

TERMINOLOGY

Definitions of specialized terms used in the analyses are provided below. These definitions are based on seminal work by a variety of latent class methodologists (Collins & Lanza, 2010; Marsh et al., 2009; Masyn, 2013; Asparouhov & Muthen, 2014).

Table A1. Definitions of Specialized Terms Used in Latent Class Analysis

Term	Definition
Cluster Analysis	Like mixture modeling (see *Mixture Modeling*), this analysis strives to identify homogeneous groups of individuals. Unlike mixture modeling, the groupings are based on fit criteria (e.g., distance to each other) with individuals only assigned to one group. Three common types of cluster analysis include *K*-means, two-step, and hierarchical.
Indicator Variables	These are the observed, or manifest, variables analyzed to arrive at the latent classes (see *Latent Classes*). These variables may be considered contributors to the latent construct of interest.
Latent Class(es)	Also called subgroups or clusters. These are subgroups of individuals who are similar in their response patterns on the indicator variables (see *Indicator Variables*).
Latent Class Analysis (LCA)	This is a form of mixture modeling that is similar to cluster analysis. The goal of LCA is to arrive at a set of latent classes that represents the response patterns in the data, including the prevalence of each latent class. The indicator variables used in LCA are typically binary. LCA is often considered a person-centered approach for its emphasis on identifying subgroups of individuals who exhibit similar patterns of characteristics. Person-centered approaches are in contrast to traditional analyses that use variable-centered approaches to identify relationships between variables (e.g., factor analysis).
Mixture Modeling	This is a type of cluster analysis in which the analyst strives to identify subgroups of individuals. The two main forms of mixture modeling are Latent Class Analysis (indicator

	variables are typically binary; see *Latent Class Analysis*) and Latent Profile Analysis (LPA; indicator variables are typically continuous). Unlike traditional cluster analyses in which individuals are assigned to only one subgroup, mixture modeling is based on a probability model with the probability of group membership as the ultimate result.

APPENDIX B

OVERVIEW OF HOLA INTERVENTION AND RECRUITMENT

Overview of HOLA Intervention

HOLA was a lay health advisor and social network intervention designed to increase HIV testing and condom use among Latino/as. The HOLA intervention targeted Latino/as who identified as sexual and gender minorities (e.g., gay, bisexual, and transgender) (Rhodes et al., 2013; Sun et al., 2014). The original research team was, and continues to be, committed to community-based participatory research (CBPR) to develop, implement, refine, and disseminate the HOLA intervention (Rhodes et al., 2006, 2013). CBPR is an approach to research that promotes co-learning, empowering, and collaborative partnerships toward the goal of improving community health outcomes and eliminating health disparities (Minkler & Wallerstein, 2011; Rhodes et al., 2006; Viswanathan et al., 2004; Wallerstein & Duran, 2006). The research team partnered with community members to develop the HOLA intervention in response to community-identified needs and priorities. This partnership comprised of representatives from public health departments, AIDS service organizations, universities, Latino/a-serving community-based organizations, and the local immigrant Latino/a community (Rhodes, Mann, et al., 2014).

Following the principles of CBPR, the HOLA intervention used CBPR to expand its partnership and develop an intervention team, review existing sexual health literature, and explore the health-related needs and priorities of Latino/a sexual and gender minorities to ensure the intervention was grounded in sound science and practice

(Rhodes et al., 2013). The team also refined and narrowed intervention priorities, blended

health behavior theory with the lived experiences of Latino/a sexual and gender

minorities, designed an intervention conceptual model, developed training modules and

materials, and pretested and revised the intervention. The intervention harnessed lay

health advisors ("Navegantes") as community assets to develop, deliver, and refine the

intervention for other Latino/as (Rhodes, Mann, et al., 2014).

