

Contextualizing HIV risk among Latino men who have sex with men:  
The role of cultural, spatial, and syndemic factors.

José E. Diaz, Jr.

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## **ABSTRACT**

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Latino men who have sex with men (MSM) in the United States experience a disproportionate and growing HIV burden. In spite of germinal studies and recent advances reported in the scientific literature, there is a noteworthy gap in our understanding of the factors that influence HIV transmission and acquisition among Latino MSM. The goal of this dissertation is to explore how cultural, spatial, and syndemic contexts influence two HIV-related risk behaviors among Latino MSM: serodiscordant condomless anal intercourse (SDCAI) and number of male causal partners. Specifically, I aimed to assess the how acculturation, neighborhood characteristics, and co-occurring epidemics may each contribute to HIV-related risk among Latino MSM. For this project, I utilized data from the NYCM2M study (R01 HD059729; PI: B. Koblin), a cross-sectional study of the relations among neighborhood environmental characteristics, sexual risk behaviors, anxiety and depression, and alcohol and substance use among urban MSM. First, I examined the association between indices of acculturation and the two HIV-related risk behavior outcomes, in addition to assessing if acculturation moderates the influence of sexual minority stressors and peer condom use norms on those same outcomes. The results indicated that relationships between the two sexual minority stressors and SDCAI were strongest among two groups: English-speaking and foreign-born Latino MSM, groups considered to be high and low, respectively, on acculturation. Second, I examined the ethnicity- and gay-related neighborhood correlates of the HIV-related risk behavior

outcomes. The results showed that living in areas with a higher proportion of men reporting experiences of ethnicity-based discrimination and higher levels of gay community connectedness were both associated with an increased likelihood of engaging with 5 or more casual sexual partners, while living in an area with a higher foreign-born population was associated with a lower likelihood of the same. Third, I examined both established and population-relevant syndemic conditions to assess the association between syndemic burden and the HIV-related risk behavior outcomes among Latino MSM, and assessed if outness moderated these potential relationships. The results indicated a significant, positive association between the number of syndemic conditions and SDCAI, but, upon testing for moderation, this relationship only existed among men with high levels of outness about their sexual orientation. The results also showed that having any syndemic conditions, regardless of the number, was associated with having more casual sexual partners. Overall, this dissertation highlights the importance of studying HIV-related risk behaviors through multiple contextual lenses among Latino MSM. Specifically, the results suggest a strong need to attend to how cultural factors, spatial environments, and syndemic factors may shape HIV burden among Latino MSM. Taken together, these studies provide evidence for the development of multi-level, multicomponent HIV-reducing interventions that specifically target the differing needs among subgroups of Latino MSM, rather than treating them as a single, monolithic group for study and intervention.

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## **Dedication**

To my family, for their countless sacrifices and continued love.

To my friends, for their perpetual encouragement.

And to Oliver, for being my amazing little ball of sunshine.

## **CHAPTER 1. Background and Specific Aims**

### **Specific Aims**

Latino men who have sex with men (MSM) are disproportionately affected by the burden of HIV (Centers for Disease Control and Prevention (CDC), 2015), yet there remains a dearth in our understanding of the factors that may influence their HIV risk behaviors. Latino MSM are an understudied population whose multiple stigmatized identities may uniquely constrain them in a variety of contexts. In other words, by neither being the prototypical Latino male (who is heterosexual) nor the prototypical gay man (who is White), Latino MSM may receive limited benefits and face added adversity in a context that might otherwise typically confer benefits to its members (e.g., ethnic enclaves, gay spaces; Diaz, 1999). Examining the HIV-related risk behaviors of Latino MSM devoid of a contextual lens can eschew the influence that these factors may have on their health behaviors (e.g., Halkitis, 2010).

Although the study of broader contextual factors has proven vital in increasing our understanding of population health behaviors (Diez Roux & Mair, 2010), their study remains limited in Latino MSM or rife with inconsistent findings. Consequently, our current knowledge related to HIV risk among Latino MSM is largely limited to the decontextualized individual, which may distort our ability to understand their health behaviors (McLeroy, 1998; Diez Roux, 1998). The dissertation seeks to expand our understanding of the contexts of HIV-related risk behavior among Latino MSM by examining the roles of acculturation, neighborhood environments, and syndemic burden.

Acculturation, a widely-studied factor among Latinos in particular, provides a cultural lens through which to examine HIV-related risk behaviors. The extant research has demonstrated that acculturation is related to a variety of health outcomes among Latinos overall. But, the

comparatively limited work focused on acculturation among Latino MSM has shown mixed results when examining its relationship to sexual risk behaviors (e.g., Zea et al., 2009; Mizuno et al., 2015). Similarly, studying correlates within neighborhood environments may amplify our understanding of the spatial contexts of HIV-related risk. While the study of neighborhood effects on health among Latinos overall is well-established (e.g., ethnic enclaves; Ruiz et al., 2016; Becares et al., 2012) and is growing among MSM (e.g., Frye et al., 2016; Carpiano et al., 2011), this line of research thus far has largely overlooked the experiences of Latino MSM whose existence in multiple distinct neighborhood contexts may be unique. Lastly, the larger sociocultural context of syndemic burden may contribute to HIV-related risk among Latino MSM. Recent work demonstrates the important role of syndemic conditions in increasing HIV risk among ethnically diverse samples that are predominantly comprised of White MSM (e.g., Stall et al., 2003; Kurtz, 2008). However, limited work has explored the manifestation of syndemic burden among Latino MSM, for whom additional epidemics that disproportionately impact men of color (e.g., discrimination, arrest history) may differentially shape their HIV risk patterns (Wilson et al., 2014; Kurtz, 2008).

These studies seek to place Latino MSM in context by exploring how cultural (i.e., acculturation), spatial, (i.e., neighborhoods), and syndemic factors (i.e., co-occurring risks) may be associated with the practice of HIV-related risk behavior. Specifically, the proposed dissertation project aims to place HIV-related risk behavior in context by examining how the aforementioned factors may influence serodiscordant condomless anal intercourse (SDCAI) and the number of male casual sexual partners among Latino MSM. This investigation will draw upon the unique insight of the literatures related to acculturation, neighborhoods and health, and

syndemics in efforts to contextualize and broaden our understanding of patterns of SDCAI and number of partners among Latino MSM.

Research Aim 1: Assess the relationship between acculturation factors (i.e., language use, nativity, ethnic identification) and HIV-related risk behaviors (i.e., SDCAI, number of partners), and examine the potential moderating effects of acculturation on the relationship between sexual risk correlates and HIV-related risk among Latino MSM.

- H1: Greater Anglo acculturation will be associated with more HIV-related risk.
- H2: The relationships between minority stressors (i.e., internalized homophobia, discrimination) and HIV-related risk will be strongest among those with greater Anglo acculturation.
- H3: The relationship between peer condom use norms and HIV-related risk behaviors will be strongest among those with less Anglo acculturation.

Research Aim 2: Assess the relationship between neighborhood characteristics and HIV-related risk behaviors among Latino MSM.

- H1: Greater gay-related factors (i.e., proportion of male-male households, neighborhood-level gay community connectedness, neighborhood-level outness, proportion reporting sexual orientation-based discrimination in home neighborhood) will predict less HIV-related risk.
- H2: Greater ethnicity-related factors (proportion of Latino residents, percent of foreign-born residents, and the proportion reporting racism in home neighborhood) will predict more HIV-related risk.

Research Aim 3: Explore the relationship between syndemic burden and HIV-related risk behaviors among Latino MSM.



- H1: An increasing number of syndemic conditions will predict more HIV-related risk.
- H2: This relationship will be moderated by outness; the association between syndemic conditions and HIV-related risk will be stronger among those who are less out than those who are more out.

## **Background**

In the remainder of this chapter, I provide an overview of the broad heuristic framework that facilitated the construction of this dissertation project: social ecological theory. Social ecological theory, which emphasizes the importance of understanding the multiple influences on population health, inspired a detailed focus on three contextual lenses and their corresponding theoretical domains. From there, I discuss the separate theoretical frameworks directly related to each of the empirical papers, including acculturation (Chapter 2), neighborhood effects on health (Chapter 3), and syndemic theory (Chapter 4). Further discussion of each body of literature with respect to relevant outcomes of interest can be found within subsequent chapters. In addition, I begin this section by grounding these theories in the HIV burden experienced by men who have sex with men (MSM), Latinos, and Latino MSM in particular.

### *Men who have sex with men and HIV*

There is growing evidence that gay, bisexual, and other men who have sex with men (MSM) experience disparities across a wide range of health outcomes (Diaz, Peterson, & Choi, 2008; Sullivan & Wolitski, 2008; Rhodes & Yee, 2008; Valdiserri, 2008; Cochran & Mays, 2008). Of particular note is the disproportionate burden of HIV/AIDS among MSM. According to the CDC, 44% of the 1.2 million total recorded AIDS diagnoses in the United States are attributable to male-to-male sexual contact alone (Centers for Disease Control (CDC), 2015). Moreover, it is estimated that MSM, who are thought to comprise roughly 3-5% of the adult male population in the United States (Purcell et al., 2012), account for 66% of new HIV infections (CDC, 2015). In fact, the rate of new HIV diagnoses among MSM is roughly 44 times that of other men (Purcell et al., 2012). This disproportionate burden of new HIV diagnoses may, in part, be explained by the continued rise in HIV infections among MSM, which occurs

concurrently with the diminished rates of infections among other at-risk populations (e.g., injection drug users; CDC, 2015).

Among MSM, extant research documents a number of correlates of HIV-related risk behaviors, including intrapersonal, interpersonal, social, and structural factors (Bauermeister, 2015). However, much of the existing literature largely focuses on ethnically-diverse samples composed predominantly of White MSM. Importantly, this research identifies heterogeneous risk factors for HIV transmission and acquisition between MSM of different racial/ethnic groups. This highlights the need for targeted research into the possible correlates and causes of HIV-related risk behavior among individual groups, such as Black and Latino MSM. Still, in spite of germinal work and recent advances found in the scientific literature focused on Latino MSM, they remain an understudied population with respect to their elevated HIV-related risk. As a result, the present dissertation will focus on a large sample of Latino MSM in efforts to expand our understanding of the contexts associated with HIV-related risk behaviors among this population.

### *Latinos and HIV*

Like MSM, the general Latino population is also disproportionately burdened by HIV/AIDS. Latinos overall comprise roughly 17% of the US population, yet account for approximately 23% of all new HIV infections in the US (U.S. Census Bureau, 2010; CDC, 2015). The rate of diagnosis among the general Latino population (18.7 per 100,000) is nearly 3 times greater than that of Whites (6.1 per 100,000; CDC, 2015). These high rates of diagnosis and infection among Latinos are largely driven by men, who accounted for the 85% of the over 10,000 new HIV infections in 2014 (CDC, 2015). Although a stark gender difference exists, a deeper examination of sexual behaviors among men helps to explain this sizable disparity.

## *Latino MSM and HIV*

Latino MSM comprise the overwhelming majority of new HIV infections among Latinos in the U.S. Among Latinos, 74% of new infections were attributed to male-to-male sexual behavior (CDC, 2015). As a result, Latino MSM are the third most-affected subpopulation by HIV (after White and Black MSM, respectively), with rates of infection that surpass other notable at-risk groups (e.g., injection drug users; Black heterosexual women). Importantly, the rates of HIV are also on the rise among Latino MSM. Latino MSM accounted for over 26% percent of new HIV diagnoses in the US in 2014 (CDC, 2015). New HIV diagnoses among Latino MSM have also increased by 16% in recent years (CDC, 2015), while diagnoses among White MSM have remained relatively constant (CDC, 2015).

Similar to national trends, Latino MSM in New York City have also seen a surge in new HIV infections. Recent citywide surveillance data show that Latinos accounted for the greatest number of new HIV infections among men in 2015 (NYC Department of Health, 2016), surpassing Black men for the first time. Despite these troubling trends, limited work has explored the possible drivers of this increase in HIV infections among Latino MSM. Furthermore, in spite of advances in literature for White and Black MSM, little research has explored a broad range of factors associated with HIV transmission and acquisition among Latino MSM more specifically.

### **Contextualizing health: Social ecological theory as a heuristic framework**

When it comes to understanding population health and health behaviors, context matters. Seminal work by Bronfenbrenner (1977) posited that contextualizing an individual within his or her multiple interlocking environments is vital in promoting a deeper understanding of human development. Although initially tailored to the study of human development, ecological systems theory continues to provide an important lens through which to view the contexts underlying

population health behaviors (McLeroy, 1998; Rosser et al., 2008). That is, by examining broader contextual influences, we may develop a more nuanced understanding of what may drive individual health behaviors (Halkitis, 2010). Attending to the influence of these systems shifted the focus away from strict individualism onto a more holistic study of a populations in context, where multiple overlapping environments may conspire to differentially shape their health behavior (Bronfenbrenner, 1977; Halkitis, 2010).

A major critique of public health research remains its continued reliance on the study of individual-level correlates of health behaviors (Diez Roux, 1998; Goldberg, 2012). For instance, decades of research have examined the importance of, among others, individuals' attitudes, perceptions, beliefs, and motivations in contributing to the practice of health-related behaviors. This work left the field with a limited understanding of how broader contextual influences may contribute to population health behaviors above and beyond these individual-level phenomena. However, the study of context has received increased attention in recent years. This shift was inspired, in part, by a renewed focus on the study of social inequities and health disparities (Diez Roux & Mair, 2010; Link & Phelan, 1995; Marmot, 2005) including those experienced by MSM. Although recent work emphasized the importance of larger contexts among MSM (e.g., Frye et al., 2010; Frye et al., 2016; Stall et al., 2003), much of the work on HIV within this population continues to focus on the proximal drivers of risk (e.g., sexual identity, attitudes towards condom use) while often ignoring the potential role of more distal influences (Halkitis, 2010). This is especially true of the work on Latino MSM. Although some research on HIV risk among Latino MSM assesses the impact of cultural influences (e.g., acculturation, machismo; Jarama al., 2005; Diaz, 1999), they remain a group for whom our understanding of HIV risk is largely drawn from intra- and inter-individual phenomena (e.g., alcohol use, substance use, discrimination; Bruce et

al., 2008). Overlooking larger contextual influences limits our ability to fully unpack the growing disparities which exist for this understudied subpopulation (Diez Roux & Mair, 2010; Halkitis, 2010; Halkitis, Wolitski, & Millett, 2013). As a result, our understanding of the role of context may play for this population remains scant.

Latino MSM are a unique population who sit at the intersection of an array of contexts that may differentially influence their sexual behaviors. This dissertation seeks to place their HIV risk behavior in context by exploring the cultural, neighborhood, and syndemic factors associated with two HIV-related risk outcomes (i.e., serodiscordant condomless anal sex, number of casual partners) among Latino MSM. Specifically, cultural factors help us to understand how individuals interact with the world around them. Such factors represent how the dynamic process of intercultural exchange manifests within the individual, where competing values and beliefs (from the host and familial origin cultures) surround and influence them (Schwartz et al., 2010). Understanding how such factors (e.g., acculturation) manifest at the individual level may allow us to place individual actions in their own cultural context.

Similarly, neighborhoods have long been established as a vital context in the study of population health (see Sampson, 2003). Characteristics of the neighborhoods in which individuals live provide an important contextual lens through which to examine their health behaviors (e.g., Sampson, 2003; Frye et al., 2010; Abraído-Lanza, Echeverría, & Flórez, 2016). Sociodemographic profiles (e.g., ethnic density) and subjective perceptions (e.g., neighborhood-level experiences of discrimination) of a neighborhood may help to directly shape individual health behaviors beyond individual-level phenomena. Finally, the recent emergence of syndemics as a larger sociocultural context of health has already deepened our understanding of HIV risk (e.g., Stall et al., 2003). By examining health behaviors in concert with other

interlocking social epidemics, we can begin to contextualize HIV risk as, in part, a product of many adverse life experiences disproportionately experienced by at-risk populations (e.g., childhood sexual abuse, history of arrest; Stall et al., 2003; Wilson et al., 2014). In sum, each of these contextual foci allows us the opportunity to deepen our understanding of HIV risk behavior among this understudied population.

### **Cultural Contexts: Acculturation and Health**

Cultural factors play important roles in Latino health. One such factor is acculturation, which is broadly defined as the process through which individuals adopt the values, norms, attitudes, and behaviors of a non-heritage culture as they navigate between and within cultural contexts (Berry, 2005; Abraído-Lanza et al., 2006). As a result, acculturation broadly reflects the lens through which individuals interact with the world around them. Given that its processes are continuous rather than static, understanding acculturation and its relationship to population health may facilitate an important additional understanding of an individual's larger social world (Schwartz et al., 2010). Acculturation thus allows us to explore how a context of continued intercultural exchange, and particularly how an individual may fit within that context, may be associated with adverse health behaviors among Latinos. As a result, acculturation is a widely utilized theoretical framework in the study of health behaviors and outcomes among immigrant populations, and Latinos specifically, in the US.

Researchers have criticized both the methodological and theoretical approaches to the study of acculturation. A key issue in acculturation research has been the operationalization of acculturation as a construct. For instance, studies often rely on imperfect proxies of acculturation (e.g., age at migration, generation status) or measures that primarily or exclusively focus on language use. Because acculturation is believed to be multi-dimensional in nature, simplistic

approaches that examine or privilege only one aspect of the construct (e.g., language) may undercut the complex ways in which elements of acculturation may work together to shape population health behaviors and outcomes. As a result, researchers advocate for more theory-driven approaches to the study of acculturation that attend to the interplay between acculturation, social ecological contexts, and health. For instance, research including the possible influence of social norms may further illuminate the associations between acculturation and health behaviors and outcomes (Abraído-Lanza et al., 2016). The present dissertation addresses both of these concerns by using a multiple moderation analysis to explore how acculturation interacts with intrapersonal and social contexts.

### **Spatial Contexts: Neighborhood Effects on Health**

The relationship between neighborhoods and health has received increased attention over the last 20 years. This line of research gained renewed prominence due, in part, to the need for a holistic understanding of population health that moves beyond the study of decontextualized individual-level behaviors (Diez Roux & Mair, 2010). Inspired by work on health disparities, this research explores how geographic social and physical environments are associated with differences in population health behaviors and outcomes, including diet, exercise, mental health, and mortality (Diez Roux & Mair, 2010). The research shows that neighborhoods can vary greatly on a number of social and demographic characteristics (e.g., socioeconomic status, racial/ethnic composition; Sampson, 2003), and that disadvantaged areas are often associated with poorer health (Diez-Roux & Mair, 2010; Stockdale et al., 2007). Broadly speaking, the exploration of geospatial indicators of health have allowed the field of public health the ability to tailor multi-level interventions that directly target populations affected by multiple adverse influences.



Researchers note a number of critiques regarding the study of neighborhood effects on health. Several authors have criticized the use of census-derived measures, as they often serve as imperfect proxies of the phenomena they aim to represent, particularly socioeconomic position (Diez Roux & Mair, 2010). Additionally, specifying census tracts and other administrative designations as a neighborhood may underestimate the influence of geospatial factors on the health of populations being studied. The primary concern that arises from each of these critiques is our inability to draw strong conclusions, including causal inferences when relevant, about the role of neighborhood factors. Lastly, authors have suggested the need to rely on theoretical models and, when possible, empirical data to support the examination of relevant factors. This would prevent the exploration of spurious correlations that offer little space for public health intervention.

To expand upon the nascent literature exploring the neighborhood effects on the health behaviors of Latino MSM, the present study sought to address these limitations in a number of ways. Due to the critiques of aggregated socioeconomic variables, we controlled for, rather than focused on, neighborhood poverty to account for its potential role. We then aggregated upwards individual-level responses on relevant measures (e.g., experiences of racism in their home neighborhood) to represent the average experiences of residents in the same geographic area. These theory-driven aggregates allow us to examine potential neighborhood correlates of HIV-related risk behaviors that would be missed by census-derived data, thus enhancing the potential public health impact of the research.