Recruitment

In the HOLA intervention, 21 Navegantes were recruited to participate in the

study, who then each recruited 8 Latino/as from their social networks. The program

coordinator, who identified as a Latino gay man and was connected with the Latino/a

community, recruited Latino MSM to serve as Navegantes who were interested in

participating in the study and demonstrated natural helper abilities. A total of 186 Latino

sexual minority men and Latina transgender women participated in the intervention study

and completed baseline, 12-month, and 24-month follow-up assessments. The surveys at

both time points were similar, except for the removal of sociodemographic questions at

post-intervention as that information was collected at baseline. Eligibility to participate in

the HOLA intervention as a Navegante include the following: (a) self-identify as Latino;

(b) be at least 18 years of age; (c) report MSM behavior since at least age 18; (d) have

some Spanish language literacy; and (e) provide informed consent. Eligibility as a social

network member included similar criteria, excluding Spanish language literacy.

The original research team selected Navegantes based on personal, performance,

and situational factors. Personal factors included being a natural leader, dedicated,

respectful, comfortable discussing sensitive issues, able to offer advice and resources, and maintain discreetness. Performance factors included the ability to read low-literacy materials, complete data collection forms, communicate orally in Spanish, participate in meetings, and interact with social network members. Situational factors included having available time and access to regular transportation. The intervention ensured that information was tailored to the targeted group. For instance, the research team worked to include inclusive wording for sexual and gender minorities.

All Navegantes participated in a multi-session training. This training was first developed as part of the HoMBReS intervention (targeted toward Latinos who identified as heterosexual men), then later adapted for HOLA. Based on lessons learned from the evaluation of HoMBRes, enhancements incorporated into HOLA included Spanish-language DVD segments on relevant health topics (e.g., condom negotiation with sexual partners, magnitude of HIV and STDs in Latino/a communities, process of HIV testing at a local public health department, and living with HIV); tour of the local health department to increase understanding, trust, and comfort with accessing and using services; and monthly meetings where the Navegante planned and organized group activities with social network members on a specific health topic, with support and guidance from the program coordinator (Sun, Mann, Eng, Downs, & Rhodes, 2015).

Over the course of the 4-session, 16-hour training, the program coordinator trained Navegantes in their skills and capacity to serve as health advisors, opinion leaders, and community advocates. Session 1 focused on providing an overview of the intervention, including the purpose of the intervention, roles and responsibilities of the

Navegantes, and how to use the resources and risk-reduction materials. Session 2 focused on HIV and STD prevention knowledge and strategies, including common STIs with visuals, correct HIV prevention information, and distinguishing facts from misperceptions. In this session, Navegantes learned how to model correct HIV prevention behavior through activities, such as correct condom use and how to share HIV prevention resources and information with their social network members. Sessions 3 and 4 focused on the specific roles and responsibilities of being a Navegante (e.g., seeking services at the local public health department, getting tested for HIV and STDs) and how to evaluate program progress through activity logs. Overall, the intervention team developed these trainings to be interactive and fun to enhance participation. The trainings included informational Powerpoint presentations, but also opportunities to role-play and practice training topics (e.g., correctly put on a condom), videos, raffles, games, and food.

Additionally, Navegantes received a briefcase, which included the following training supplies and materials for distribution to their social network members: all presentations used during the training, pocket-sized carrying cards depicting how to correctly use a condom and where to find HIV and STD testing sites, and brochures about HIV and STDs. Navegantes were also offered a tour of the local health department to increase their understanding of, trust in, and comfort with accessing and using healthcare services. At the end of the training, all Navegantes received a framed certificate of accomplishment they could display.