### **Syndemic Theory: Risk in Context**

The theory of syndemics is a prominent framework used to identify the underlying causes of increased disease burden among marginalized populations (Singer, 1994; Singer, Bullad, &

Ostrach, 2012). Syndemic theory posits that multiple co-existing conditions work together to synergistically magnify the risk for adverse health behaviors. For example, syndemic theory encourages us to examine how the elevated rates of well-documented epidemics among MSM, namely substance abuse (e.g., Woody et al., 2001), depression (Sandfort et al., 2001; Cochran & Mays, 2000), and childhood sexual abuse (Friedman et al., 2011), may work together to increase their risk for HIV transmission and acquisition. A seminal paper by Stall and colleagues (2003) expanding the application of this theory and methodology to the study of HIV risk among MSM in the US resulted in a sizable literature adopting this framework.

There are a number of critiques present in the syndemics literature. First, in the nearly 2 decades since, limited research has systematically explored additional co-occurring conditions that may function as syndemic factors. A notable exception has been the work by Parsons and colleagues (2012), who established sexual compulsivity as an additional syndemic condition of import. Still, the syndemics literature targeting MSM thus far largely overlooks conditions that may be most relevant to Black and Latino MSM (Wilson et al., 2014). Lastly, syndemics research, due to its broad focus on multiple health conditions, does not easily facilitate directed recommendations for intervention.

This dissertation seeks to address each of these concerns in concrete ways. First, we consulted the relevant literature to examine syndemic factors relevant to the population of interest that are both theory- and evidence-driven. Additionally, we included a moderation analysis in efforts to further hone our understanding of the populations for whom syndemic burden may be most relevant.

## **Summary**

In the present studies, I expand our understanding of the HIV burden experienced by Latino MSM by exploring the role that contextual correlates may play. Specifically, I explore how acculturation factors, neighborhood characteristics, and population-relevant syndemic conditions may contribute to HIV-related risk behaviors. When possible, I also explore interaction effects to strengthen our understanding of both how these factors may shape health behaviors (Chapter 2) and for whom these factors may alter risk even further (Chapter 4). Overall, this dissertation seeks to fill gaps in multiple literatures while addressing relevant critiques, when possible, in efforts to strengthen HIV prevention efforts among Latino MSM.

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## **CHAPTER 2. Acculturation as a moderator of the associations between sexual minority stressors, peer condom use norms, and HIV behaviors risk among Latino men who have sex with men.**

### **Introduction**

Latino gay, bisexual, and other men who have sex with men (MSM) in the United States are disproportionately burdened by HIV. Latinos, who comprise roughly 17% of the total population, accounted for 24% of all new HIV diagnoses in 2014 (Centers for Disease Control and Prevention, 2015). Importantly, 75% of new diagnoses among Latinos were among MSM (CDC, 2015). Moreover, the rates of new HIV diagnoses among Latino MSM continue to rise while remaining largely unchanged among Black and White MSM (CDC, 2015). In spite of the continued and growing disparity of HIV diagnoses among Latino MSM, our understanding of the drivers of HIV-related risk and infection among this population remains scant. It thus becomes vital to further our understanding of the factors that contribute to the heightened HIV burden faced by Latino MSM. We will explore the associations between indicators of acculturation, sexual minority stressors, peer condom use norms, and HIV risk among Latino MSM. We will also examine how elements of acculturation may moderate these relationships among Latino MSM. In the sections that follow, we will provide the rationale for focusing on these variables and concepts.

The role that acculturation plays in shaping Latino health is also well documented in the existing literature. Acculturation is broadly defined as the process through which individuals adopt the values, norms, attitudes, and behaviors of a non-heritage culture (Abraído-Lanza, Armbrister, Florez, & Aguirre, 2006; Berry, 2005; Schwartz, Unger, Zamboanga, & Szapocznik, 2010). These processes influence both immigrants and their non-immigrant descendants, as the latter may be indirectly influenced by their family's culture of origin (Schwartz et al., 2010).

Over time, contact with both host and native cultures may guide the development of, and changes in, the ethnic identity of both foreign- and native-born groups (Phinney, 2003; Schwartz, Montgomery, & Briones, 2006). Importantly, the sociopolitical nature of the host culture (often, the US culture) to which individuals and their family members acclimate may play a key role in their processes of acculturation and upward mobility (Schwartz et al., 2010; Portes & Rumbaut, 2001). In other words, anti-immigrant and anti-Latino sentiments may adversely impact the acculturation of Latinos, including both those who are foreign born and those born in the US (Salas, Ayon, & Gurrola, 2013; Perez, Fortuna, & Alegria, 2008). As a result, acculturation has long been considered a vital focus in the study of Latino health.

A large body of research has found an array of relationships between greater Anglo acculturation and negative health-related outcomes (e.g., obesity, depression) among the general Latino population (Abraído-Lanza, Echeverría, & Flórez, 2016; Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005). Furthermore, the association between Anglo acculturation and increased HIV risk is well-documented, but this literature predominantly focuses on heterosexual Latinos (Guilamo-Ramos, Jaccard, Pena, & Goldberg, 2005; Haderxhanaj, Rhodes, Romaguera, Bloom, & Leichter, 2015; Levy et al., 2005; Marks, Cantero, & Simoni, 1998; Meston & Ahrold, 2010). Our understanding of how elements of acculturation may shape HIV-related risk behaviors among Latino MSM, however, remains underdeveloped. For example, lower levels of Anglo acculturation have been associated with both more (Nakamura & Zea, 2010; Zea, Reisen, Poppen, & Bianchi, 2009) and less (Poppen, Reisen, Zea, Bianchi, & Echeverry, 2004) receptive condomless anal sex. Given these inconsistencies, it is vital to strengthen our understanding of the more complex role that acculturation may play in shaping HIV risk among Latino MSM.

For Latino MSM, acculturation may create distinct lived experiences that shape how both beneficial and adverse influences impact their engagement in HIV-related risk behaviors (Diaz, 1998). Due to the complex nature of acculturation, different elements of acculturation (i.e., language use, nativity status, ethnic identification) may not only exert a direct influence on HIV-related risk behaviors, but may also attenuate or potentiate the influence of other drivers of sexual risk. As a result, we must examine how processes of acculturation may differentially shape the effect of other influences on HIV-related risk behaviors among Latino MSM. To that end, we consider two notable correlates of HIV risk among Latino MSM: sexual minority stressors, and peer condom use norms.

Minority stress theory posits that exposure to prejudice, discrimination, and stigma creates a hostile environment that, absent stress-reducing factors like social support, broadly contributes to population-level health disparities (Meyer, 2003). Sexual minority stressors in particular encompass the unique multiple manifestations of stigma experienced by sexual minorities because of their sexual orientation (Meyer, 2003; Rosario, Schrimshaw, Hunter, & Gwadz, 2002). Two prominent stressors, internalized homophobia (i.e., negative feelings about one's own sexual orientation or behavior) and interpersonal discrimination (i.e., experiences of sexual orientation-based discrimination), have been shown to directly impact the well-being of sexual minority groups (Hatzenbuehler & Pachankis, 2016; Meyer, 2003).

Evidence of the direct relationship between these two sexual minority stressors and HIV risk, however, remains mixed. Although a number of studies document an association between greater levels of internalized homophobia and engagement in more sexual risk behaviors (Hatzenbuehler, Nolen-Hoeksema, & Erickson, 2008; Huebner, Davis, Nemeroff, & Aiken, 2002; Meyer & Dean, 1998; Rosario, Hunter, Maguen, Gwadz, & Smith, 2001), others find no

direct effect (Dudley, Rostosky, Korfhage, & Zimmerman, 2004; Preston, D'Augelli, Kassab, & Starks, 2007). This unclear relationship encourages an investigation of the circumstances under which internalized homophobia may influence sexual risk behaviors (Newcomb & Mustanski, 2011). In addition, experiences of sexual orientation-based discrimination have been associated with increased HIV risk behaviors among Latino MSM (Díaz, Ayala, Bein, Henne, & Marin, 2001; Mizuno et al., 2012; Ryan, Huebner, Diaz, & Sanchez, 2009). However, recent research also indicates that experiences of homophobic discrimination alone may not be as strongly linked to sexual risk as earlier studies suggest (Mizuno, Borkowf, Ayala, Carballo-Diéguez, & Millett, 2015). As a result, it becomes vital to explore factors that may explain the inconsistent relationships between internalized homophobia, sexual orientation-based discrimination, and HIV risk.

Acculturation may play a key role in shaping the unclear relationship between sexual minority stressors and HIV risk among Latino MSM. Past research documented an association between experiences of discrimination and the processes of acculturation, including an increased affiliation with one's ethnic group (Berry, Phinney, Sam, & Vedder, 2006). Additionally, past research shows that stronger ethnic identification may strengthen the relationship between overt racial/ethnic discrimination and psychological distress among Latinos (Torres, Yznaga, & Moore, 2011). Taken together, this may indicate that elements of acculturation alter how stressors, like discrimination, impact HIV risk among Latino MSM. For example, recent work among Latino MSM also found that the impact of social discrimination (i.e., both sexuality- and ethnicity-based discrimination together) on condomless anal sex was stronger for foreign-born men than among U.S. born men (Mizuno et al., 2015). Limited work, however, has

comprehensively examined how multiple indicators of acculturation may moderate the influence of sexual minority stressors on HIV risk among this population.

Another noted influence on HIV risk behaviors are peer social norms related to condom use. Social norms theory states that the perceptions of normative practice within relevant social groups will influence an individual's own behavior (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Research broadly shows that social norms are integral to a number of health-related behaviors, including alcohol and substance use (Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Latkin, Kuramoto, Davey-Rothwell, & Tobin, 2010). A large number of studies also show that perceived group norms favoring condom use are associated with lower levels of sexual risk behavior (Kelly et al., 1997; Latkin, Forman, Knowlton, & Sherman, 2003; O'Donnell, Myint-U, O'Donnell, & Stueve, 2003; Waldo, McFarland, Katz, MacKellar, & Valleroy, 2000), including among Latino MSM specifically (Bedoya et al., 2012; Carlos et al., 2010). Moreover, a meta-analysis found that norms related to safer sexual behavior may exert a stronger influence on condom use behavior among both males (compared to females) and ethnic minority (compared to White) samples (Albarracín, Kumkale, & Johnson, 2004). This may be because an individual's perceived peer group may differentially shape the influence of broader group-level norms on behavioral outcomes (Schultz et al., 2007; Linnehan, Chrobot-Mason, & Konrad, 2006; Holley, Kulis, Marsiglia, & Keith, 2006). Since Latino MSM may be integrated into both the Latino and gay communities, it thus becomes important to explore how peer norms related to condom use may influence their sexual risk behavior while also attending to factors that may shape their perceived peer groups.

Theories have long noted that the influence of norms on behavior may shift due, in part, to the processes of acculturation (Abraído-Lanza et al., 2006; Berry, 1997). For example,

evidence suggests that the strength of ethnic identification may differentially shape the influence of norms on behaviors (e.g., Holley et al., 2006). Because Latino MSM sit at the intersection between the Latino and gay communities, distinct patterns of acculturation may expose them to, and cause them to identify more strongly with, normative behaviors more prominent within their preferred community (Diaz, 1998; Bruce et al., 2008). As a result, it becomes vital to further explore how elements of acculturation may alter the relative importance of perceived peer condom use norms for some Latino MSM.

The present study seeks to examine how sexual minority stressors (i.e., internalized homophobia, sexual orientation-based discrimination), perceived peer condom use norms, and acculturation indices (i.e., language use, nativity status, ethnic identification) may impact HIV risk behaviors (i.e., serodiscordant condomless anal intercourse; number of casual sexual partners) among Latino MSM. In line with trends in recent evidence, we hypothesized that exposure to greater levels of sexual minority stressors would not be associated with increased engagement in HIV risk behaviors. Next, we hypothesized that perceptions of positive peer condom use norms would be associated with a reduction in HIV risk behaviors. In light of inconsistent evidence among Latino MSM, we hypothesized that greater levels of Anglo acculturation (i.e., more English use, U.S. born, lower ethnic identification) would each be associated with more HIV risk behavior. Further, this study will expand upon the existing literature by exploring the potential role of indices of acculturation in mitigating or potentiating the unique relationships between sexual minority stressors and sexual risk behaviors, and between peer condom use norms and sexual risk behaviors. In particular, we hypothesized that the effect of sexual minority stressors (i.e., internalized homophobia, sexual orientation-based discrimination) on our two HIV risk behavior outcomes would be strongest among those with



high Anglo acculturation (i.e., more English language use, born in the US, lower levels of ethnic identification) compared to those with low Anglo acculturation. We also hypothesized that positive peer condom use norms would be associated with less HIV risk behavior among those with lower levels of Anglo acculturation.

## **Method**

### *Participants*

The data for this study came from the NYCM2M study, a cross-sectional study that assessed how urban neighborhood environments may contribute to sexual risk behaviors, alcohol and substance use, and anxiety and depression among MSM. This report is based on the subsample 425 Latino MSM who reside in New York City. Eligible participants were assigned male at birth, at least 18 years of age, lived in NYC, spoke English and/or Spanish, reported engaging in anal sex with another man in the past three months, and were able and willing to provide informed consent to participate in the study. The present study included only those participants who self-identified as Hispanic/Latino and who reported their HIV serostatus as either positive or negative. Participants who reported an unknown HIV status were excluded from the study and subsequent analyses.

### *Procedure*

The methods utilized for study recruitment have previously been discussed in detail (Koblin et al., 2013). Briefly, gay, bisexual, and other men who have sex with men (MSM) living in New York City were recruited using a modified venue-based time-space sampling method. Starting in July 2012, men were also recruited via banner and pop-up ads placed on select websites (i.e., Facebook, BGCLive.com) and geospatial smartphone apps (i.e., Grindr).

Interested men who clicked on these ads were redirected to the study's website and subsequently screened for preliminary eligibility.

Between 2010 and 2013, the contact information for 4,998 men was collected to allow for further screening for study eligibility and the scheduling of a visit to one of two study sites in NYC. Of the 1,997 eligible men who scheduled a study site visit, 1,503 men (75%) enrolled in the study, with 1,493 participants providing complete interview data. A total of 450 Latino MSM enrolled in the study in the sample. For the present analyses, 6 were excluded due to missing data related to sexual behaviors while another 19 were excluded due unclear responses related to their HIV serostatus. The final sample for the present analysis was 425 Latino MSM.

After providing written informed consent, participants completed a set of quantitative measures via audio computer-assisted self-interviewing (ACASI). They also completed interviewer-administered questionnaires related to their birthplace, upbringing, and their social and sexual networks. Lastly, participants were offered both HIV counseling and testing. All participants received a two-way Metrocard and \$50 for their transportation costs and their time and participation in the study. The parent study received approval from the Institutional Review Boards (IRB) at the New York Blood Center, New York University, and the New York Academy of Medicine. The present analyses were approved by the IRB at Columbia University Medical Center.

### *Measures*

*Serodiscordant condomless anal intercourse (SDCAI)*: SDCAI encounters were defined as the number of condomless anal sex encounters that participants had with casual male sexual partners of opposite or unknown serostatus in the past three months.

*Casual sexual partners:* The total number of casual sexual partners consists of the self-reported count of all non-primary male partners with whom participants had any anal sex in the past three months.

*Internalized homophobia:* A 7-item measure was adapted from Herek and Glunt (1995) to measure respondents' negative thoughts and attitudes towards their attraction towards other men (e.g., "If someone offered me the chance to be completely heterosexual, I would accept the chance."). A 5-point Likert scale ranging from 1 (*Disagree strongly*) to 5 (*Agree strongly*) was used, with higher average scores indicating higher levels of internalized homophobia ( $\alpha = .86$ ).

*Lifetime sexual orientation based discrimination:* A 16-item modified version of the Heterosexist Harassment, Rejection, and Discrimination scale (Szymanski, 2006) was used to assess the cumulative burden of sexual orientation-based discrimination. Participants were asked how often in their lives they had been treated unfairly by various individuals (e.g., teachers, supervisors, friends) based on their sexual orientation identity or same-sex sexual behavior. A 5-point Likert scale ranging from "never" to "most of the time" was used, with higher average scores indicating greater frequency of sexual orientation-based discrimination ( $\alpha = .91$ ).

*Peer condom use norms:* The 7-item Norms subscale of the Sexual Risks Scale (DeHart & Birkimer, 1997) assessed peer social norms regarding safer sex practices. Respondents were asked to rate their responses to questions assessing their perceptions of friends' beliefs related to condom use (e.g., "My friends talk a lot about 'safer' sex"). A 4-point Likert scale ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*) was used. After recoding the one negatively worded item, higher average scores represented more positive condom use norms among friends ( $\alpha = .84$ ).

*Acculturation factors*

*Language use:* A modified version of the Language subscale from the Short Acculturation Scale for Hispanics (Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987) was used to assess language use and preference, including questions such as “In what language do you usually think?” and “What language do you usually speak at home?”. Responses ranged from 1 (*English only*) to 5 (*Only another language than English*). Scores were reverse coded and averaged to create an overall language-based acculturation score, with higher scores representing more English language use ( $\alpha = .83$ ).

*Nativity status:* Respondents were asked about the region of the world in which they were born with one multiple choice item, with response options including the United States, Caribbean, Puerto Rico, Other US territories, Asia, Europe, South America, Central America, Africa, Canada, and Australia/Oceania. Consistent with past research (e.g., Mizuno et al., 2015), men born within the United States were grouped together; all others, including those from US territories, comprised the foreign-born group.

*Ethnic identification:* The 12-item Multigroup Ethnic Identification Measure (MEIM; (Roberts et al., 1999) is a widely used global composite index of ethnic identity that focuses upon the exploration of cultural practices (e.g., “I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs”) and a sense of commitment to one’s own ethnic group (e.g., “I am happy that I am a member of the ethnic group that I belong to”) A 4-point Likert scale was used, ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*), which higher average scores indicating greater ethnic identification. The MEIM demonstrated strong reliability in the current sample ( $\alpha = .89$ ).

*Social support:* A 19-item shortened form of the Inventory of Social Supportive Behaviors (Barrera, Sandler, & Ramsay, 1981) was used to assess the frequency within the last 3

months that they received various types of assistance. A 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*About every day*) was used, with higher average scores indicating a greater frequency of support received ( $\alpha = .92$ ). Social support was included as a covariate in these analyses due to both its theoretical relevance and correlations with variables of interest.

### *Demographic Covariates*

The following demographic characteristics were assessed: age (in years), annual income (less than \$10,000, \$10,000 to \$19,999, \$20,000 to \$59,999, greater than \$60,000), education (completed high school/GED or less, some college or more), relationship status (single, married / partnered in the past 3 months), sexual orientation (gay, bisexual, heterosexual/other), and HIV status (positive, negative).

### *Data Analysis*

We first examined the univariate distributions of each independent and moderator variable, as well as the two outcome variables (i.e., number of SDCAI encounters, total number of partners). Each continuous predictor variable of interest was mean centered, while any dichotomous variables were recoded with a reference group of -1 (instead of 0) to facilitate the calculation and interpretation of interaction effects. Due to the overdispersed nature of the count data, the subsequent regression analyses were conducted using generalized linear modeling using a negative binomial distribution with a log link. Our model was then built in steps. First, we examined the bivariate relationships between each independent and dependent variable through a set of unadjusted negative binomial regressions. Next, we entered all of the factors that were significant at the bivariate level for either outcome into a multivariate model after controlling for demographic covariates and social support. We controlled for sociodemographic factors, including age, annual income, education, relationship status, sexual orientation, and HIV status.

We also controlled for social support in spite of its non-significant relationships due to its theoretical relevance and correlations with other significant predictors. We then simultaneously tested the possible role of the three acculturation indicators as moderators of the relationships between the three risk-related factors that were significant at the bivariate level for either outcome: internalized homophobia (model 2), sexual orientation-based discrimination (model 3), and peer condom use norms (model 4). Lastly, we combined any significant interactions found in the models 2-4 into a final model (model 5) to simultaneously test the moderating effects while controlling for other potentially overlapping moderated relationships.

## **Results**

The demographic characteristics of the sample are presented in Table 1. The sample had an average age of 31 years ( $n = 431$ ). Just over one-fifth did not complete high school ( $n = 96$ , 22%), and thirty-nine percent ( $n = 167$ ) were currently unemployed. Four out of five participants self-identified as gay ( $n = 356$ , 82.6%), and just over half of the sample reported currently being single (53%,  $n = 229$ ). Twenty-nine percent also reported an HIV positive serostatus ( $n = 126$ ). Nearly one in three participants was born outside of the United States (31%,  $n = 133$ ). Over three-fourths (79%,  $n = 338$ ) of the sample spoke a language other than English. Participants also predominantly reported high levels of identification with their ethnic identity (mean = 3.07, SD = 0.56). In the past three months, roughly twenty percent ( $n = 85$ ) reported at least one serodiscordant condomless anal sex encounter and most (84%,  $n = 361$ ) reported having at least one non-primary male sexual partner.