After the training, Navegantes met monthly with the project coordinator for approximately a year to obtain additional project support and training as needed, restock

briefcases with sexual health promotion supplies (e.g., condoms, water-based lubricants, and informational brochures). Further, Navegantes were expected to promote sexual health, particularly condom use and HIV and STD testing, among their social network members by carrying out informal and formal helping using the skills and materials gained through the training. To remind Navegantes on how to provide support to others, the project coordinator provided a low-literacy wallet-sized card using APOYO ("HELP") (see **Figure B1**): *Poner Atención – Preguntar – Ofrecer consejo – Y – Organizar juntos los pasos siguientes* (Pay attention – Ask questions – Offer advice – And – Together organize next steps). Navegantes also recorded their interactions in an activity log that was collected monthly by the intervention team (see **Figure B2**). The intervention team developed these activity logs to be simple and easy to complete. Thus, the Navegantes could easily record the date of the event, number and gender identity of those present, whether those present were social network members enrolled in the study, and the types of activities conducted (e.g., discuss general health, sexual health, or sexual problems; distribute condoms; or provide referrals to a partner community-based organization, the local public health department, or other health providers).

Figure B1. APOYO ("HELP") Card for Navegantes

Figure B2. Sample Monthly Activity Log Completed by Navegantes

APPENDIX C

KEY VARIABLES OF INTEREST

Table C1. Key Variables of Interest Across Specific Aims 1 and 2

Variable	Question Number and Item	Specific Aim	New and *Original* Variable Name
Demographics			
Latino	Q1: Do you consider yourself to be Hispanic or Latino? ☐0 No ☐1 Yes ☐88 Don't know ☐99 Refused to answer	1,2	**Latino_1** *Q1*
Race	Q2: For this question you may select more than one option. Do you consider yourself… ☐1 American Indian / Alaska Native ☐2 Asian ☐3 Black or African American ☐4 Native Hawaiian or Pacific Islander ☐5 White ☐6 Other, please specify: _____ ☐88 Don't know ☐99 Refused to answer	1,2	**Race_2** **Race_2O** *Q2* *Q2Other_Ethnicity*
Sexual Orientation	Q13: Which of the following terms do you think of yourself as? ☐0 Heterosexual / Straight ☐1 Gay ☐2 Bisexual ☐3 Transgender ☐4 Other [please specify] _Q13_Other_ ☐88 Don't know ☐99 Refused to answer	1,2	**Orie_13** **Orie_13O** *Q13* *Q13_Other*
Relationship Status	Q14: What is your current relationship status? ☐1 Single and not dating anyone special ☐2 Dating someone special but have sex with other people also ☐3 Dating someone special but don't have sex with other people	1,2	**Rel_14** **Rel_14N** *Q14_R* *Q14NoRespond*

	☐4 Partnered or married but have sex with other people also ☐5 Partnered or married but don't have sex with other people ☐88 Don't know ☐99 Refused to answer		
Gender of Partner	Q15: If dating, partnered, or married, what is that person's gender? ☐0 Female ☐1 Male ☐2 Male to female transgender ☐3 Female to male transgender ☐4 Other [please specify]: _____ ☐88 Don't know ☐99 Refused to answer	1,2	**Part_15** **Part_15O** *Q15* *Q15Other*
Education	Q89_r: What is the <u>highest</u> level of education you reached? ☐1 Less than 5 years of school ☐2 5-8 years of school ☐3 Less than high school diploma or equivalent (GED) ☐4 High school diploma or equivalent (GED) ☐5 Some college ☐6 2-year college degree ☐7 4-year college degree ☐8 Master's degree, professional degree, or more ☐88 Don't know ☐99 Refused to answer	1,2	**Edu_89** **Edu_89R** *Q89_R* *Q89_1_3* *Q89_4_99*
Employment	Q92: What best describes your current employment status? ☐1 Employed year round ☐2 Employed in seasonal work but not year round ☐3 Retired ☐4 Unemployed since arrived in US ☐5 Unemployed seasonal worker ☐6 Unemployed (but not '4' or '5' above) ☐7 Disabled and not working ☐88 Don't know ☐99 Refused to answer	1,2	**Emp_92** *Q92*
Income (Monthly)	Q95: About how much money do you receive each	1,2	**Inc_95** **Inc_95R**

	month from all sources?		Q95
	☐0 None ☐1 $1-$99 ☐2 $100-$499 ☐3 $500-$999 ☐4 $1,000-$1,999 ☐5 $2,000-$2,999 ☐6 $3000 or more ☐88 Don't know ☐99 Refused to answer		
Country of Origin	Q97: Where were you born? _____ [city] _____ [region/state/department] _____ [country]	1,2	**Born_97** **Born_97R** *Q97_COUNTRY*
Age First Came to US	Q98: How old were you when you first came to live in the United States? _____ Years old ☐88 Don't know ☐99 Refused to answer	1,2	**AgeUS_98** **AgUS_98R** *Q98AGE_COME_US* *Q98_NO_RESPONSE*
Age	Q99Age_Now_R: How old are you now? _____ years old ☐88 Don't know ☐99 Refused	1,2	**Age_99** *Q99AGE_NOW_R* *Q99_No_Response*
Years Living in US	Q100_r: How long have you lived in the US, total years and/or months? _____ [months] _____[years] 88 Don't know 99 Refused to answer	1,2	**YrUS_100** **MoUS_100** *Q100_R* *Q100_MOS* *Q100_YRS* *Q100_No_Response*
Years Living in NC	Q101_r: How long have you lived in NC total years and/or months? _____ [months] _____[years]	1,2	**YrNC_101** *Q101_R* *Q101_MOS* *Q101_YRS* *Q101_No_Response*
Health Status	Q6: Compared to other people your age, would you say your health is… ☐1 Excellent ☐2 Very good ☐3 Good ☐4 Fair ☐5 Poor	1,2	**HlthSt_6** *Q6*

	☐88 Don't know ☐99 Refused to answer		
Indicator Variables of Vulnerability			
Education	Q89_r: What is the <u>highest</u> level of education you reached? ☐1 Less than 5 years of school ☐2 5-8 years of school ☐3 Less than high school diploma or equivalent (GED) ☐4 High school diploma or equivalent (GED) ☐5 Some college ☐6 2-year college degree ☐7 4-year college degree ☐8 Master's degree, professional degree, or more ☐88 Don't know ☐99 Refused to answer	1	**Edu_89** **Edu_89R** *Q89_R* *Q89_1_3* *Q89_4_99*
Employment	Q92: What best describes your current employment status? ☐1 Employed year round ☐2 Employed in seasonal work but not year round ☐3 Retired ☐4 Unemployed since arrived in US ☐5 Unemployed seasonal worker ☐6 Unemployed (but not '4' or '5' above) ☐7 Disabled and not working ☐88 Don't know ☐99 Refused to answer	1	**Emp_92** *Q92*
Routine Care	Q7: When did you last see a healthcare provider such as a doctor or nurse in the US for a routine check-up, a routine physical examine, or something similar, NOT including an Emergency Department visit? ☐0 Never ☐1 Within past 6 months ☐2 Within the past year ☐3 1-2 years ago ☐4 Over 2 years ago ☐88 Don't know ☐99 Refused to answer	1	**Check_7** *Q7*
Social Support	Q105a_r–Q105r_r: Tell me if you know persons in NC or outside NC, with whom you are maintaining some form of regular contact, who would perform	1	**So_105A** **So_105B** **So_105C** **So_105D**