The bivariate associations between each of the predictor variables are presented in Table 2. These relationships support the inclusion of each indicator of acculturation as a separate items that capture distinct elements of acculturation.

## *Serodiscordant condomless anal sex encounters*

### *Bivariate analyses*

We conducted separate unadjusted negative binomial regression analyses to examine the bivariate relationships between each demographic factor, predictor, and the two HIV risk outcome variables (Table 3). In the unadjusted models, having a recent partner or being married (uIRR=0.50, 95% CI 0.36, 0.69), annual personal income (\$20-39,999 vs. less than \$10,000; uIRR=0.43, 95% CI 0.29, 0.65), higher education (uIRR=0.61, 95% CI 0.44, 0.86), more positive peer condom use norms (uIRR = 0.43, 95% CI 0.32, 0.59), and more frequent sexual orientation-based discrimination (uIRR = 0.98, 95% CI 0.96, 1.00) were each associated with fewer SDCAI encounters, while age (uIRR=1.03, 95% CI 1.01, 1.05), positive HIV serostatus (uIRR=1.96, 95% CI 1.43, 2.70), and being born in the US (uIRR=1.43, 95% CI 1.01, 2.02) were each associated with more SDCAI encounters.

### *Multivariate analyses*

Table 4 presents the multivariate negative binomial regression analyses predicting SDCAI. After controlling for age, education, annual income, sexual orientation, HIV status, and social support, model 1 demonstrated that perceiving more positive peer condom use norms (aIRR=0.40, 95% CI 0.28, 0.56), lower English language use (aIRR=0.72, 95% CI 0.56, 0.92), and, in terms of nativity status, being born outside the US (US-born = 1; aIRR=1.92, 95% CI 1.20, 3.09) were each associated with fewer SDCAI encounters.

### *Moderation: Acculturation and internalized homophobia*

In model 2, when entered simultaneously, we found that language use (aIRR=2.84, 95% CI 2.00, 4.03), nativity status (foreign-born vs. US-born, aIRR=0.22, 95% CI 0.11, 0.45), and ethnic identification (aIRR=1.62, 95% CI 1.04, 2.50) each moderated the relationship between

internalized homophobia and SDCAI. Figures 1 through 3 present a calculation of the simple slopes when -1 SD/+1 SD are entered into the equation for internalized homophobia with the values for language use (-1 SD/+1 SD), nativity status (foreign-born = -1, US-born = +1), ethnic identification (-1 SD/+1 SD), separately. For language use (Figure 1), the positive association between internalized homophobia and SDCAI exists only for those who tend to speak more English; among those who speak less English, IH was not associated with SDCAI. For foreign born men (Figure 2), higher levels of internalized homophobia were associated with engaging in more SDCAI, while the opposite (fewer SDCAI encounters) was found among US-born men. Lastly, the association between higher levels of internalized homophobia and engaging in more SDCAI encounters was stronger for men with high levels (versus low levels) of ethnic identification (Figure 3).

*Moderation: Acculturation and sexual orientation-based discrimination*

In model 3, we found that language use (aIRR=1.77, 95% CI 1.19, 2.62) and nativity status (US-born = 1, aIRR=0.38, 95% CI 0.15, 0.92) separately moderated the effect of sexual orientation-based discrimination on SDCAI. Figures 4 & 5 present a calculation of the simple slopes when -1 SD/+1 SD are entered into the equation for sexual orientation-based discrimination with the values for language use (-1 SD/+1 SD) and nativity status (foreign-born = -1, US-born = 1), separately. For those who spoke more English, there was a strong association between greater discrimination and more SDCAI encounters; no such association was found among those with lower levels of English use (Figure 4). Higher levels of discrimination were also associated with more SDCAI encounters for foreign-born men, but were associated with less SDCAI among US-born men (Figure 5).

*Moderation: Acculturation and peer condom use norms*



In model 4, we found the effect of positive peer condom use norms on SDCAI was moderated by language use (aIRR=0.60, 95% CI 0.37, 0.97) and ethnic identification (aIRR=0.30, 95% CI .16, .57). Figures 6 & 7 show the calculation of simple slopes when -1 SD/+1 SD are entered into the equation for both peer condom use norms with the values for nativity status (foreign-born = 0, US-born = 1) and ethnic identification (-1 SD/+1 SD), separately. Perceiving more positive peer condom use norms was protective for all men, but the effect was stronger for those who spoke more English (Figure 6). Men with high levels of ethnic identification were most impacted by positive peer condom use norms, with high levels of such norms acting as a strong protective factor for SDCAI. Among men with lower levels of ethnic identification, positive peer condom use norms showed no effect on their number of SDCAI encounters (Figure 7).

#### *Comprehensive moderation model*

In Model 5, we re-ran the model and entered the seven significant (out of nine tested) interaction effects simultaneously. As shown in Table 4, five of the potential seven moderation effects remained significant when added to the final model; two moderated relationships were no longer significant (internalized homophobia by ethnic identification; peer condom use norms by language use).

Among the significant interactions, a comparison of the interaction plots from the comprehensive model (controlling for all significant interactions) with those from the individual models (2 through 4) revealed no substantive differences in appearance and interpretation of the relationships, and, therefore, are not presented here.

#### *Number of casual partners*

##### *Bivariate analysis*

In the unadjusted models (Table 2), having a recent partner or being married (uIRR=0.60, 95% CI 0.47, 0.77), higher levels of internalized homophobia (uIRR=0.84, 95% CI 0.73, 0.97), and more positive peer condom use norms (uIRR = 0.81, 95% CI 0.66, 0.98) were each associated with having fewer casual partners, while only a positive HIV serostatus (uIRR=1.63, 95% CI 1.28, 2.08) was associated with having more casual partners.

#### *Multivariate analysis*

Table 5 presents the multivariate negative binomial regression analyses predicting total number of casual partners. After controlling for age, education, annual income, sexual orientation, HIV status, and social support, Model 1 demonstrated that greater internalized homophobia (aIRR=0.85, 95% CI 0.72, 1.00,  $p = .053$ ) and being born outside of the US (US = 1; aIRR=0.72, 95% CI 0.53, 0.99) were each associated with fewer casual partners.

#### *Moderation analysis: Acculturation and internalized homophobia, sexual orientation-based discrimination*

In Models 2 and 3, we see that the non-significant main effects of neither internalized homophobia nor sexual orientation-based discrimination were moderated by language, nativity status, or ethnic identification.

#### *Moderation analysis: Acculturation and peer condom use norms*

Model 4 shows that only ethnic identification moderated the relationship between positive peer condom use norms and total number of casual partners. Figure 8 shows the calculation of simple slopes when -1 SD/+1 SD are entered into the equation for both peer condom use norms and ethnic identification. For men with higher levels of ethnic identification, more positive peer condom use norms were associated with having fewer partners. For men with lower levels of ethnic identification, there was no significant association between norms and the

total number of partners. Due to the limited number of moderated relationships found, no comprehensive model was run. Final results are reported from Model 4.

## **Discussion**

In the present study, we examined factors associated with HIV risk behaviors among a large sample of Latino MSM. We first examined the main effects of two sexual minority stressors (i.e., internalized homophobia, experiences of sexual orientation-based discrimination), peer condom use norms, and indicators of acculturation (i.e., language use, nativity status, ethnic identification) on the number of SDCAI encounters and the number of male casual sexual partners. We found no significant main effect of either of the two sexual minority stressors on sexual risk. Additionally, consistent with our hypotheses, peer condom use norms were significantly associated with fewer SDCAI encounters but not with number of partners. Among the indicators of acculturation, we also found that language use and birthplace were significantly associated with our outcomes, while ethnic identification was not. Lastly, when simultaneously controlling for the tested interaction effects, we found that acculturation indices consistently moderated the associations between sexual minority stressors, peer condom use norms, and SDCAI. Importantly, only ethnic identification moderated the relationship between peer norms and number of partners.

Consistent with our hypothesis, we found that acculturation moderated the influence of sexual minority stressors on the number of SDCAI encounters. Contrary to expectations, however, we found that the associations between sexual minority stressors and SDCAI differed depending on the acculturation variable examined. For instance, sexual minority stressors were associated with an increasing number of SDCAI encounters among those with high levels of English use and among those who are foreign-born — groups considered to be high and low,

respectively, on acculturation. There are a number of potential explanations for the role that acculturation plays in shaping these relationships. For instance, the contexts in which English-speaking and foreign-born Latino MSM experience discrimination may help us understand the patterns of sexual risk behaviors that emerged among these distinct two groups. For English speaking men, sexual risk may be linked to their inclusion in, and attachment to, the gay community (Diaz, 1998), which itself is associated with both increased exposure to multiple forms of social discrimination (Diaz, Ayala, & Bein, 2004; Huebner & Davis, 2005; Ryan et al., 2009). For these men, the anxious expectation of sexual orientation-based discrimination based on past exposure may negatively impact their subjective well-being, which may lead them to engage in riskier sexual behaviors (Wang & Pachankis, 2016). Conversely, among predominantly Spanish-speaking Latino MSM, the impact of discrimination-based rejection may be mitigated by expectations surrounding homophobia and homophobic discrimination. Among these men, belief in the unavoidable nature of homophobic discrimination, perhaps influenced by their own levels of internalized homophobia, may unexpectedly build resilience against the cumulative influence of homophobic discrimination on, thereby potentially reducing their engagement in high-risk sexual encounters.

Among foreign-born men, many immigrate to the US from nations with anti-gay social and political environments (e.g., Morales, Corbin-Gutierrez, & Wang, 2013). For these men, direct experiences with the homonegative messages found in a highly discriminatory society may facilitate greater levels of sexual risk post-immigration. Specifically, moving to a region that is perceived as more gay-friendly may encourage more post-migration sexual exploration, which may lead to HIV-related risk behaviors (Bianchi et al., 2007; Egan et al., 2011). Additionally, having a diminished exposure to discrimination in gay-friendly environments may be protective

for SDCAI among foreign-born men. For example, reducing the exposure to, and internalization of, these discriminatory messages may reduce their need to engage in riskier sexual behaviors post-migration. Importantly, among US born men, greater exposure to homophobic discrimination (compared to less exposure) trends towards reducing the engagement in SDCAI. This may be due, in part, to these men concealing their sexual orientation, requiring that sexual partnering efforts be fewer and more calculated so as to avoid outing oneself (e.g., Schwitters & Sondag, 2017). Since the present study indicates that sexual minority stressors have different associations with risk based on language use and nativity status, further research is needed to examine the potential different mechanisms through which sexual minority stressors influence sexual risk behavior among both English speaking and foreign-born Latino MSM.

It is important to note that the association between nativity status and SDCAI differs when it is entered as a predictor and as a moderator variable. In particular, our results show that being born in US (a unidimensional indicator of greater Anglo acculturation) is associated with more SDCAI encounters in our first multivariate model. This coheres with our other findings showing that more English language use, an additional indicator of Anglo acculturation, is associated similarly associated with sexual risk. Only when nativity status is entered as a moderator of the association between sexual minority stressors and SDCAI do we find that foreign-born men (but not US-born men) exhibit associations between sexual minority stressors and sexual risk behaviors, and that these patterns similar to those found among predominant English speakers. These findings are broadly consistent with the literature documenting the differing influences on sexual risk behavior among US- and foreign-born Latino MSM (Mizuno et al., 2015). Broadly speaking, our findings indicate that, for US-born men, one's birthplace alone may be a driver of increased sexual risk behavior. Conversely, for foreign-born men,

nativity status may facilitate and strengthen associations between other risk factors (e.g., sexual minority stressors) and HIV-related risk behaviors. In other words, being born in the US is a risk factor for HIV risk behavior among Latino MSM, but simply being born outside of the US alone does not reduce one's risk. As a result, it becomes vital to further examine the complex role that nativity status may play in driving and potentiating HIV risk among Latino MSM.

We also found evidence that ethnic identification, but no other acculturation indices, acts as a moderator of the relationship between positive peer condom use norms and sexual risk behaviors. Among men with high ethnic identification, negative condom use norms among peers were associated with greater HIV risk, while positive norms were associated with less risk sexual behaviors. For men with low levels of ethnic identification, the relationship between positive peer condom use norms and sexual risk behaviors was not significant. These findings are intuitive and may reflect the greater influence of peer networks on Latino MSM with a stronger sense of ethnic identity. Past research shows, for instance, that ethnic identity and ethnic identification may increase the importance of peer group social norms among Latinos (Ndiaye, Hecht, Wagstaff, & Elek, 2009; Saucedo, Wiebe, & Simoni, 2016). When positive norms related to condom use are not available, highly identified Latino MSM may instead be influenced by normative elements ingrained in Latin culture. In particular, past research shows that Latino MSM may link condom use to a loss in sexual pleasure or intimacy (Balán, Carballo-Diéguez, Ventuneac, & Remien, 2009), which may be partly rooted in cultural influences that place male sexual control and pleasure, rather than HIV prevention, as paramount (Jarama et al., 2005; Parker, 1996). On the other hand, given that norms are important for highly identified Latinos, when condom use appears normative amongst one's peers, the influence of such norms may be strong. These norms may supplant the existing cultural influences by allowing men the

possibility of exploring sexual intimacy in the context of condom use. Further research should explore how ethnic identification may further shape the influence of norms related to HIV prevention efforts among Latino MSM.

Beyond the aforementioned moderation effect, we found limited evidence of any other effects on the total number of casual sexual partners. Although internalized homophobia was associated with having fewer partners at the bivariate level, the association became only marginally significant in the multivariate model. These findings indicate that Latino MSM with varying levels of internalized homophobia are engaging in sex with similar numbers of partners. This is perhaps due to the way that internalized homophobia affects Latino MSM in particular. Past research showing that LGB of color exhibit comparable levels of internalized homophobia to their White peers found that the deleterious effects of internalized homophobia (e.g., greater perceived stigma) were only found among Whites (e.g., Moradi et al., 2010). As a result, and consistent with our findings, the negative influences of internalized homophobia may still play a key role in certain HIV risk behaviors (i.e., SDCAI) but not others (i.e., number of partners). Notably, language use was not a significant influence on the number of sexual partners. This may be due in part to the ease of locating partners in high-risk sexual environments that require little direct communication (e.g., public sex venues, Bianchi et al., 2007). Further work is needed to explore how Latino MSM conceptualize having a greater number of partners, especially with the increased presence of geospatial smartphone applications that may further facilitate and normalize having an increased number of partners among MSM.

The present study provides evidence that HIV prevention efforts require tailored approaches that address the individual, interpersonal, and broader cultural influences on HIV-related risk among Latino MSM. In particular, interventions that aim to diminish the influence of

sexual minority stressors and further build perceptions of safer peer sexual norms may require deeper attention to acculturation and its indicators in efforts to reduce the HIV burden felt by Latino MSM. By attending to heterogeneity among these men through disaggregating them into relevant groups (e.g., foreign-born, predominantly English speaking), interventions at any level can target and address the multi-faceted needs of Latino MSM. For example, recent individual-level (Rhodes et al., 2017) and community-level (Rhodes, Leichter, Sun, & Bloom, 2016) interventions targeting rural Spanish-speaking, foreign-born Latino MSM with strong ties to the Latino community saw significant decreases in HIV risk behaviors. For instance, lay health advisors, particularly men within existing social networks, educated and advocated for consistent condom use among their peers to much success (Rhodes et al., 2016). An intervention of this nature may be strengthened among urban foreign-born Latino MSM by adding a stigma reduction component, which, coupled with the utilization of strong ethnic peer norms could reduce the deleterious impact of sexual minority stressors on HIV related risk among that population. Additional interventions targeting foreign-born Latino MSM are needed to further enhance HIV prevention among this population.

We also found evidence of the need for interventions directly targeting English-speaking and monolingual English Latino MSM. These men are often integrated into studies and interventions with ethnically-diverse samples, limiting our ability to target their needs in a culturally-sensitive manner. For instance, for men who may feel excluded from the Latino and gay communities, community- or multi-level interventions that create space to build community understanding may reduce HIV risk among this population. One such intervention, Project CHHANGE (Frye et al., 2017) is a multi-component, community-level intervention that provides, among other notable elements, community residents alternatives to damaging and



discriminatory actions and was found to be associated with increased HIV testing at the intervention site. By building spaces to connect with community members and perhaps family as well, this intervention may work to reduce the experiences of rejection that may underlie elements of sexual risk for these Latino MSM. Future research should further elucidate areas of need among English-speaking Latino MSM to enhance our ability to tailor targeted interventions for that population.

### *Limitations*

The results of the present study should be viewed in light of its limitations. We did not use a validated, multidimensional scale of acculturation in the present study, making it difficult to compare our results to other studies that may use such measures. However, the use of separate unidimensional factors related to acculturation is similarly well-grounded in the literature and our findings highlighted a need to consider each indicator in separately. Additionally, the study was carried out in NYC and had a large number of men who were predominantly Anglo acculturated and born in the United States. This may make these findings less generalizable to Latino MSM who recently immigrated or are monolingual Spanish speakers. Furthermore, we relied on self-reported sexual risk behavior which may have elicited social desirability bias in light of the sensitive nature of the questions asked. ACASI, which has been shown to reduce such biases, was used to improve the validity of participant responses.

The study also did not assess the use of biomedical prevention strategies such as pre-exposure prophylaxis (PrEP). PrEP received FDA approval towards the end of this study, and thus was not a prominent method of HIV prevention at the time. Still, PrEP remains underutilized by Latino MSM in particular (Bush et al., 2016), encouraging further research into how acculturation may relate to PrEP usage as a form of HIV prevention. Moreover, it is

possible that the viral loads of the men engaging in SDCAI (including non-participant partners) were suppressed, limiting the risk of HIV transmission or acquisition in those encounters. Lastly, the present study utilized cross-sectional data, thereby limiting our ability to identify how acculturation may shape any causal pathways that might exist between sexual minority stressors, condom use norms, and HIV-related risk. Future research should use longitudinal methods to prospectively explore how changes in acculturation might directly influence changes in sexual risk behaviors, as well as shape the influence of sexual minority stressors and peer condom use norms over time.

### *Conclusion*

The results from this study extend prior research on Latino MSM by examining the moderating role of acculturation on a number of potential drivers of sexual risk behavior, including sexual minority stressors (i.e., internalized homophobia, sexual orientation-based discrimination) and peer condom use norms. Importantly, we found that neither of the two sexual minority stressors exerted an influence on SDCAI until we included the moderating role of acculturation. We also found that perceived peer norms related to condom use differed in their importance based on one's level of ethnic identification. Elements of acculturation may shape the lens through which individuals view and approach the world. As a result, it vital that future research and interventions attend to the role that acculturation may play in promoting or inhibiting HIV prevention among Latino MSM.

Table 1. Sample characteristics (n = 430 unless otherwise specified)

	<b>Mean (SD) or n (%)</b>	
Age in years, mean	30.5	9.51
Education		
High School, GED, or less	96	22.3%
Some College or more	335	77.7%
Income (n=420)		
< \$9,999	139	33.1%
\$10,000-\$19,999	97	23.1%
\$20,000-\$39,999	87	20.7%
> \$40,000	97	23.1%
Employment		
Unemployed	167	38.8%
Full- or part-time	263	61.2%
Relationship Status (n=428)		
Single	229	53.5%
Married or recent partner	174	40.7%
Sexual Identity		
Gay or homosexual	356	82.6%
Bisexual	45	10.4%
Heterosexual/other	17	3.9%
HIV Status		
HIV Negative	305	70.8%
HIV Positive	126	29.2%
Social Support, mean	2.94	1.96
Language use, mean	3.84	0.93
Nativity Status		

U.S. Born	298	69.1%
Foreign Born	133	30.9%
Ethnic Identification, mean	3.07	0.56
Sexual orientation discrimination	13.1	10.11
Internalized homophobia, mean (n = 425)	1.75	0.78

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*Note:* A small minority of participants reported self-identifying as heterosexual. Heterosexually-identified men may engage in same-sex sexual behavior, including anal sex, without identifying as gay or bisexual.