	each helpful behavior...		**So_105E**
			So_105F
	a. Comfort you whenever you feel homesick.		**So_105G**
	b. Listen and talk with you whenever you feel lonely or depressed.		**So_105H**
			So_105I
	c. Share your good and bad times.		**So_105J**
	d. Spend some quiet time with you whenever you do not feel like going out.		**So_105K**
			So_105L
	e. Spend time chatting with you whenever you are bored.		**So_105M**
			So_105N
	f. Accompany you to do things whenever you need someone for company.		**So_105O**
			So_105P
	g. Visit you to see how you are doing.		**So_105Q**
	h. Accompany you somewhere even if he or she doesn't have to.		**So_105R**
	i. Reassure you that you are loved, supported, and cared for.		**SoS_105**
			SoSI_105
	j. Provide necessary information to help orient you to your new surroundings.		*Q105A_R-105R_R*
	k. Help you deal with some local institutions' official rules and regulations.		
	l. Show you how to do something that you didn't know how to do.		
	m. Explain things to make your situation clearer and easier to understand.		
	n. Tell you what can and cannot be done in North Carolina.		
	o. Help you interpret things that you don't really understand.		
	p. Give you some tangible assistance in dealing with any communication or language problems that you might face.		
	q. Explain and help you understand the local culture and language.		
	r. Tell you about available choices and options.		
	5-point scale from 0 to 4: "No one would do this" [0], "Someone would do this" [1], "A few would do this" [2]; "Several would do this" [3]; "Many would do this" [4]		
Acculturation	Q10a–Q10k: The following section is about language and how you prefer to communicate. a. What was the language(s) you used as a child? b. What language(s) do you usually speak at home? c. In which language(s) do you usually think? d. What language(s) do you usually speak with your friends?	1	**Acc_10A** **Acc_10B** **Acc_10C** **Acc_10D** **Acc_10E** **Acc_10F** **Acc_10G** **Acc_10H** **Acc_10I** **Acc_10J** **Acc_10K**

	e. In what language(s) are the TV programs you usually watch? f. In what language(s) are the radio programs you usually listen to? g. In general, what language(s) are the movies, TV, and radio programs you prefer to watch and listen to? h. Your close friends are… i. You prefer going to social gatherings/parties at which people are… j. The persons you visit or who visit you are… k. If you could choose your children's friends you would want them to be… 5-point scale from 1 to 5 (2 response types): "Only Spanish" [1], "More Spanish than English" [2], "Both Equally" [3], "More English than Spanish" [4], "Only English" [5] ; "All Latinos/Hispanics" [1], "More Latinos than Americans" [2], "About half and half" [3], "More Americans than Latinos" [4], "All Americans" [5]		**AccS_10** **AccSI_10** *Q10A-10K*
Racial/Ethnic Discrimination	Q70a–Q70j: Now I want to ask you about day-to-day life experiences of discrimination. In the past 12 months, in your day-to-day life, how frequently have any of the following things happened to you because of your race, ethnicity, or color? a. You have been treated with less courtesy than other people. b. You have been treated with less respect than other people. c. You have received poorer service than other people at restaurants or stores. d. People have acted as if they think you are not smart. e. People have acted as if they are afraid of you. f. People have acted as if they think you are dishonest. g. People acted as if they're better than you are. h. You have been called names or insulted. i. You have been threatened or harassed. j. You have been followed around in stores. 0 No 1 Yes	1	**RDi_70A** **RDi_70AR** **RDi_70BH** **RDi_70B** **RDi_70BR** **RDi_70CH** **RDi_70C** **RDi_70CR** **RDi_70DH** **RDi_70D** **RDi_70DR** **RDi_70E** **RDi_70ER** **RDi_70F** **RDi_70FH** **RDi_70FR** **RDi_70G** **RDi_70GH** **RDi_70GR** **RDi_70HH** **RDi_70H** **RDi_70HR** **RDi_70IH** **RDi_70I** **RDi_70IR** **RDi_70JH** **RDi_70J** **RDi_70JR**