Table 2. Correlations between indicators of acculturation, sexual minority stressors, and peer condom use norms.

<b>Measures</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Language Use	--					
2. Nativity Status	0.54**	--				
3. Ethnic identification	-0.24**	-0.06	--			
4. Internalized Homophobia	-0.02	-0.01	-0.05	--		
5. Sexual orientation-based discrimination	-0.06	-0.002	0.39	.098*	--	
6. Peer condom use norms	-0.08	0.01	0.23**	-0.12*	-0.01	--
7. Social support	-0.05	0.05	0.18**	0.19**	0.03	0.12*

*Note:* Spearman's correlation coefficients are presented above due to skewness present in the data.

Table 3. Unadjusted negative binomial regression models examining associations between demographic and psychosocial factors with two sexual risk outcomes.

	Serodiscordant CAI		# of Partners	
	uIRR	95% CI	uIRR	95% CI
Age	1.03***	(1.01, 1.05)	1.01	(0.99, 1.02)
Income (a)				
\$10,000-\$19,999	1.07	(0.73, 1.57)	1.32	0.98, 1.79
\$20,000-\$39,999	0.43***	(0.29, 0.65)	0.88	0.66, 1.16
> \$40,000	0.73	(0.42, 1.28)	0.98	0.65, 1.45
Education (b)				
Some College or more	0.613**	(0.44, 0.86)	0.91	(0.69, 1.19)
Relationship status (c)				
Married /recent partner	0.50***	(0.36, 0.71)	0.60***	(0.47, 0.77)
Sexual orientation (d)				
Bisexual	1.01	(0.61, 1.66)	1.16	(0.80, 1.67)
Heterosexual/other	1.35	(0.77, 2.36)	1.09	(0.69, 1.71)
HIV status (e)				
HIV positive	1.96***	(1.43, 2.70)	1.63***	(1.28, 2.08)
Social support	1.01	(0.94, 1.10)	1.04	(0.98, 1.10)
Internalized homophobia	1.12	(0.92, 1.36)	0.84*	(0.73, 0.97)
Peer condom use norms	0.43***	(0.32, 0.59)	0.81*	(0.66, 0.98)

Sexual orientation discrimination	0.98**	(0.96, 1.00)	0.999	(0.99, 1.01)
Language	0.89	(0.76, 1.05)	0.96	(0.85, 1.08)
Ethnic identity	0.83	(0.61, 1.14)	1.12	(0.97, 1.30)
US-born (f)	1.43	(1.01, 2.02)	0.85	(0.67, 1.09)

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*Note.* (a) vs. less than \$10,000; (b) vs. high school diploma, GED, or less; (c) vs. single; (d) vs. gay or homosexual; (e) vs. HIV negative; (f) vs. foreign-born  
†  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\* $p < .001$

Table 4. Multivariate negative binomial regressions of minority stressors, peer condom use norms, acculturation indices, and interaction terms with serodiscordant condomless anal intercourse encounters

	Serodiscordant Condomless Anal Intercourse				
	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR	IRR	IRR	IRR	IRR
Internalized Homophobia (IH)	1.08	0.01	1.06	1.10	0.02
Sexual Orientation (SO) Discrimination	0.80	0.99	0.89	0.99	0.92
Peer Condom Use Norms	0.40***	0.36	0.39	103.04	30.15
Language Use	0.72**	0.13	0.48	3.28	0.33
US Born <sup>a</sup>	1.92**	24.45	3.94	1.56	43.34
Ethnic Identity	0.84	0.32	0.81	25.59	7.09
Moderation					
IH x Language Use	-	2.83***	-	-	2.56***
IH x US Born <sup>a</sup>	-	0.22***	-	-	0.24***
IH x Ethnic Identity	-	1.63*	-	-	1.45
SO Discrimination x Language Use	-	-	1.04**	-	1.03*
SO Discrimination x US Born <sup>a</sup>	-	-	0.94*	-	0.94†
SO Discrimination x Ethnic Identity	-	-	1.01	-	-
Norms x Language Use	-	-	-	0.60*	0.69
Norms x US Born <sup>a</sup>	-	-	-	1.09	-
Norms x Ethnic Identity	-	-	-	0.30***	0.38**
$\Delta$ -2LogLikelihood	-126.39	-164.456	-134.79	-143.14	-179.87

Note: All models controlled for age, education, annual income, sexual orientation, HIV status, and social support.

(a) vs. Foreign born (0); † $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



Table 5. Multivariate negative binomial regressions of minority stressors, peer condom use norms, acculturation indices, and interaction terms with total number of casual partners

	Number of Casual Partners			
	Model 1	Model 2	Model 3	Model 4
	IRR	IRR	IRR	IRR
Internalized Homophobia (IH)	0.85†	0.94	0.85	0.89
Sexual Orientation (SO) Discrimination	1.01	1.01	0.92	1
Safer Sex Norms	0.84	0.81	0.82	1.36
Language Use	1.08	1.07	0.89	0.69
US Born <sup>a</sup>	0.72*	1.17	0.87	0.48
Ethnic Identity	0.93	0.9	0.74	2.87
Moderation:				
IH x Language	-	1.01	-	-
IH x US Born <sup>a</sup>	-	0.76	-	-
IH x Ethnic Identity	-	1.02	-	-
SO Discrimination x Language	-	-	1.01	-
SO Discrimination x US Born <sup>a</sup>	-	-	0.98	-
SO Discrimination x Ethnic Identity	-	-	1.02	-
Norms x Language	-	-	-	1.16
Norms x US Born <sup>a</sup>	-	-	-	1.18
Norms x Ethnic Identity	-	-	-	0.68*
$\Delta$ -2LogLikelihood	-115.176	-116.836	-119.612	-126.626

Note: All models controlled for age, education, annual income, sexual orientation, HIV status, and social support.

(a) vs. Foreign born (0); † $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Figure 1. Interaction plot of language use ( $\pm 1$  SD) by internalized homophobia ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.

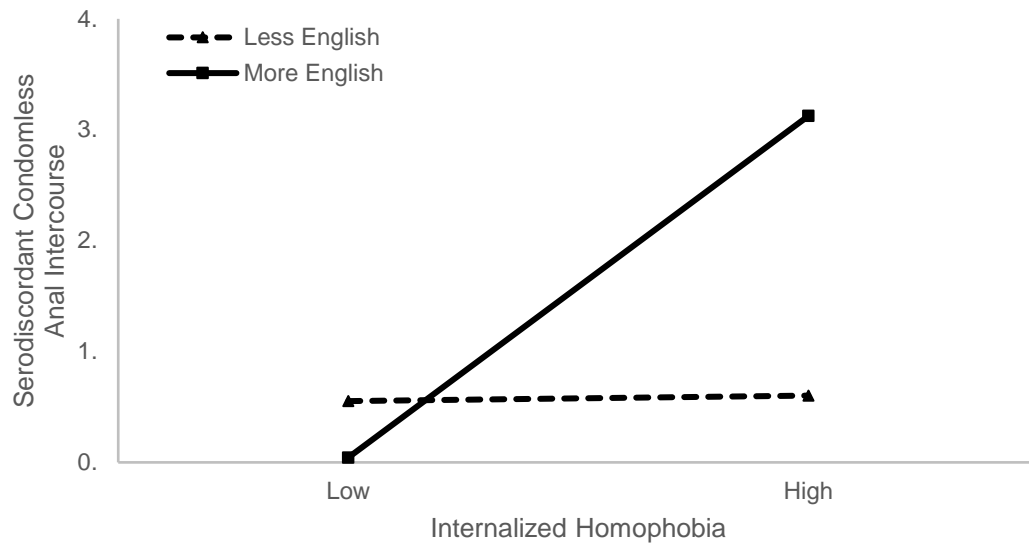


Figure 2. Interaction plot of nativity status (foreign-born vs. US-born) by internalized homophobia ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.

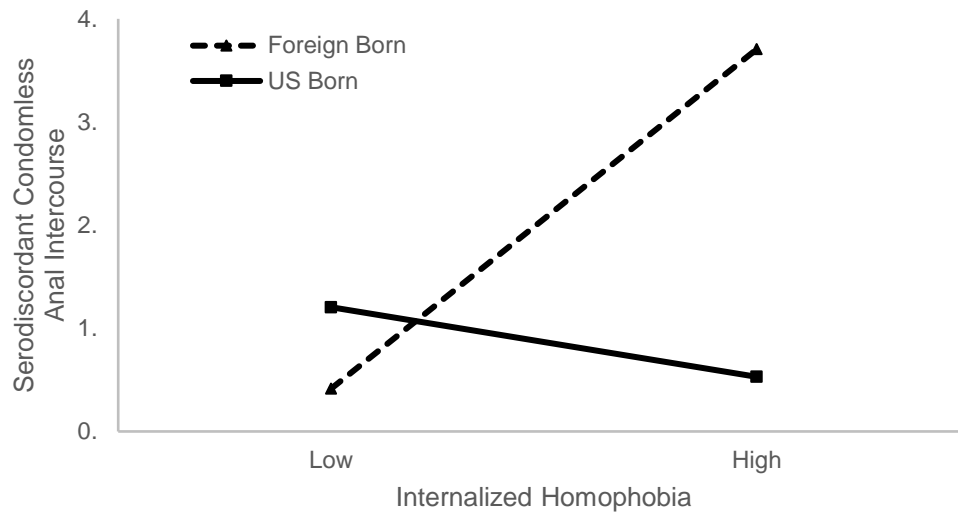
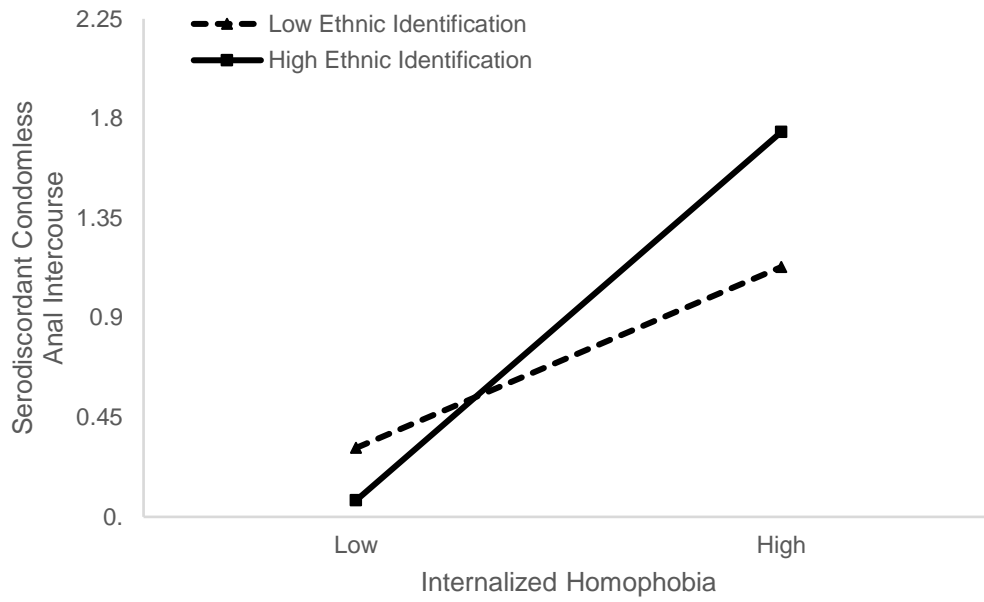


Figure 3. Interaction plot of ethnic identification ( $\pm 1$  SD) by internalized homophobia ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.



**Figure 4.** Interaction plot of language use ( $\pm 1$  SD) by experiences of sexual orientation-based discrimination ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.

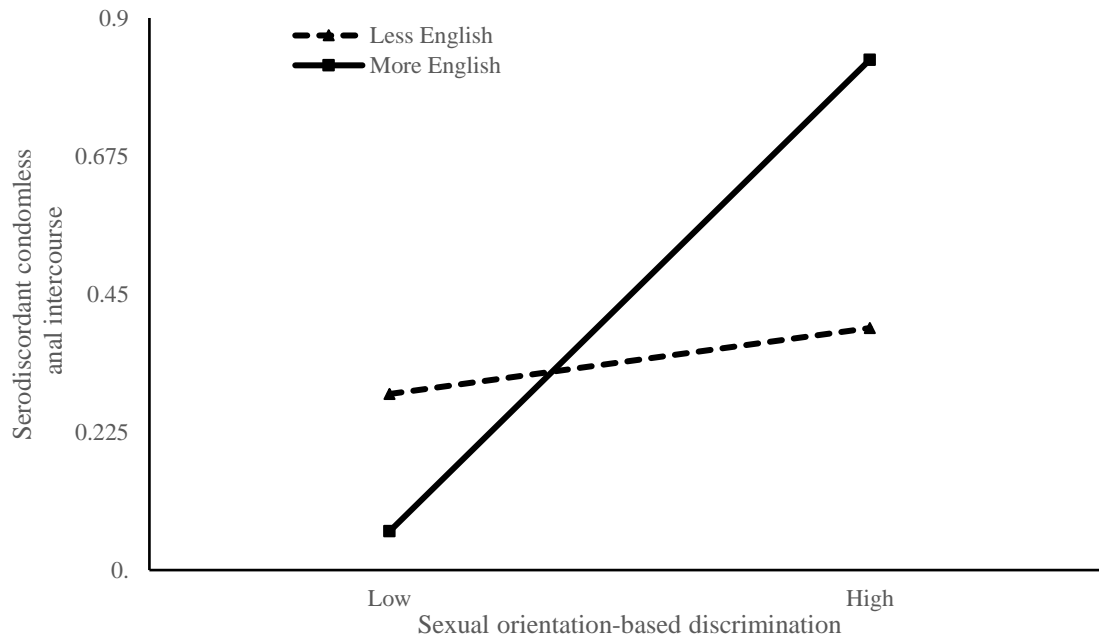
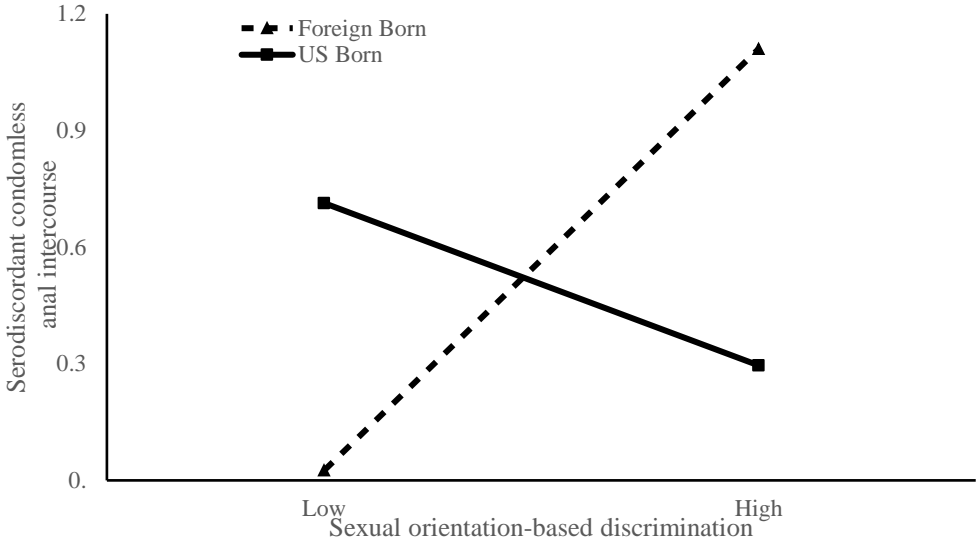


Figure 5. Interaction plot of nativity status (foreign-born vs. US-born) by experiences of sexual orientation-based discrimination ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.



**Figure 6.** Interaction plot of language use ( $\pm 1$  SD) by peer condom use norms ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.

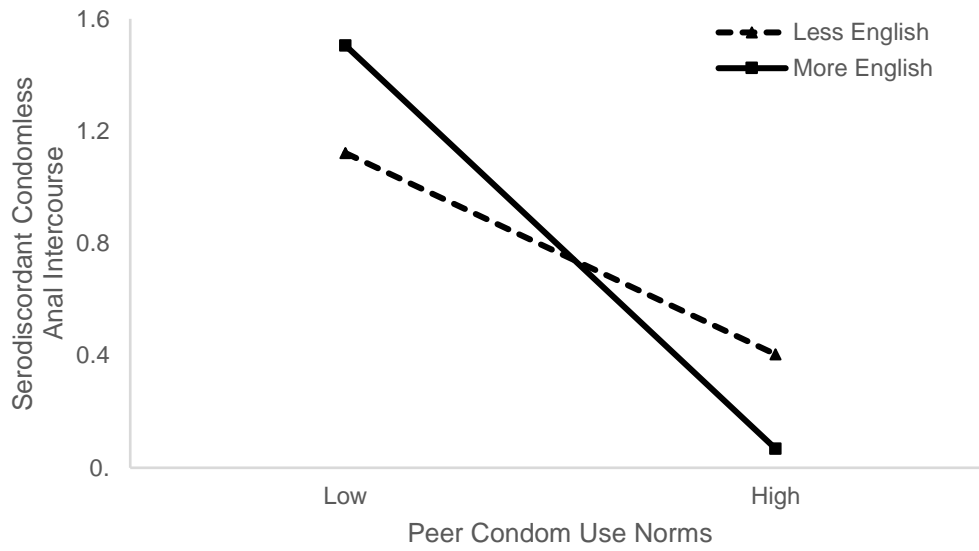


Figure 7. Interaction plot of ethnic identification ( $\pm 1$  SD) by peer condom use norms ( $\pm 1$  SD) on the number of serodiscordant condomless anal intercourse encounters, controlling for demographics, social support, and main effects.

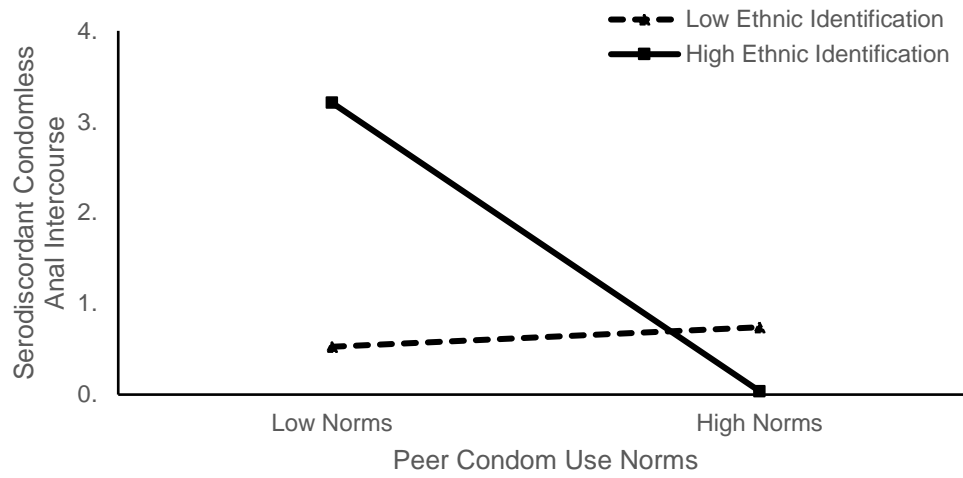
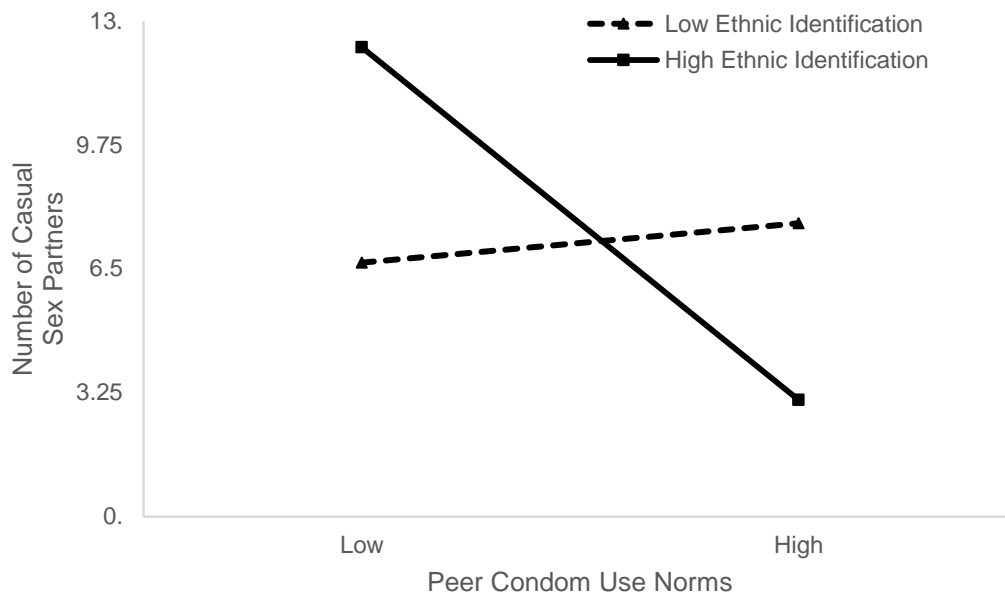




Figure 8. Interaction plot of ethnic identification ( $\pm 1$  SD) by peer condom use norms ( $\pm 1$  SD) on the number of casual sexual partners, controlling for demographics, social support, and main effects.



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## **CHAPTER 3. Ethnicity- and gay-related neighborhood-level correlates of HIV risk behavior among Latino men who have sex with men.**

### **Introduction**

Latino gay, bisexual, and other men who have sex with men (MSM) in New York City experience disproportionately elevated rates of HIV. Recent citywide surveillance data show, for example, Latinos accounted for the greatest percentage (37.7%) of new HIV infections among males, surpassing both Black (37.0%) and White men (19.2%) (NYC Department of Health, 2016). Importantly, over three-fourths (77%) of these new infections among Latinos in NYC were attributed to MSM (NYC Department of Health, 2016). These trends indicate a heightened need to enhance our understanding of the potential drivers of HIV transmission and acquisition among Latino MSM in urban environments. As a result, the present study seeks to extend our understanding of the disproportionate HIV burden experienced by Latino MSM by exploring the neighborhood-level correlates of their HIV-related risk behaviors.

A robust literature has documented associations between neighborhood contexts and population health and health behaviors (Diez-Roux & Mair, 2010). A number of theories provide a framework to enhance our understanding of how neighborhood environments may exert an influence on population health outcomes, including social disorganization theory. Social disorganization theory posits that elements of structural neighborhood disadvantage (e.g., greater ethnic heterogeneity, greater concentration of poverty) may influence population health outcomes by diminishing social ties and weakening the influence of positive norms related to adverse health behaviors (Kubrin & Weitzer, 2003; Sampson & Robert, 2003). Past research shows, for instance, that neighborhood contexts with heightened adversity (e.g., concentrated poverty) are often associated with poorer population health outcomes (Diez Roux & Mair, 2010;

Galea et al., 2007; Wen, Browning, & Cagney, 2003). However, the relationship between elements of neighborhood disadvantage and population health becomes less clear when studying Latino populations, and Latino MSM in particular.

Extant research indicates a counterintuitive relationship between disadvantage and health among Latinos in the U.S., commonly referred to as the Latino immigrant health paradox (Markides & Rote, 2015). Although findings are mixed (e.g., Roy, Hughes, & Yoshikawa, 2013), residing in areas with greater disadvantage and greater same-ethnicity presence is frequently associated with *lower* rates of all-cause mortality and adverse health outcomes among Latinos (Cagney, Browning, & Wallace, 2007; Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Ford & Browning, 2014; Inagami et al., 2006). Rather than deteriorating health, these ethnically-dense residential environments may build epidemiologic resilience to adverse health outcomes among Latinos by shaping differing patterns of health behaviors (Abraído-Lanza, Chao, & Flórez, 2005; Ruiz, Hamann, Mehl, & Connor, 2016). For example, fewer stressors, including lower exposure to racial/ethnic discrimination, may enhance residential population health behaviors and outcomes (Becares et al., 2012; Pickett & Wilkinson, 2008). Still, our understanding of the neighborhood effects of ethnic density on sexual risk behavior among Latinos, and Latino MSM in particular, remains underdeveloped. This may be because much of neighborhood literature focuses on obesity and mental health related behaviors and outcomes (see Arcaya et al., 2016, for review), leaving our understanding of broader neighborhood effects on other centrally important health behaviors (e.g., HIV-related risk) somewhat less clear.

Broadly speaking, past evidence indicates that neighborhood environments are associated with HIV transmission and acquisition, but these relationships remain understudied among MSM. For instance, past research exploring the impact of the neighborhood effects on sexual

risk behaviors has shown that that positive neighborhood environments (e.g., reduced disadvantage) are associated with less sexual risk among heterosexuals (e.g., greater condom use; (Bauermeister, Zimmerman, & Caldwell, 2011; Browning, Burrington, Leventhal, & Brooks-Gunn, 2008; Burns & Snow, 2012; Cooper et al., 2015; Kerrigan, Witt, Glass, Chung, & Ellen, 2006). The evidence among MSM, however, remains mixed. Although one study showed that greater neighborhood disadvantage was associated with less frequent condomless anal sex among a predominantly Black sample of MSM (Bauermeister et al., 2015), other studies found no significant associations with condom use among an ethnically-diverse sample, among White and Black MSM, and among a predominantly White sample of MSM, respectively (Frye et al., 2010; Frye et al., 2016; Kelly, Carpiano, Easterbrook, & Parsons, 2012). The evidence is even less clear when considering Latino MSM. As members of both the Latino and gay communities, and as potential outsiders in both groups (Bruce, Ramirez-Valles, & Campbell, 2008; Diaz, 1998), Latino MSM may reside in neighborhoods with varying levels of Latino and/or gay influences. It thus becomes vital to explore how neighborhood-level correlates that are central to Latinos and to MSM may impact sexual risk among Latino MSM.

The relationships between gay-related neighborhood factors (e.g., gay presence) and HIV-related risk behaviors have also received some attention, though the literature remains sparse and with mixed findings. Recent evidence indicates that a greater proportion of same-sex households is associated with both reduced (e.g., more consistent condom use) and increased (e.g., having 5 or more sexual partners) sexual risk among MSM (Frye et al, 2010; Frye et al., 2016). Studies characterizing neighborhood gay presence as the prominence of gay-serving institutions in an area found no direct neighborhood effect of gay presence on condomless anal sex (Kelly et al., 2012; Mills et al., 2001). However, the latter studies notably rely on enclave-

like neighborhoods which often correlate with prohibitively expensive rental prices, reducing the likelihood that Latino MSM (who experience high rates of poverty) may reside within them (Doan & Higgins, 2011). Furthermore, extant research has utilized predominantly- or exclusively-White samples, making it difficult to infer how neighborhood-level gay presence might influence sexual risk behaviors among Latino MSM.

The present study seeks to expand our understanding of the role that neighborhood environments play in shaping sexual risk behavior among Latino MSM. Specifically, based on the existing literature, we hypothesize that ethnicity-related neighborhood characteristics (i.e., higher proportion of Latino residents, higher proportion of foreign-born residents, lower proportion of self-reported ethnicity- and neighborhood-specific discrimination) would be associated with lower levels of sexual risk. Additionally, in line with research focusing on gay presence, we hypothesize that gay-related neighborhood-level characteristics (i.e., higher percent of male same-sex households, high neighborhood-level outness, high neighborhood-level gay community connectedness, low proportion reporting experiencing homophobia within their home neighborhood) would also be associated with more sexual risk behaviors.

## **Method**

This report utilized data from the NYCM2M study, a cross-sectional study that examined the relationships between neighborhood environmental characteristics and sexual risk behaviors, mental health, and alcohol and substance use among urban MSM. The present study is based on a sample of 248 Latino MSM who live in New York City. To be eligible for the study, men must have been assigned male at birth, 18 years of age or older, reside in NYC, able to communicate in English or Spanish, had anal sex with a man in the last 3 months, and willing to give informed consent to participate in the study. The present study includes only data from the subsample of



Latino MSM who reported HIV positive or HIV negative serostatus, and who resided in neighborhood areas with 5 or more study participants.

The details of the NYCM2M study recruitment have been discussed in detail elsewhere (Koblin et al., 2013). Briefly, men were approached for initial recruitment at selected venues using a modified venue-based time-space sampling method targeting neighborhoods where gay populations were prominent, emerging, or underrepresented. After screening for preliminary eligibility, potential participants were asked to provide their contact information for further screening. Advertisements were also placed on select websites (i.e., Facebook, BGCLive.com) roughly every 3 months until completion of recruitment. Four sets of 24-hour advertisements were also placed on Grindr, a geospatial smartphone application frequently used by MSM for romantic and sexual partnering between December 2012 and May 2013. When clicked, the advertisements directed interested men to the study website, where they were screened for preliminary eligibility and, if eligible, provided their contact information for further screening.

Contact information for 4,998 men was collected, and attempts were made to contact each individual to allow screening for study eligibility and scheduling study site visits for further participation. A total of 1,997 ethnically-diverse men scheduled a visit to one of two study locations in New York City. Of the eligible men, 1,503 participated in the study, with 1,493 men providing complete study data. Of the 450 Latino MSM enrolled, 25 were excluded here due to missing or unclear response data. The data from participants who lived in neighborhood areas with fewer than 5 participants were also excluded, thus limiting our ability to aggregate their responses to the neighborhood-level. This resulted in a sample of 248 Latino MSM.

After providing written informed consent, participants were guided by trained staff members through the process of identifying both their home and other relevant neighborhoods.

Using a desktop version of Google Earth, participants placed an electronic marker (“dropping a pin”) at the street intersection nearest to their home. The process for assigning the appropriate neighborhood for each participant pin dropped is described in detail below. In addition, participants completed a set of quantitative measures using audio computer-assisted self-interviewing (ACASI) and an interviewer-administered sexual network inventory. Each participant was offered voluntary HIV counseling and rapid testing. Participants who visited the study site were compensated with a two-way Metrocard for their transportation costs and \$50 for their time. The parent study was approved by the Institutional Review Boards (IRB) of the New York Blood Center, New York University, and New York Academy of Medicine. The analyses for the present study were approved by the IRB at Columbia University Medical Center.

For the present study, neighborhoods areas were identified using the 2010 Neighborhood Tabulation Areas (NTAs) classifications. NTAs are an upwards aggregation of census tracts within a given area, with each NTA requiring a minimum of 15,000 residents. NTAs are used in both the American Community Survey (ACS) and the 2010 Census, and, for the ACS, provide a geographic classification that is largely devoid of the sampling error found at the lower census tract level (NYC Department of Planning, 2016). To identify NTAs, each “pin” dropped by participants was assigned to the corresponding 2010 census tract. Residence in these census tracts was then up-aggregated to the corresponding NTAs for further analysis. To protect the confidentiality of participants, the research team jittered the pin drop locations within the same census tract. Neighborhood-level data were pulled from archival sources (i.e., American Community Survey, 2010 Census) in addition to participant self-reported responses (e.g., gay community connectedness). To aggregate individual-level responses to up to the neighborhood-level, averages or tallies were taken of each measure among participants within each NTA. All

neighborhood-level indicators were separated into quartiles to adjust for skewness in the aggregated data. Going forward, the terms neighborhood(s) and NTA(s) will be used interchangeably.

### *Measures*

#### *HIV Risk Behaviors Outcomes*

The number of casual partners was operationalized as reporting 5 or more casual (i.e., non-primary) sexual partners in the past three months. Individuals who reported less than 5 casual partners during the same timeframe were coded as zero.

Serodiscordant condomless anal intercourse (SDCAI) was defined as having any condomless anal sex with a partner of opposite or unknown HIV serostatus in the past three months. Men who did not report at least one instance of SDCAI were coded as zero.

#### *Individual-level covariates*

We assessed the following demographic characteristics, including: age (in years), relationship status (single, married or recently partnered), education (high school graduate/GED/or less, some college or more), employment status (unemployed, part- or full-time employed), sexual orientation (gay, bisexual, heterosexual/other), and HIV status (negative, positive).

#### *Neighborhood-level gay presence*

The 5-year estimates (2008-2012) from the ACS were used to calculate the proportion of male-male same-sex households in a neighborhood area. As in the recent literature, these estimates reflect gay residential presence in a given neighborhood.

#### *Neighborhood-level ethnic presence*

The 5-year estimates (2008-2012) from the ACS were also used to examine neighborhood population characteristics that may approximate a larger ethnic presence. To reflect residential elements of Latino and immigrant enclave-like neighborhoods, the percent of Hispanic residents and the percent of foreign-born residents were both assessed.

#### *Neighborhood-level social discrimination*

Two similarly worded items were used to separately assess ethnicity-based and sexual orientation-based discrimination in the home neighborhood. To examine neighborhood-level ethnicity-based discrimination, participants were asked: “Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in your home neighborhood because of your race, ethnicity, or color?” Participants who responded affirmatively were recorded as having experienced this form of discrimination in their home neighborhood. The same question was asked regarding discrimination based on participants’ sexual orientation-based. Participants who endorsed this version of the question were recorded as having experienced sexual orientation-based discrimination in their home neighborhood. The responses for each type of discrimination were separately tallied among participants in each NTA, allowing them to be aggregated up to the neighborhood level to reflect two distinct elements of the social environment: proportion experiencing neighborhood-level ethnicity-based discrimination, and proportion experiencing neighborhood-level sexual orientation-based discrimination.

#### *Neighborhood-level gay community attachment*

A modified 7-item scale was used to assess how attached men felt to New York City’s gay community (Frost & Meyer, 2012). Participants were asked to rate their agreement with statements covering their feeling part of the gay community in NYC, being proud to be a

member of the community, and feeling a bond with other sexual minority men. A 4-point Likert scale ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*) was used, with higher scores indicating greater levels of gay community attachment ( $\alpha = 0.80$ ). Though this was assessed at the individual-level, the mean responses were aggregated up to the neighborhood level to reflect mean levels of attachment felt by those in each neighborhood area.

#### *Neighborhood-level outness*

Three items were used to assess how many family members, friends, and people they know or see day-to-day know about respondents' sex with other men. A 4-point Likert scale ranging from 0 (*None*) to 4 (*All*) was used, with higher average scores across the three items representing greater levels of outness ( $\alpha = 0.74$ ). Responses were averaged and up-aggregated to the neighborhood level to reflect the average level of outness exhibited by residents in a given neighborhood area.

#### *Neighborhood-level poverty*

The 5-year estimates (2008-2012) from the American Community Survey were used to account for the proportion of households living below the poverty line in each neighborhood area.

#### *Data Analysis*

Binary logistic generalized estimating equations (GEE) with a logit link function were used to examine the associations between neighborhood correlates and our two outcomes: SDCAI and 5 or more partners. GEE was employed because allows us to control for individual-level factors (e.g., age) and explore associations between neighborhood-level correlates and our outcomes of interest, while accounting for participant clustering by neighborhood area. For these models, neighborhoods (i.e., NTAs) served as the cluster factor. The models were initially fit

with both independent and exchangeable working correlation structures due to within-neighborhood variability in measures. An independent structure assumes that all responses are unique regardless of potential similarities due to clustering, while an exchangeable structure assumes some correlation among participants within the same cluster (indicating a neighborhood-specific effect). Since no appreciable differences emerged between the two approaches, we report only the data from the models using the exchangeable working correlation structure.

We first tested the bivariate associations between each neighborhood-level correlate and our two outcome variables. To avoid possible issues of multicollinearity arising from strong correlations between multiple indicators, we then ran two separate multivariate models per outcome to assess the influence of population-relevant neighborhood-level factors on having SDCAI and having five or more partners. Each multivariate model controlled for age, relationship status, education, employment, sexual orientation, HIV status, and neighborhood-level poverty. We controlled for neighborhood-level poverty in these analyses due to its heightened relevance to neighborhood trends in population health. First, we estimated the associations between the proportion of Latino residents, percent of foreign-born residents, and the proportion reporting ethnic discrimination in home neighborhood with our sexual risk outcomes. In a second model, we estimated the associations between neighborhood-level sexuality-related variables (i.e., proportion of male same-sex households, proportion reporting homophobia in home neighborhood, neighborhood outness, neighborhood gay community connectedness) and our outcomes of interest. As stated above in the measures section, each of these variables was quartiled to correct for the skewness that emerges when aggregating the data.

Each quartiled indicator was then entered as a continuous (rather than categorical) variable, such that the results indicate the effects of a 10% change in a given indicator on the outcome variable.

## **Results**

Table 1 displays the individual-level demographic characteristics, in addition to the medians and interquartile ranges (IQR) for the neighborhood-level characteristics. In the past 3 months, roughly 20% of the sample (19.4%,  $n = 48$ ) had engaged in serodiscordant condomless anal intercourse, while 29% ( $n = 73$ ) had five or more casual sexual partners. The average age of respondents was 30.8 years; just under 83% self-identified as gay; 18% had a high school education or below; just over 37% were employed part- or full-time; and 30% were HIV positive. Poverty was prominent in respondents' home neighborhoods, with a median rate of 27.1%. The median percent of Latino residents in these neighborhoods was 48%, while the median proportion of foreign-born residents was just under 36%. The median percentage of men ever reporting ethnicity-specific discrimination in their home neighborhoods was 16%. Male same-sex households were not especially present in these neighborhoods, with a median percentage of 0.4%. However, neighborhoods exhibited high rates of gay community attachment ( $Md = 3.1$  out of 4) and outness ( $Md = 3.0$  out of 4). Lastly, the median percentage of men reporting home-neighborhood homophobia was just over 15%.

Table 2 presents the associations between ethnicity- and gay-related neighborhood-level factors with 5+ partners and SDCAI, after adjusting for age, education, sexual orientation, HIV status, and neighborhood-level poverty.

### *5 or more partners*

Among the ethnicity-related neighborhood characteristics examined, living in a neighborhood with a higher proportion of foreign-born residents was associated with a lower

likelihood of having 5 or more partners (OR = 0.70, 95% CI 0.54, 0.91) while men living in neighborhoods with higher proportions reporting experiences of ethnic discrimination in their home neighborhood were associated with a greater likelihood of having 5 or more partners (OR = 1.23, 95% CI 1.02, 1.48). There was no significant association between the neighborhood proportion of Latino residents and the likelihood of having 5 or more partners.

Among the gay-related neighborhood factors, living in neighborhoods with a high levels of gay community connectedness was significantly associated with an increased likelihood of having 5 or more partners (OR = 1.39, 95% CI 1.15, 1.69). The percent of male-male households, neighborhood levels of homophobia, and neighborhood outness were not significantly associated with the outcome.

#### *Serodiscordant condomless anal intercourse*

There were no significant associations between any of the neighborhood-level indicators and the SDCAI outcome after controlling for demographic covariates and neighborhood-level poverty.

## **Discussion**

The present study is among the first to explore the associations between the ethnicity- and gay-related neighborhood factors and sexual risk behaviors in a large sample of Latino MSM. Importantly, we found a number of neighborhood-level characteristics associated with the likelihood of having 5 or more sexual partners in the past three months. First, we found that a higher proportion of foreign-born residents was associated with a reduced likelihood of having multiple partners. We simultaneously found that higher levels of neighborhood-level ethnicity-specific discrimination were associated with a greater likelihood of having multiple partners. Next, higher levels of gay community connectedness within the neighborhood were also shown



to be associated with a greater likelihood of having multiple partners. Interestingly, we found no associations between neighborhood-level correlates and the odds of having serodiscordant condomless anal sex.

We found that living alongside a higher percentage of foreign born residents was associated with a lower likelihood of having 5 or more casual sex partners among Latino MSM. While limited work has explored this relationship, our findings are consistent with the broader literature on Latinos showing that residence in immigrant enclaves may be protective against a number of adverse health behaviors (Cagney et al., 2007; Eschbachet al., 2004; Ford & Browning, 2014; Inagami et al., 2006). Latino MSM in neighborhoods with a large foreign-born population may be limited in the availability of proximal partnering opportunities. For instance, they may live with members of their own family, which may reduce the ease of having more sexual partners. Alternatively, men in those neighborhoods may be less open about their sexual orientation and behaviors out of fear of rejection, limiting the number of accessible partners. These findings may also be due in part to the documented links between more HIV-related communication and a reduction in the number of sexual partners, both among native- and foreign-born Latino MSM (Jarama, Kennamer, Poppen, Hendricks, & Bradford, 2005; Zea, Reisen, Poppen, & Bianchi, 2009). It may be that men in these neighborhoods experience heightened concerns regarding HIV transmission and acquisition, which reduces the number of partners overall. Further research is needed to determine the mechanisms through which a greater foreign-born presence influences sexual behaviors among Latino MSM.