	If yes, how many times? _____ 99 Refused to answer		**RDi_70AH** **RDi_70EH** **RDiS_70** **RDiS_70R** **RDiSI_70** **RDSI_70R** *Q70A-70J* *Q70A_HOW_MANY-* *Q70J_HOW_MANY* *Q70A_Refuse-* *Q70J_Refuse*
Sexual Discrimination	Q72a–Q72j: Now I want to ask you about day-to-day life experiences of discrimination. In the past 12 months, in your day-to-day life, how frequently have any of the following things happened to you because of your sexual identity or same-sex sexual behaviors? a. You have been treated with less courtesy than other people. b. You have been treated with less respect than other people. c. You have received poorer service than other people at restaurants or stores. d. People have acted as if they think you are not smart. e. People have acted as if they are afraid of you. f. People have acted as if they think you are dishonest. g. People acted as if they're better than you are. h. You have been called names or insulted. i. You have been threatened or harassed. j. You have been followed around in stores. 0 No 1 Yes If yes, how many times? _____ 99 Refused to answer	1	**SDi_72AH** **SDi_72A** **SDi_72AR** **SDi_72BH** **SDi_72B** **SDi_72BR** **SDi_72CH** **SDi_72C** **SDi_72CR** **SDi_72DH** **SDi_72D** **SDi_72DR** **SDi_72EH** **SDi_72E** **SDi_72ER** **SDi_72FH** **SDi_72F** **SDi_72FR** **SDi_72GH** **SDi_72G** **SDi_72GR** **SDi_72HH** **SDi_72H** **SDi_72HR** **SDi_72IH** **SDi_72I** **SDi_72IR** **SDi_72JH** **SDi_72J** **SDi_72JR** **SDiS_72** **SDiS_72R** **SDiSI_72** **SDSI_72R**

			Q72A-72J *Q72A_HOW_MANY-Q72J_HOW_MANY* *Q72A_Refuse-Q72J_Refuse*
Internalized Homonegativity	Q88a_r–Q88g_r: On a scale from 1"strongly disagree" to 7 "strongly agree" which best describes your response to the statement below? Give your first response and don't spend too much time on any one item. a. Even if I could change my sexual orientation, I wouldn't. b. I feel comfortable being a homosexual man. c. Homosexuality is as natural as heterosexuality. d. I feel comfortable in gay bars. e. Social situations with gay man make me feel uncomfortable. f. I feel comfortable discussing homosexuality in a public situation. g. I feel comfortable being seen in public with an obviously gay person. 7-point scale from 1 to 7: Strongly Disagree to Strongly Agree, Don't know, Refused to answer	1	**Hom_88A** **Hom_88B** **Hom_88C** **Hom_88D** **Hom_88E** **Hom_88F** **Hom_88G** **HomS_88** **HomSI_88** *Q88A_R-88G_R* *Q88A_NO-88G_NO*

Distal Outcomes of Vulnerability (Sexual Health Behaviors)

HIV Testing (past 12 months)	Q56a: During the past 12 months, have you been to a clinic, hospital, health department, or doctor's office to be tested for HIV? ☐0 No ☐1 Yes	2	**HIV_56A** **HIV_56AR** *Q56A*
STD Testing (past 12 months)	Q55a: During the past 12 months, have you been to a clinic, hospital, health department, or doctor's office to be tested for sexual transmitted diseases (STDs)? This does not include testing for HIV? ☐0 No ☐1 Yes	2	**STD_55A** *Q55A*
Consistent Condom Use (most recent insertive anal	Q29: Thinking about the most recent time you put your penis in the anus of another man, did you use condoms?	2	**AnR_29** **AnVagR**

with man)	□0 No □1 Yes □88 Don't know □99 Refused to answer		*Q29*
Consistent Condom Use (most recent receptive anal with man)	Q33: Thinking about the most recent time that another man put his penis in your anus, did he use condoms? □0 No □1 Yes □88 Don't know □99 Refused to answer	2	**AnR_33** **AnVagR** *Q33*
Consistent Condom Use (most recent vaginal with woman)	Q41: Thinking about the most recent time that you had vaginal sex with a female, did you use condoms? □0 No □1 Yes □88 Don't know □99 Refused to answer	2	**VagR_41** **AnVagR** *Q41*
Consistent Condom Use (most recent anal with woman)	Q46: Thinking about the most recent time that you had anal sex with a female, did you use condoms? □0 No □1 Yes □88 Don't know □99 Refused to answer	2	**AnR_45** **AnVagR** *Q45*