Residing in neighborhoods with a higher proportion of residents reporting ethnicity-based discrimination was also associated with a greater risk for engaging with multiple casual partners. This conflicts with research showing that experiences of racial/ethnic discrimination alone are

not associated with increased sexual risk among Latino MSM (Díaz, Ayala, Bein, Henne, & Marin, 2001; Mizuno, Borkowf, Ayala, Carballo-Diéguez, & Millett, 2015). However, past research has also shown that experiences of interpersonal ethnicity-based discrimination may indirectly lead to risky sexual behaviors through the pathway of greater alcohol use (Mizuno et al., 2015; Bruce et al., 2008). Our findings are consistent with the broader literature showing that environments that appear antagonistic towards one's identity group are associated with greater psychological distress among MSM (e.g., suicidal ideation; Duncan & Hatzenbuehler, 2014). This may be because the perceptions of one's home neighborhood environment as discriminatory towards one's racial/ethnic group (as opposed to individual experiences of discrimination) creates a more pervasive feeling diminished security and belonging, leading to adverse health behaviors (e.g., sex under the influence of alcohol) as a method of alleviating stress. As a result, men in these neighborhoods may engage with more sexual partners as a method of escaping the unwelcoming environment while establishing more intimate connections. Future studies are needed to unpack the role that perceptions of neighborhood-based ethnic discrimination may play on the physical, mental, and sexual health of Latino MSM.

Our results also indicated that a greater presence of Latinos in a neighborhood was not associated with sexual risk behaviors among Latino MSM. These findings are consistent with a study showing that the proportion of Latinos was not associated with sexual risk among an ethnically-diverse sample of MSM (Phillips et al., 2015). These combined findings show little evidence of a neighborhood-level Latino ethnic density effect on sexual risk behavior among MSM. In fact, it may not be that the concentration of Latinos alone that contributes to HIV risk, but rather the social disorganization found in heterogeneous neighborhoods irrespective of Latino population. One recent study found that, among Black (but not White) MSM, residence in

neighborhoods with moderate levels of ethnic heterogeneity (2nd quartile) was associated with a lower likelihood of engaging in SDCAI than living in the most ethnically diverse (Q4) neighborhoods (Frye et al., 2016). This may indicate that, rather than a simple concentration of one ethnic minority group fostering connectivity, high levels of neighborhood ethnic heterogeneity may deteriorate feelings of connectedness in a neighborhood space. Because of the nascent nature of this line of research, further work is needed to explore how ethnic heterogeneity may influence HIV transmission and acquisition risk among Latino MSM.

We also found that neighborhoods with higher levels of gay community connectedness were associated with a greater likelihood of having five or more sexual partners. Other proxies related to gay presence (i.e., percentage of male same-sex households, neighborhood levels of outness, neighborhood experiences of homophobia) revealed no significant associations. This is not consistent with earlier research which found a link between the proportion of same-sex households and sexual risk among samples of young ethnically-diverse MSM and adult White MSM, respectively (Frye et al., 2010; Frye et al., 2016). Importantly, our findings are consistent with the literature showing that gay presence alone may not drive risk, but may act through the pathway of gay-related social networks (Kelly et al., 2012). Our findings also align with individual-level research noting that Latino MSM connected to the gay community may experience unique patterns of sexual risk (Diaz, 1998; Bruce et al., 2008), and may be exposed to additional racial/ethnic discrimination from within the gay community (Ibañez, Van Oss Marin, Flores, Millett, & Diaz, 2009; Reisen, Brooks, Zea, Poppen, & Bianchi, 2013). It may be, for example that neighborhoods which have strong exposure to norms associated with the gay community facilitate a spatial environment where greater feelings of comfort allow for more proximal opportunity for sexual partnering, allowing men to engage with more sexual partners.

This greater connectedness may also expose those same men to elevated levels of racial/ethnic discrimination from within the gay community (Callander, Holt, & Newman, 2016) and, perhaps, within their own neighborhood spaces, which may promote greater sexual risk-taking. Further work is needed to unpack the complex influence of neighborhood-level gay presence on partner selection in efforts to appropriately target interventions.

We found no direct relationship between any neighborhood-level factors, including neighborhood poverty, and serodiscordant condomless anal intercourse. Our findings conflict with those of Bauermeister and colleagues (2015), who found that area socioeconomic disadvantage was associated with less SDCAI among an ethnically-diverse sample of young MSM. This study's findings may be representative of the complex nature of neighborhood influence on sexual relationships in an urban environment. Specifically, recent research shows that Latino MSM report the highest rates (compared to Black and White MSM) of incongruence between home neighborhoods and the neighborhoods where they most often had sex (Duncan, Kapadia, & Halkitis, 2014; Koblin et al., 2016). As a result, condom use and sexual partnering decisions among Latino MSM may be uniquely influenced by multiple neighborhood contexts in ways that require additional consideration. Further research is needed to explore how sexual neighborhood characteristics may be associated with sexual risk behaviors among MSM and Latino MSM in particular.

The findings from the present study have a number of implications for HIV prevention efforts among Latino MSM. We found that a greater density of foreign-born residents within a neighborhood was associated with a reduced likelihood of having more sexual partners. We additionally found that both higher proportions of men experiencing ethnic discrimination in their home neighborhoods and greater neighborhood-level gay community connectedness were

associated with having more sexual partners. Taken together, these findings highlight the need for tailored multi-level, multi-faceted interventions that attend to neighborhood-level influences that may otherwise be overlooked by individual-level interventions. For instance, interventions focused on reducing HIV transmission and acquisition among Latino MSM should target areas with a lower foreign-born presence, as the men residing in those environments may be at greater risk for engaging in HIV-related risk behaviors. Strengths-based interventions that build resilience against discrimination may benefit these men by counteracting the deleterious influence of discrimination on sexual partnering among those Latino MSM. Moreover, multi-level interventions that work to diminish anti-Latino sentiments in neighborhood and community spaces may simultaneously, and unexpectedly, reduce HIV-related risk among Latino MSM by fostering more welcoming environments. Lastly, individual- and community-level anti-stigma interventions may be most impactful in areas populated by Latino MSM with a strong connection to the gay community. These men, who may be exposed to the negative impact of race-based partner selection in the community, may benefit from efforts to build resilience and positive gay-centric social networks.

### *Limitations*

The findings of this study must be considered in light of its limitations. First, the study is cross-sectional in nature which limits our ability to infer causal directionality. However, the present study is among the first to explore the neighborhood-level correlates of sexual risk behaviors specifically among Latino MSM, which contributes to our ability to contextualize HIV-related risk behaviors among this group. Second, the time-space venue-based sampling methods employed may have facilitated self-selection biases, which would alter the characteristics of the sample in spite of efforts to account for such biases during recruitment.

Third, the requirement that men report recent anal sex with another man in the past three months reduces the generalizability of the sample, as a number of men with multiple partners may engage in other forms of sexual contact. A focus on these men is warranted, however, due to continued importance of anal sex in the transmission and acquisition of HIV. Fourth, same-source bias may be introduced by aggregating individual-level responses to represent neighborhood-level correlates. The present study sought to limit this influence by using archival data when possible. Fifth, due to the timing of data collection, the study was unable to assess the use of and adherence to PrEP, which may alter the risk associated with both of the outcomes measured. However, PrEP remains underutilized among Latino MSM, signaling that the outcomes used in this study remain primary drivers of HIV risk among that population (Bush et al., 2016). Finally, the use of NTAs may result in inaccurate representations of the noted neighborhood effects (i.e., spatial misclassification). Still, the present study contributes to the underdeveloped literature exploring possible neighborhood effects on sexual risk behaviors among Latino MSM. Further research examining the impact of these and other relevant neighborhood correlates on Latino MSM should strive for fine-grain census tract-level analyses or other more egocentric neighborhood definitions (e.g., radius around a centralized area).

### *Conclusion*

The present study is among the first to explore a number of neighborhood-level correlates related to both sexuality and race/ethnicity that may be associated with HIV risk among Latino MSM. This study shows that elements of neighborhood environments that encompass exclusion (e.g., ethnic discrimination) and inclusion (e.g., gay community connectedness) may both uniquely contribute to sexual risk behavior among Latino MSM. Moreover, we found evidence of a neighborhood-level effect of foreign-born populations on reducing HIV risk behavior. Given

the elevated rates of HIV infection and diagnosis among Latino MSM, these findings encourage further examination of the potential influence of neighborhood environments on HIV-related risk among Latino MSM. Further research should be sensitive to neighborhood-level influences that are particularly salient for Latino MSM in efforts to grow our understanding of how physical and social environments may shape their risk for HIV transmission and acquisition.

Table 1. Descriptive characteristics of study participants and their home neighborhoods.

Demographic characteristics	Mean (SD) or n (%)
5 or more partners (p3m)	73 (29.7%)
Serodiscordant condomless anal sex (p3m)	48 (19.4%)
Age in years, mean	30.8 (9.7)
Education	
High School, GED, or below	45 (18.1%)
Some College or more	204 (81.9%)
Employment	
Unemployed or retired	156 (62.7%)
Part-time or full-time	93 (37.3%)
Relationship Status	
Single	144 (57.8%)
Married or recent partner	105 (42.2%)
Sexual Identity	
Gay	206 (82.7%)
Bisexual	28 (11.2%)
Hetero/other	15 (6.0%)
HIV Status	
HIV Negative	175 (70.3%)
HIV Positive	74 (29.7%)
Neighborhood characteristics	Median (IQR)
Ethnicity-related indicators	
% Latino	0.48 (0.10, 0.71)
% Foreign-born	0.36 (0.20, 0.62)
% Ethnic discrimination	0.16 (0, 0.39)
Gay-related indicators	
% Male-male households	0.004 (0, 0.04)
% Gay community connectedness	3.10 (2.71, 3.48)
% Outness	3.0 (2.41, 3.48)
% Homophobia	0.15 (0.05, 0.44)
% Poverty	0.27 (0.08, 0.43)



Table 2. Associations between neighborhood characteristics and sexual risk behaviors among Latino MSM.

	5 or more partners		SDCAI	
	OR	95% CI	OR	95% CI
Ethnicity-related indicators				
% Latino	1.08	(0.84, 1.40)	1.37	(0.94, 1.98)
% Foreign-born	0.75	(0.56, 0.99)*	1.03	(0.66, 1.60)
% Ethnic discrimination	1.23	(1.01, 1.51)*	0.93	(0.63, 1.35)
Gay-related indicators				
% Male-male household	1.03	(0.82, 1.30)	0.86	(0.54, 1.36)
% Homophobia	0.87	(0.68, 1.11)	0.78	(0.52, 1.19)
Gay community connectedness	1.39	(1.15, 1.69)*	0.95	(0.67, 1.35)
Outness	1.01	(0.79, 1.29)	1.21	(0.84, 1.73)

*Note.* Models controlled for age, relationship status, education, employment, sexual orientation, HIV status, and neighborhood-level poverty.

†  $p < .10$

\*  $p < .05$

\*\*  $p < .01$

\*\*\* $p < .001$

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## **CHAPTER 4. Syndemic factors associated with HIV risk among Latino MSM: The moderating role of outness.**

### **Introduction**

Latinos in the U.S. are disproportionately burdened by HIV, with rates of new diagnoses nearly 3 times greater than those of Whites (Centers for Disease Control and Prevention (CDC), 2015). Latinos comprise roughly 17% of the total U.S. population, yet account for 24% of all new HIV diagnoses overall (U.S. Census Bureau, 2010; CDC, 2015). Among Latinos, three-fourths (75%) of all new HIV infections are attributed to sexual behavior between men who have sex with men (MSM; CDC, 2015). Furthermore, while new HIV diagnoses have decreased among White MSM, they have risen by 13% among Latino MSM in recent years (CDC, 2015). Despite these trends, limited work has explored the factors that contribute to HIV infection among Latino MSM when compared to research on other at-risk groups.

Syndemic theory is a prominent framework for understanding the underlying drivers of increased HIV burden among marginalized populations (Singer, 1994; Singer, Bulled, & Ostrach, 2012; Stall et al., 2003). According to syndemic theory, population-level epidemics (e.g., depression, substance abuse) work together, above and beyond their own individual influence, to increase risk for HIV acquisition and transmission. A syndemic is a set of these interconnected epidemics which thrive within, and further foster, adverse social conditions (e.g., poverty, social marginalization) and which work to adversely influence population health. A growing body research has demonstrated a synergistic relationship between trauma, mental health conditions, substance abuse, and HIV risk and infection among MSM (Halkitis et al., 2013; Halkitis et al., 2012; Mimiaga, O’Cleirigh, et al., 2015; Stall et al., 2003; Stults, Javdani, Greenbaum, Kapadia, & Halkitis, 2015; Tieu et al., 2014; Frye et al., 2015). However, such

studies often rely on predominantly White samples which limits our ability to understand how additional epidemics may amplify HIV-related risk among Latino MSM (Mustanski et al., 2017).

Latino MSM are disproportionately burdened by a number of established co-occurring syndemic conditions, including substance use (Dolezal, Carballo-Diéguez, Nieves-Rosa, & Díaz, 2000; Goldstein, Burstyn, LeVasseur, & Welles, 2016), depression (De Santis, Colin, Vasquez, & McCain, 2008; Díaz, Ayala, Bein, Henne, & Marin, 2001; Rhodes et al., 2013), and childhood sexual abuse (Arreola, Neilands, & Díaz, 2009; Arreola, Neilands, Pollack, Paul, & Catania, 2005; Doll et al., 1992; Jinich et al., 1998). Recent work proposed the inclusion of additional adverse social and structural syndemic factors (e.g., arrest, poverty) that disproportionately burden Latinos and Latino MSM specifically (Wilson et al., 2014). Latino MSM are 1.3 times more likely than White MSM to experience recent arrests (Fisher, Milroy, Reynolds, Klahn, & Wood, 2004; Lim, Sullivan, Salazar, Spaulding, & Dinunno, 2011). Latinos overall are also disproportionately affected by financial insecurity, with over one-fifth of Latinos living below the poverty line compared to only 10% of Whites (U.S. Census Bureau, 2016). Although poverty was shown to moderate the relationship between syndemic conditions and HIV risk in the general heterosexual population (Oldenburg, Perez-Brumer, & Reisner, 2014), the complex relationships that financial difficulties have with psychological distress, substance use, and trauma, among Latino MSM warrant its consideration as a contributing epidemic (Diaz, Ayala, & Bein, 2004; Diaz et al., 2001; Wilson et al., 2014).

The relationships among these adverse conditions -- childhood sexual abuse, depression, drug use, history of arrest, and financial insecurity -- and HIV-related sexual risk behaviors among Latino MSM have been well-documented in the literature. In particular, substance use (Balán, Carballo-Diéguez, Ventuneac, & Remien, 2009; Diaz & Ayala, 1999; Dolezal et al.,

2000; Fernandez et al., 2005; Mizuno, Borkowf, Ayala, Carballo-Diéguez, & Millett, 2015; Poppen, Reisen, Zea, Bianchi, & Echeverry, 2004; VanDevanter et al., 2011), depression (De Santis, Vasquez, Weidel, Watson, & Sanchez, 2009; Poppen et al., 2004), childhood sexual abuse (Lloyd & Operario, 2012; Mimiaga et al., 2009), history of arrest (Halkitis et al., 2013; Kurtz, 2013), and financial insecurity/poverty (Ayala, Bingham, Kim, Wheeler, & Millett, 2012; Halkitis & Figueroa, 2013) have each been associated with increased sexual risk behavior. Consistent with the literature, one recent study demonstrated that both established syndemic factors (e.g., depression) and additional psychosocial conditions (e.g., experiences of discrimination) work together additively to increase HIV risk among Latino MSM in the US (Martinez et al., 2016). However, in spite of recent attention to their importance, there remains little work examining how financial insecurity and criminal justice involvement may act as contributing syndemic factors among this population in particular (González-Guarda, Florom-Smith, & Thomas; Wilson et al., 2014).

Outness, or openness about one's sexual identity and/or behavior, has also been shown to have a nuanced relationship with sexual risk among MSM. For instance, greater outness to family members is associated with more condomless anal sex, while being out to more friends is associated with less (White & Stephenson, 2014). Outness is also associated with a number of syndemic conditions, including more drug use (Kipke et al., 2007; Klitzman, Greenberg, Pollack, & Dolezal, 2002; Quinn et al., 2014; Thiede et al., 2003), greater levels of depression (Pachankis, Cochran, & Mays, 2015; Riggle, Rostowsky, Black, & Rosenkrantz, 2017; c.f., Kosciw, Palmer, & Kull, 2015; Juster, Smith, Ouellet, Sindi, & Lupien, 2013), and situations that may bring about financial hardship (e.g., employment discrimination, rejection from family; Sears & Mallory, 2011; Rew, Whittaker, Taylor-Seehafer, & Smith, 2005). Since it may also

confer a number of psychological benefits (e.g., greater self-esteem; Kosciw et al., 2015), Pitpitan et al. (2016) examined outness as a potential moderator the association between the number of syndemic factors and sexual risk behaviors among a sample of Mexican MSM. They found that the association between syndemic burden and greater instances of condomless anal intercourse with a stranger was stronger among those who were less out. However, this study utilized an international sample of Latinos whose experiences related to outness may differ from those in the U.S. As a result, we seek to explore how outness may moderate the relationship between syndemic conditions and HIV-related risk among a sample of Latino MSM in the U.S.

This study examines how syndemic factors may differentially shape the practice of HIV-related risk behavior among Latino MSM. We expand upon the existing literature by exploring syndemic factors that may uniquely impact Latino MSM (Wilson et al., 2014). We hypothesized that, consistent with the literature, a greater number of syndemic conditions would be associated with more sexual risk behavior. Further, this study is the first to explore the potential moderating effect of outness on the relationship between syndemic conditions and sexual risk among Latino MSM in the U.S. Consistent with past research, we hypothesized that the relationship between syndemic conditions and HIV-related risk behaviors would be stronger for individuals with low levels of outness compared to those with high levels of outness.

## **Method**

### *Participants*

The report on the present study is based on the sample of 425 Latino MSM in New York City recruited for the NYCM2M study. To be eligible participants had to: be assigned male sex at birth, be 18 years of age or older, live in NYC, communicate in English or Spanish, report having had anal sex with a man in the last 3 months, and be willing to give informed consent to

participate in the study. For the present study, we added two additional eligibility criteria: self-reported Latino ethnic identity, and negative or positive HIV serostatus. Participants reporting an unknown HIV status were excluded due to a focus on serodiscordant sexual encounters.

### *Procedure*

The present study utilized data from the cross-sectional NYCM2M study, which explored associations between the urban neighborhood environmental characteristics and sexual risk behaviors, anxiety and depression, and the use of alcohol and other substances among MSM in NYC. The recruitment methods for this study have been discussed in detail elsewhere (Koblin et al., 2013). Briefly, men were approached for initial recruitment via physical (e.g., bars, street intersections) and online (e.g., apps, websites) means using a modified venue-based time-space sampling method aiming to recruit MSM in NYC. Face-to-face recruitment targeted neighborhoods highly visible, growing, or sparse gay populations. After screening for preliminary eligibility, potential participants were asked to provide their contact information for to screen for further eligibility by phone. Online recruitment was added in July of 2012 due to the increased prominence of romantic and sexual partnering smartphone applications among MSM. Advertisements were placed on Grindr, a geospatial smartphone app that rose to heightened prominence during study recruitment. Banner ads were also placed on other online venues frequented by MSM, including a website used predominantly by MSM of color (i.e., BGCLive.com) and a widely used social media site (i.e., Facebook). The advertisements on websites were placed every 3 months until the completion of recruitment. Ads placed on Grindr were employed for one 24-hour period once a month in December of 2012 and March through May of 2013 (Usher et al., 2014). Men who clicked on the ads were directed to the study website, where those who were interested and met preliminary eligibility criteria provided their

contact information for further screening. The research team attempted to contact each interested individual to screen them for study eligibility. Contact information for 4,998 men was collected between 2010 and 2013 to allow screening for study eligibility and scheduling study site visits for further participation.

Eligible participants were invited to visit one of two study locations in NYC. A total of 1,997 eligible men scheduled a visit at either study location, with 1,503 men (75%) enrolling in the study; 1,493 provided complete data. Of the 450 Latino MSM enrolled in that study, 425 were included in the present analysis; 19 were excluded due to unknown or missing serostatus data, while an additional 6 were missing relevant sexual behavior data.

After providing informed consent, participants met with a staff member to identify their home and social neighborhoods (via dropping a pin in Google maps, discussed in detail elsewhere) (Koblin et al., 2016) and answer questions regarding their place of birth and where they predominantly spent their childhood. Participants then completed a set of quantitative measures via audio computer-assisted self-interviewing (ACASI) and an interviewer-administered social and sexual network inventory. Lastly, they received optional HIV risk reduction counseling and HIV testing. All participants visiting the study site received a two-way Metrocard for their transportation costs and \$50 for their time and participation in the study. The parent study received approval from the Institutional Review Boards (IRB) at the New York Blood Center, the New York Academy of Medicine, and New York University, while the present study was approved by the IRB at Columbia University Medical Center.

### *Measures*

#### *Demographic characteristics*

The following demographic characteristics were included in the present analysis: age in years, relationship status (single, partner in past 3 months, married to male or female partner), education (up to a high school degree/GED, some college or above), sexual orientation (gay, bisexual, queer, or heterosexual/other) and HIV status (negative, positive).

#### *HIV-Related Risk Behaviors*

HIV-related risk behaviors were assessed as the number of serodiscordant condomless anal intercourse (SDCAI) encounters, and the total number of casual sexual partners. SDCAI was defined as number of encounters with partners of opposite or unknown serostatus with whom a participant engaged in insertive or receptive anal intercourse without a condom. The total number of casual sexual partners consists of the self-reported count of all casual male sexual partners had in the past 3 months. The use of pre-exposure prophylaxis (PrEP) was not included in the present study as it received approval from the Federal Drug Administration towards the end of data collection.

#### *Syndemic Factors*

*Childhood Sexual Abuse:* Childhood sexual abuse (CSA) was assessed as having any sex under the age of 12 or any unwanted sex between the ages of 12 and 16 years old. Participants who reported at least one of these two instances were recorded as having experienced CSA (Williams et al., 2015).

*Depression:* We used a modified version of the PRIME-MD Patient Health Questionnaire (PHQ-9; Kroenke & Spitzer, 2002) to assess depressive symptomology in the past 3 months. Participants were asked if they had experienced a range of symptoms (e.g., suicidal thoughts) over a 2-week period in their lifetime. Those who said yes were subsequently asked if this 2-week period occurred in the past 3 months. Responses to each question were summed, with

individuals who reported yes to experiencing 5 or more symptoms within the last 3 months being classified as having a recent history of depressive symptomology ( $\alpha = .84$ ).

*History of Arrest:* Respondents were asked about their lifetime history of arrest with the single, dichotomous item: “Have you ever been arrested (including a time you may have been arrested but not sentenced, sentenced and incarcerated or spent time in state prison)?” Those who responded positively (“yes”) were classified as having any history of arrest.

*Hard Drug Use:* Due to disproportionately high rates of stimulant and heroin use among Latino MSM (Goldstein et al., 2016), respondents were separately asked to indicate if they had used an array of substances in the past 3 months, including: cocaine, crack, methamphetamine (crystal, speed, tina), heroin, prescription opioids (e.g., Vicodin), and club drugs (e.g., MDMA, ecstasy) in the past 3 months. Participants reporting the use of at least one of the listed substances drug being classified having a recent hard or illicit drug use (Mimiaga, Biello, et al., 2015).

*Financial insecurity:* To assess the continued exposure to financial insecurity, participants were asked: “In the last 3 months, how often did you NOT have enough money in the household for rent, food, or utilities (for example, gas, electric, phone)?” A 4-point Likert scale was used, ranging from 0 (*Never*) to 3 (*Very often*). Participants who reported not being able to meet their financial needs either fairly often (2) or very often (3) were coded as experiencing financial insecurity.

#### *Syndemic variable*

We calculated a count based on the number of syndemic conditions experienced by participants which yielded a range from 0 to 5. These conditions included: CSA, depression, history of arrest, hard drug use, and financial insecurity.



### *Moderator*

*Outness:* We measured outness with three items which asked respondents how many of their family members, friends, and people they know or see day-to-day know about their sex with other men. Responses ranged from 0 (*None*) to 4 (*All*), with higher average scores across the three items representing greater levels of outness ( $\alpha = .74$ ).

### *Data Analysis*

First, we calculated the prevalence of each of the syndemic conditions. We then used logistic and negative binomial regressions where appropriate to explore the bivariate associations among each of the syndemic conditions, as well as the bivariate associations between each syndemic condition and the two outcome variables (i.e., SDCAI, total number of casual partners). We then conducted separate negative binomial regressions to evaluate whether two HIV-related risk outcomes varied as a function of the presence of a greater number of syndemic conditions while controlling for demographic covariates (i.e., age, education, relationship status, sexual identity, and HIV status) and outness. Finally, we entered the interaction term in the two final models after controlling for covariates to determine whether outness moderated the relationship between syndemic conditions and each outcome variable.

## **Results**

### *Sample Characteristics*

Demographic characteristics are shown in Table 1. The mean age of our sample ( $n = 431$ ) was 31 years. Approximately one-fourth of participants has some high school education or less ( $n = 96, 22\%$ ). Thirty-nine percent ( $n = 167$ ) were unemployed. Slightly over half of participants reported being single ( $n = 229, 53\%$ ). Seventeen percent were non-gay identified ( $n = 75$ ). Twenty-nine percent ( $n = 126$ ) reported previously testing positive for HIV. One in five

participants (n = 85) engaged in serodiscordant condomless anal sex in the past three months, and 84% (n = 361) reported having at least one non-primary male sexual partner in the past three months.

Our sample reported elevated rates of a number of syndemic conditions. Sixty-four percent (n = 274) reported a lifetime history of childhood sexual abuse. Twenty-eight percent (n = 121) reported a depressive episode in the past three months. One-fourth of participants reported a lifetime history of arrest (n = 108, 25%). Thirty percent of participants (n = 129) reported using hard drugs in the past three months. Sixteen percent (n = 70) reported experiencing financial insecurity fairly or very often.

The count of the number of syndemic conditions revealed that approximately 1 in 5 (n = 87, 20%) reported no syndemic conditions, while 124 (29%) reported one condition, 123 (29%) reported two conditions, 66 (15%) reported three conditions, and 31 (7%) reported four or five conditions.

### *Bivariate Analyses*

Table 2 shows the bivariate associations among syndemic conditions and the outcome variables. Seven of ten potential associations among syndemic conditions were positive and statistically significant. There was no statistically significant association between depression and history of arrest or depression and hard drug use. Serodiscordant condomless anal intercourse was significantly associated with three syndemic conditions: depression, history of arrest, and hard drug use. Total number of partners was significantly associated only with history of arrest.

### *Multivariate Analyses*

#### *Serodiscordant Condomless Anal Intercourse*

Results of the unadjusted and adjusted negative binomial regression models predicting number of SDCAI encounters are presented in Tables 3 & 4. For SDCAI (Table 3), the unadjusted models showed that age (uIRR=1.03, 95% CI 1.01, 1.05) and an HIV-positive serostatus (uIRR=1.96, 95% CI 1.43, 2.70) were associated with engaging in more SDCAI encounters, while a higher education (uIRR=0.61, 95% CI 0.44, 0.86) and having a spouse or recent same-sex partner (uIRR=0.5, 95% CI 0.36, 0.69) was associated with fewer SDCAI encounters.

The multivariate model controlling for demographic factors and outness was statistically significant,  $\chi^2$  (11, N = 425) 77.73,  $p < .001$ . In the model, the main effects of age (aIRR=1.02, 95% CI 1.00, 1.04), HIV-positive serostatus (aIRR=1.51, 95% CI 1.02, 2.24), and having a spouse or recent same-sex partner (aIRR=0.60, 95% CI 0.42, 0.86) on engaging in SDCAI remained significant.

The likelihood for engaging in more SDCAI encounters was greatest for those with a higher number of syndemic conditions. Compared to participants reporting zero syndemic conditions, those with 1 condition had nearly 2.2 times the likelihood of engaging in a greater number of SDCAI encounters (aIRR=2.18, 95% CI 1.19, 4.02), those with 2 conditions had 2.9 times the likelihood (aIRR=2.91, 95% CI 1.60, 5.28), those with 3 conditions had 3 times the likelihood (aIRR=3.05, 95% CI 1.58, 5.91), and those with four or more conditions had 7 times the likelihood (aIRR=7.03, 95% CI 3.45, 14.34).

#### *Total Number of Casual Partners*

For total number of casual partners (Table 3 & 4), both the unadjusted and adjusted models showed that being HIV-positive [uIRR=1.63, 95% CI (1.28, 2.08); aIRR=1.65, 95% CI (1.27, 2.14)] was associated with having more partners, while being married or in a recent

relationship with a man [uIRR=0.63, 95% CI (0.50, 0.80); aIRR=0.64, 95% CI (0.50, 0.81)] was associated with having fewer partners.

We found that having any syndemic conditions (versus none) was significantly associated with having more partners. However, this relationship was not indicative of an additive syndemic effect. As the number of syndemic conditions increased, the likelihood of having more partners remained similarly elevated. Compared to participants reporting zero syndemic conditions, those with 1 condition (aIRR = 1.50, 95% CI 1.05, 2.13), 2 conditions (aIRR = 1.55, 95% CI 1.09, 2.20), or 3 (aIRR = 1.51, 95% CI 1.01, 2.27) each had roughly 1.5 greater likelihood of having a greater number of casual partners, while having 4 or more conditions was marginally significantly associated with having 1.6 times the likelihood of having more partners (aIRR = 1.60, 95% CI 0.98, 2.63,  $p < .10$ ). The multivariate model was statistically significant,  $\chi^2(11, N = 357) 39.00, p < .001$ .

#### *Outness as a Moderator*

For SDCAI, there was a significant interaction between outness and tally of syndemic conditions. Specifically, outness moderated the relationship between both 3 syndemic conditions (aIRR = 7.46, 95% CI 2.65, 21.61) and 4 or more syndemic conditions (aIRR = 4.20, 95% CI 1.70, 10.33) and SDCAI. Figure 1 presents simple slopes estimated by entering low and high outness (-/+ 1 SD) and low and high syndemic tallies (1 condition / 4 or more conditions) into the model equation. The results show that the positive relationship between a greater number of syndemic conditions and serodiscordant condomless anal sex exists only for those with high levels of outness. A greater number of syndemic conditions is not associated with an increase in SDCAI among those with low levels of outness.

For total number of partners, no significant interaction was found between outness and tally of syndemic conditions.

## **Discussion**

Previous research has documented a relationship between syndemic factors and HIV-related risk behavior among MSM. In this study, we found evidence that supports the application of syndemic theory to predict HIV-related risk among Latino MSM in the U.S. By exploring additional relevant syndemic factors (i.e., financial insecurity) the present study confirms and extends some of the findings shown in previous research exploring syndemic burden among Latino MSM.

Consistent with the broader literature, we found that a greater number of syndemic factors was associated with more serodiscordant condomless anal intercourse (SDCAI) encounters among Latino MSM. This association between syndemic conditions and SDCAI specifically was previously shown in international samples of Latino MSM (Mimiaga, Biello, et al., 2015) and in ethnically-diverse samples of MSM in the US (Parsons, Rendina, Moody, Ventuneac, & Grov, 2015), but limited work has explored it among Latino MSM in the US. Syndemic burden may facilitate more SDCAI encounters through the influence of the attributional processes of fatalism. Fatalism, or the belief that all things are predetermined and therefore inevitable, may especially reduce risk reduction efforts among HIV-negative men due to heightened feelings of helplessness to prevent the acquisition of HIV (Diaz & Ayala, 1999). Research has shown, for instance, that high levels of fatalism are associated increased sexual risk behaviors (Roberts, Roberts, & Chen, 2000). Additionally, a recent intervention aimed at improving consistent condom use also showed that increasing HIV knowledge reduced the levels of fatalism among Latino MSM (Rhodes et al., 2017). However, we must take caution to note

that fatalism does not manifest solely due to a lack of disease-related information. For instance, a robust literature has found that greater levels of fatalism and fatalistic thought (e.g., external locus of control) have also been associated with greater depression (Kalichman, Kelly, Morgan, & Rompa, 1997; see Benassi, Sweeney, & Dufour, 1988 for review). It may be, for example, that greater levels of depression bring forth fatalistic beliefs which in turn shape both serosorting and condom using behaviors. Further research is needed to unpack the role that fatalism might play in potentiating the relationship between syndemic burden and sexual risk behaviors.

In line with the existing literature, we found a significant association between syndemic conditions and the total number of casual partners. Having any number of syndemic conditions (compared to none) was associated with a greater likelihood of having more partners, but the likelihood did not increase as the number of conditions increased. This indicates an absence of the expected additive nature of syndemic burden on total number of partners. The differences in findings may be due in part to alternative conceptualizations of syndemics in the respective analyses. For example, unlike the present study, Martinez and colleagues (2016) explored the syndemic nature of sexual orientation-based discrimination. In the context of syndemic theory, discrimination has been associated with more sexual partners (Mustanski et al., 2016) and shown to strengthen the syndemic effect on sexual risk behaviors (Herrick et al., 2012). As a result, experiences of sexual orientation-based discrimination may, in part, potentiate the relationship between syndemic burden and the number of partners. Still, some evidence has shown that the impact of syndemic burden may be weaker among MSM of color compared to their White counterparts in relation to number of sexual partners (Mustanski et al., 2016). This may be due to lower levels of risk factors (e.g., substance use) compared to White MSM, coupled with a need further explore novel syndemic factors that may play role in shaping syndemic burden among

MSM of color. This highlights the need for further examinations of the role that multiple adverse epidemics play in driving various elements of HIV risk, especially among Latino MSM.

This study also expands upon this literature by considering the additive effect of additional epidemics that disproportionately affect Latino MSM, including financial insecurity. Latino MSM experience high rates of poverty, which have in turn been linked to a number of co-occurring syndemic conditions. Frequent financial insecurity was significantly associated with each of the other four syndemic factors, which supports both early and recent calls to consider its vital contribution to the production of syndemic burden among MSM of color (Singer, 1994; Wilson et al., 2014). Financial insecurity was also marginally associated with an increased number of casual partners, but not associated with SDCAI. Still, when including financial insecurity as a syndemic factor we found a positive, additive relationship between syndemic conditions and SDCAI. Financial insecurity may thus act in tandem with other syndemic factors to increase HIV-related risk in a number of ways. For example, higher levels of financial insecurity may encourage men to engage in exchange sex, survival sex, or sex under the influence of drugs/alcohol, which may place them at increased risk of HIV transmission or acquisition (Ayala et al., 2012). Financial hardship has also been linked to psychological distress, which may in turn shape the manner in which men approach sexual encounters with other men. Further research is needed to explore how financial insecurity and hardship may additively contribute to syndemic burden among Latino MSM.

Similar to previous studies (e.g., Herrick et al., 2012), we also found that the use hard drugs (e.g., stimulants, opioids), rather than polysubstance use, might contribute to syndemic burden. The inclusion of polysubstance use works under the tested assumption that individuals who partake in multiple drugs within a given timeframe may also have elevated HIV-related risk.

However, the study of polysubstance use often centralizes upon high rates of marijuana use in addition to other drugs (Tomczyk, Isensee, & Hanewinkel, 2016). When compared to White MSM, research has shown that Latino MSM have lower rates of overall substance use, including lower rates of marijuana use in particular, but higher rates of harder drug use (Newcomb, Birkett, Corliss, & Mustanski, 2014; Goldstein et al., 2016). As a result, a focus on marijuana via polysubstance use among Latino MSM may mask the influence of other more frequently used substances among this population. As a result, future research should examine hard drug use in lieu of polysubstance use among populations for whom such patterns of use are relevant, including Latino MSM. Centralizing our focus on population-relevant epidemics will enhance our understanding syndemic burden among these groups.

In spite of a robust literature on syndemic burden and HIV risk, little is known of the factors that may moderate the syndemic effect on HIV-related risk. Consistent with one study among MSM in Tijuana, Mexico (Pitpitan et al., 2016), we found that outness acts as a moderator of the positive relationship between syndemic conditions and HIV-related risk. The previous study found that the effect of added syndemic burden was attenuated by high levels of outness. Contrary to their findings and our own hypothesis, we found that the syndemic effect was significant only for those with *high* levels of outness, with no significant relationship present among those with low levels of outness. The present study examined outness to specific targets including family and friends, two groups which have been differentially associated with sexual risk behaviors (White & Stephenson, 2014). As a result, the present operationalization of outness may have factored in additional elements that are not captured in more general measures of outness. While outness has been linked to a number of positive outcomes, research has also shown that higher levels of outness are associated with factors that may increase HIV-related risk



behaviors, including drug use (Wilkerson, Noor, Breckenridge, Adeboye, & Rosser, 2015). It is also important to consider how the benefits and risks related to outness may manifest, both in general and among Latino MSM specifically.

Although coming and being out may confer positive benefits, some studies have shown that the disclosure of one's sexual orientation is not universally positive (e.g., Schrimshaw, Siegel, Downing, & Parsons, 2013). For instance, being or coming out exposes sexual minorities to possible rejection from family and friends, which is associated with a depression, substance use, and condomless sex (Ryan, Huebner, Diaz, & Sanchez, 2009). In fact, fear of these negative reactions may actively prevent the disclosure of stigmatized sexual identities and behaviors (Schrimshaw, Downing, & Cohn, 2018). As a result, lower levels of outness among men who experience multiple syndemic conditions may prevent exposing those men, who are already burdened by a number of challenges, to an additional layer of stigma and rejection.

Recent research has also shown that the positive psychological benefits of outness may only extend to both high-SES individuals (McGarrity & Huebner, 2014) and to White, but not Latino, MSM (Villicana, Delucio, & Biernat, 2016). As a result, while high levels of outness may expose Latino MSM to similar levels of risks as White MSM (e.g., more discrimination), it may not confer the same protective elements to counteract those risks among Latino MSM. Importantly, outness may moderate the syndemic effect differently when accounting for financial hardship as a contributing epidemic. For instance, the positive outcomes found among high-SES MSM may be less salient among those for whom financial insecurity is present and persistent. Additional research is needed to unpack the role that outness plays in strengthening or attenuating the relationship between the number of syndemic factors and risk behaviors among Latino MSM.

The present study provides evidence that HIV prevention efforts among Latino MSM require multi-level, multi-faceted interventions that tackle the range of conditions which contribute simultaneously to HIV infection. Individual-level interventions often fail to address the macro-level factors that were shown to additively contribute to HIV risk in the present study. For example, comprehensive interventions should broadly aim to improve living conditions in areas with elevated rates of risk factors (e.g., substance abuse, poverty) while also enacting broader policy change (e.g., reduce overpolicing, anti-LGBT discrimination laws) to impede the spread of HIV. Additional support for these interventions can take the form of coordinated individual-level intervention efforts between substance use, mental health, and HIV/STI clinics. For instance, government-run HIV/STI clinics could also provide preliminary screening for mental health and substance use issues and connect clients to care, thereby strengthening prevention efforts among those at risk for HIV acquisition or transmission. A multi-pronged approach to addressing the HIV epidemic among Latino MSM may prove vital in reducing the spread of virus among this population.

Importantly, the present study provides evidence that complex interventions aimed at reducing the influence of syndemic burden on HIV-related risk behaviors should primarily target individuals with high levels of outness. Because outness may not confer the same protective benefits for Latino MSM as it does for other MSM, there are a number of foci which could be adopted by interventions. For example, coordinated individual-level interventions could work to directly empower highly out Latino MSM and to connect them to mental health services or positive social networks. Such interventions might provide these men with the tools to counteract the deleterious influence of exposures that coincide with greater outness (e.g., more homophobic discrimination). Similarly, family- and community-focused interventions could work to educate

relevant parties in efforts to reduce the rate of negative reactions that Latino MSM experience from their peers and loved ones regarding their sexual orientation or behavior. An intervention of this nature that keenly targets Latino cultural values may help to counteract the adverse role that negative reactions play in shaping experiences of poverty and psychological distress among Latino MSM. Targeted interventions that focus on Latino MSM with high levels of outness may help to reduce the impact of syndemic burden on the transmission and acquisition of HIV among this population.

### *Limitations*

While this study contributes to the literature on HIV risk among Latino MSM, the results should be interpreted in context of some limitations. The data for the present study conceptualized HIV risk as serodiscordant condomless anal sex encounters and number of male casual partners, and thus did not account for recent advances in biomedical prevention strategies, such as pre-exposure prophylaxis (PrEP). However, PrEP, receiving FDA approval in 2012, was not widely accessible as an HIV risk reduction strategy during the course of this study, and still remains under-utilized by Latino MSM (Bush et al., 2016). It is also possible that some of the HIV-negative participants engaged in SDCAI encounters with partners whose viral loads were suppressed and undetectable, which would limit their risk of HIV acquisition.

Additional limitations to consider include, for instance, that our sample reported elevated rates of childhood sexual abuse (CSA) above those found in the existing literature, but this may be due to how CSA was operationalized (i.e., any sex before 12 years old, unwanted sex between 12 and 16 years old). A more conservative measure that explicitly examined the unwanted nature of participant's sexual encounters before the age of 12 may have reduced these rates. Consistent with much of the literature, this study also relied on the recollection and self-report of past sexual

risk behavior, and thus may be subject to some recall and social desirability biases in spite of the data collection methods employed (e.g., ACASI). The data were also gathered among men in an urban setting with a prominent gay presence, which makes it difficult to generalize the findings to Latino MSM in other settings. Finally, the study was also cross-sectional in nature which limits our ability to infer that the relationship between additive syndemic burden and HIV risk is causal in nature.

### *Conclusion*

Despite these limitations, the results of this study bolster the growing evidence that multiple syndemic factors work in tandem to increase the risk behaviors related to HIV transmission and acquisition. Our data suggest that HIV prevention interventions aimed at diminishing the role of syndemic burden among Latino MSM may be most efficacious if directed at those with high levels of outness. This study highlights the importance of interventions targeting psychosocial and structural epidemics that affect Latino MSM in the interest of stemming the growing number of HIV infections among this population.

Table 1. Sample characteristics (n = 430 unless otherwise specified)

	<b>Mean (SD) or n (%)</b>
Age in years (M)	30.50 (9.51)
<b>Education</b>	
High School, GED, or below	96 (22.3%)
Some College or more	335 (77.7%)
<b>Employment</b>	
Unemployed	167 (38.8%)
Part-time or full-time	263 (61.2%)
<b>Relationship Status</b>	
Single	229 (53.5%)
Married or recent partner	174 (40.7%)
<b>Sexual Identity</b>	
Gay	356 (82.6%)
Bisexual	45 (10.4%)
Hetero/other	17 (3.9%)
<b>HIV Status</b>	
HIV Negative	305 (70.8%)
HIV Positive	126 (29.2%)
<b>Syndemic Factors</b>	
Childhood Sexual Abuse	274 (63.6%)
Depressive Symptomology	121 (28.1%)
Financial Insecurity (n = 429)	70 (16.2%)
History of Arrest (n = 429)	108 (25.2%)
Hard Drug Use	129 (29.9%)
<b>Syndemic Scale</b>	
0 Factors	87 (20.2%)
1 Factor	124 (28.8%)
2 Factors	123 (28.5%)
3 Factors	66 (15.3%)
4 Factors	21 (4.9%)
5 Factors	10 (2.3%)

Table 2. Bivariate associations among syndemic factors and sexual risk behaviors.

	<b>Odds Ratio (95% CI) or Incidence Rate Ratio (95% CI)</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Childhood Sexual Abuse	--					
Depressive Symptoms	2.37*** (1.47, 3.82)	--				
Financial Insecurity	2.37** (1.29, 4.36)	3.17*** (1.87, 5.38)	--			
History of Arrest	1.81* (1.12, 2.92)	1.39 (0.87, 2.22)	2.31** (1.35, 3.96)	--		
Hard Drug Use	1.92** (1.22, 3.02)	1.51† (0.97, 2.36)	1.83* (1.08, 3.11)	3.16*** (2.00, 4.99)	--	
Serodiscordant CAI	1.07 (0.78, 1.47)	1.63** (1.18, 2.25)	1.33 (0.90, 1.96)	2.84*** (2.05, 3.92)	1.51** (1.09, 2.07)	--
# of Casual Partners	0.91 (0.72, 1.14)	1.10 (0.86, 1.41)	1.33† (0.99, 1.79)	1.53*** (1.19, 1.98)	1.14 (0.90, 1.45)	1.12*** (1.06, 1.19)

Note: CAI = condomless anal intercourse.

†  $p < .10$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Table 3. Unadjusted negative binomial regression models examining associations between demographic and syndemic factors with sexual risk outcomes.

	Serodiscordant Condomless Anal Sex (n = 426)			Number of Casual Partners (n = 357)		
	uIRR	95% CI	p-value	uIRR	95% CI	p-value
Age	1.03	(1.01, 1.05)	<.001	1.01	(0.99, 1.02)	0.274
Some college or more <sup>a</sup>	0.61	(0.44, 0.86)	0.005	0.91	(0.69, 1.19)	0.472
Married/Partnered <sup>b</sup>	0.50	(0.36, 0.69)	<.001	0.63	(0.50, 0.80)	<.001
Heterosexual/other <sup>c</sup>	1.01	(0.61, 1.67)	0.973	1.09	(0.69, 1.71)	0.727
Bisexual <sup>c</sup>	1.35	(0.77, 2.36)	0.290	1.16	(0.80, 1.67)	0.440
HIV Positive <sup>d</sup>	1.96	(1.43, 2.70)	<.001	1.63	(1.28, 2.08)	<.001
Outness	0.99	(0.85, 1.16)	0.895	1.01	(0.90, 1.14)	0.828
Syndemic Scale <sup>e</sup>						
1 Condition	3.16	(1.77, 5.64)	<.001	1.52	(1.09, 2.14)	0.015
2 Conditions	3.07	(1.71, 5.48)	<.001	1.51	(1.07, 2.12)	0.018
3 Conditions	3.64	(1.94, 6.83)	<.001	1.53	(1.04, 2.26)	0.031
4+ Conditions	7.17	(3.63, 14.18)	<.001	1.74	(1.08, 2.81)	0.023

†  $p < .10$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

<sup>a</sup> vs. completed high school or less.

<sup>b</sup> vs. single

<sup>c</sup> vs. gay

<sup>d</sup> vs. HIV negative

<sup>e</sup> vs. 0 conditions

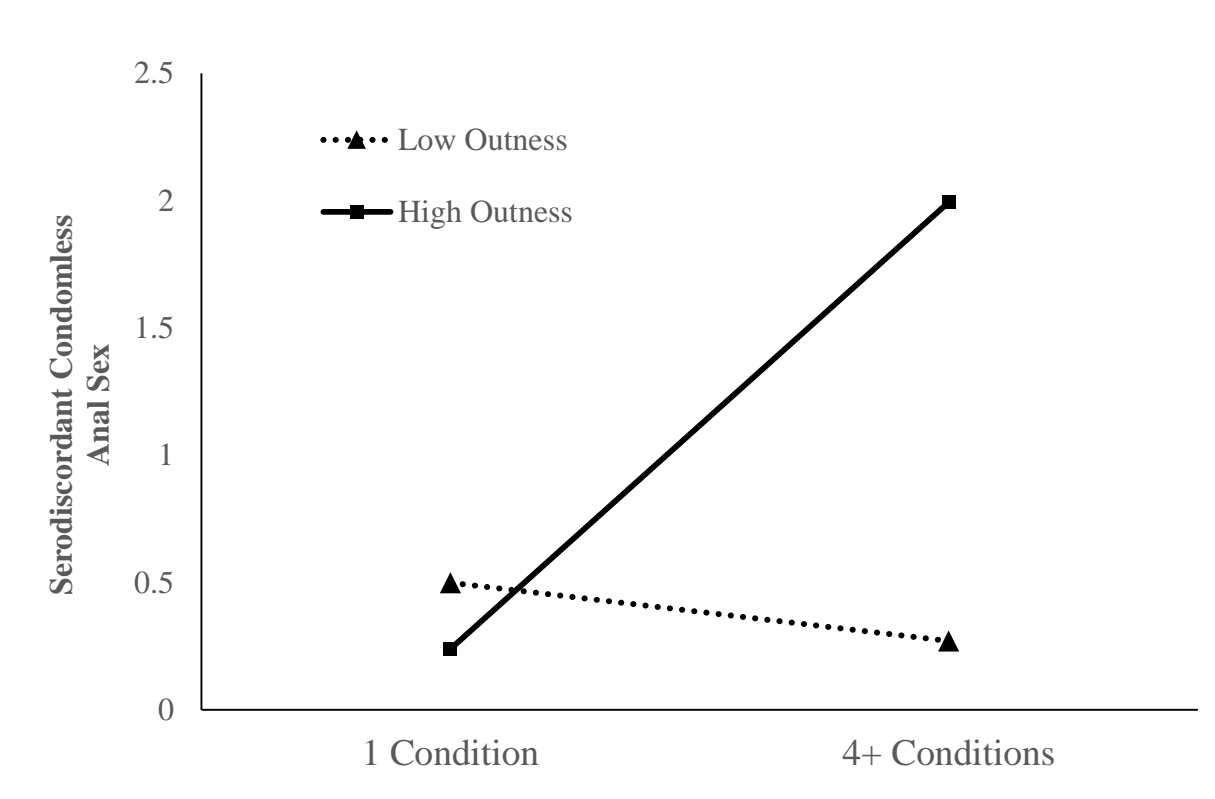
Table 5. Multivariate negative binomial regression examining association of demographic and syndemic factors on sexual risk behaviors.

	Serodiscordant Condomless							
	Anal Intercourse				Total Number of Casual Partners			
	Model 1		Model 2		Model 1		Model 2	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Step 1:								
Age	1.02*	(1.00, 1.04)	1.02*	(1.00, 1.04)	1.00	(0.99, 1.01)	1.00	(0.99, 1.02)
Some college or more <sup>a</sup>	0.66*	(0.45, 0.98)	0.67	(0.45, 1.02)	0.97	(0.73, 1.29)	0.95	(0.72, 1.26)
Married/Partnered <sup>b</sup>	0.55***	(0.39, 0.77)	0.60**	(0.42, 0.86)	0.64**	(0.50, 0.81)	0.63***	(0.50, 0.80)
Bisexual <sup>c</sup>	1.10	(0.64, 1.91)	1.02	(0.53, 1.83)	1.14	(0.71, 1.83)	1.20	(0.74, 1.93)
Heterosexual/other <sup>c</sup>	1.20	(0.64, 2.23)	1.03	(0.53, 2.01)	1.16	(0.78, 1.71)	1.15	(0.77, 1.71)
HIV Positive <sup>d</sup>	1.62*	(1.11, 2.36)	1.51*	(1.02, 2.24)	1.65**	(1.27, 2.14)	1.56***	(1.20, 2.03)
Outness	0.96	(0.79, 1.17)	0.65†	(0.39, 1.08)	0.98	(0.86, 1.12)	1.10	(0.81, 1.48)
Syndemic Scale <sup>e</sup>								
1 Condition	2.18*	(1.19, 4.02)	2.21	(1.15, 4.27)	1.50*	(1.05, 2.13)	1.47	(1.03, 2.09)
2 Conditions	2.91***	(1.60, 5.28)	3.26	(1.73, 6.14)	1.55*	(1.09, 2.20)	1.52*	(1.07, 2.16)
3 Conditions	3.05***	(1.58, 5.91)	1.53	(0.61, 3.80)	1.51*	(1.01, 2.27)	1.48	(0.99, 2.22)
4 Conditions	7.03***	(3.45, 14.34)	4.71	(2.07, 10.69)	1.60†	(0.98, 2.63)	1.28	(0.75, 2.17)
Step 2:								
Moderation								
1 Condition x Outness	--	--	1.07	(0.58, 1.99)	--	--	1.48	(0.78, 2.82)
2 Conditions x Outness	--	--	1.28	(0.70, 2.32)	--	--	0.90	(0.60, 1.36)
3 Conditions x Outness	--	--	7.46***	(2.65, 21.01)	--	--	0.77	(0.52, 1.13)
4 Conditions x Outness	--	--	4.20***	(1.7, 10.33)	--	--	0.90	(0.61, 1.33)
Δ-2LogLikelihood		-84.53		122.70		59.13		63.99

<sup>a</sup> vs. completed high school or less, <sup>b</sup> vs. single, <sup>c</sup> vs. gay, <sup>d</sup> vs. HIV negative, <sup>e</sup> vs. 0 conditions  
† $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



Figure 1. Outness as a moderator of the number of syndemic conditions and serodiscordant condomless anal intercourse.



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## **CHAPTER 5: General Discussion, Limitations, and Conclusion**

Unlike trends seen among other MSM populations, the rate of new HIV diagnoses among Latino MSM continues to increase. Inspired by social ecological theory as a broad heuristic framework, this dissertation provides evidence of the need to account for how multiple key contexts (i.e., cultural/acculturation, spatial/neighborhood, and sociocultural/syndemic) contribute to HIV-related risk behaviors among Latino MSM. In this section, I will discuss selected findings of each of the preceding chapters, both separately and together. I will then situate these findings within the broader heuristic framework of social ecological theory. This section will broadly demonstrate the vital need to move both HIV prevention efforts and research beyond the study of decontextualized individual-level correlates of risk among this population.

### *Review of the findings*

As discussed in Chapter 2, past research utilizing validated measures of acculturation have found mixed evidence of its relationship to sexual risk behavior among Latino MSM. I found that acculturation indices were not directly associated (at the bivariate level) with the HIV-related risk outcomes examined (i.e., serodiscordant condomless anal intercourse, number of casual sexual partners). This may reflect the complex nature of the relationship between acculturation and HIV-related risk among Latino MSM. Interestingly, I found that the indicators of acculturation moderated the relationships between sexual minority stressors (i.e., internalized homophobia, sexual orientation-based discrimination) and SDCAI in conflicting ways. For example, the influence of the two minority stressors on SDCAI was strongest (and significant only) among men with high (more English speaking) and low (foreign-born) levels of acculturation. This signifies that acculturation may amplify or buffer the influence of other factors, depending on the indicators of acculturation used. In other words, contrary to how they

are framed throughout the literature on Latino MSM, I found evidence that elements of acculturation do not have a simple, direct relationship with HIV risk among this population. Instead, I found strong evidence that acculturation indices may act as the lenses through which Latino MSM interact with the world around them, subsequently modifying, in complex ways, the effect of other internal and external influences on their sexual risk behaviors.

Similarly, Chapter 3 was among the first to explore the potential influence of both ethnicity- and gay-related neighborhood factors on HIV-related risk among Latino MSM. I found that neither of the two commonly explored indicators of ethnic and gay influence (i.e., ethnic density, proportion of male-male households) were significantly associated with my outcomes, but other factors were associated with greater (i.e., proportion reporting racial/ethnic discrimination in home neighborhood, neighborhood-level gay community connectedness) and lower (i.e., proportion of foreign-born residents) likelihood of having 5 or more sexual partners. This highlights a need for complex examinations of the neighborhood contexts in which Latino MSM in particular, and MSM overall, live.

Lastly, I examined both established (e.g., depression) and novel syndemic factors (e.g., history of arrest) in Chapter 4 to determine their relationship with HIV-related risk behavior among Latino MSM. I found evidence of an additive syndemic burden on serodiscordant condomless anal intercourse, but this relationship existed only among those with high levels of outness. These findings demonstrate the need to consider population-specific epidemics within the syndemic framework, as failing to do so may inhibit our ability to understand the broader impact of syndemics on at-risk populations. They also show the strong need to further explore how the other psychosocial correlates may take shape within the context of syndemic burden,

because identifying factors that may moderate the association between syndemic conditions and HIV-related risk behaviors may prove vital in furthering HIV prevention efforts.

Each of these chapters individually highlights the central need to attend to the contexts that may contribute to HIV risk, particularly among Latino MSM. It is important, however, to consider the aggregate information we might gain from this series of studies by viewing them alongside one another. Pulling from multiple chapters, here I will discuss two distinct sets of findings in particular that highlight the value of context to the study of HIV risk among Latino MSM.

#### *Minority stressors in context*

One key finding from this dissertation is how different contexts shape the associations between racial/ethnic and sexual minority stressors and HIV-related risk behaviors. Consistent with the recent literature (e.g., Mizuno et al., 2015), this dissertation found that sexual orientation-based discrimination was not associated with HIV-related risk behaviors among Latino MSM. However, I enhanced this literature by finding that this relationship is, in fact, significant for those who predominantly speak English (but not those who speak more Spanish) and those born outside of the U.S (but not those who were born in the U.S.). These findings indicate a vital need to consider the cultural lenses through which Latino MSM interact with the world around them, including elements of acculturation, especially when addressing the possible influence of other intrapersonal and interpersonal phenomena on their HIV-related risk.

Similarly, we found that neighborhoods with greater proportions of residents reporting racial/ethnic discrimination were also associated with a greater likelihood of having multiple casual sexual partners. The proportion of Latino residents, conversely, was not associated with either of our HIV risk outcomes. These results demonstrate that it may not be ethnic density (an



indicator of a stronger Latino presence) that is associated with sexual risk, but rather how hostile that neighborhood feels towards Latino MSM because of their race/ethnicity. This may reflect the way that MSM of color are impacted by the unwelcoming and racialized nature of urban neighborhood spaces (Frye et al., 2014). Though not directly comparable, these findings arguably conflict with other studies that failed to find a direct association between individual-level experiences of racial/ethnic discrimination and sexual risk behaviors among Latino MSM (Mizuno et al., 2012; Ayala et al., 2012). Overall, these findings highlight the need to further examine the environmental impact of discrimination in a given space, as failing to do so may lead us to underestimate its contributory role in shaping the HIV burden among Latino MSM.

This dissertation, unlike previous work (Martinez et al., 2016), did not directly examine of the role that interpersonal discrimination may play in contributing to syndemic burden among Latino MSM. Instead, I found evidence supporting the usage of novel syndemic factors that may potentially reflect more structural forms of discrimination that, in line with Singer's (1994) original theory, may work in concert to facilitate and heighten HIV burden. For instance, the high rates of poverty experienced by Latinos overall, and Latino MSM in particular, may partially reflect exposure to a number of adverse conditions, including experiences of employment discrimination (e.g., Bendick, Jackson, Reinoso, & Hodges, 1991), that create and sustain economic hardships among marginalized populations. There is also strong evidence that racial/ethnic minorities, including those in low-income minority areas, are disproportionately stopped and arrested when compared to similar Whites (e.g. Gelman, Fagan, & Kiss, 2007; Pierson et al., 2017). In this study in particular, I found that both financial insecurity and history of arrest were associated with a number of other syndemic conditions. Taken together, the prominence of both financial insecurity and history of arrest indicate a broader discriminatory

environment that may facilitate, and synergize with, a number of syndemic factors. These findings highlight the need to consider discrimination as both an interpersonal and sociopolitical phenomenon, as both may work to increase syndemic burden and HIV-related risk among Latino MSM.

Overall, these three sets of results demonstrate that sexual and racial/ethnic minority stressors, and discrimination in particular, may exert differential influences on HIV-related risk behaviors depending on contexts in which they occur. This is a vital consideration when viewing the existing literature and considering its importance to HIV prevention efforts among Latino MSM. For example, failing to account for cultural factors that may differentially shape the influence of sexual orientation-based discrimination on HIV risk may cause us to underestimate discrimination's contributions to HIV burden experienced by Latino MSM. Similarly, studies that explore racial/ethnic discrimination only at the individual-level may overlook the contexts in which it occurs, and thus, do not account for its ability to create broader adverse neighborhood environments shown here to contribute to HIV risk. Lastly, syndemic analyses that overlook either direct experiences of discrimination or indicators reflecting a discriminatory environment may underestimate the impact of syndemic burden on HIV risk. Overall, by failing to account for the contextual manners in which sexual and racial/ethnic minority stressors impact Latino MSM, we limit our ability to craft successful HIV prevention efforts for this population.

#### *Outness in context*

The findings of this dissertation also demonstrate that research needs to carefully attend to the contexts in which gay-related factors, and outness in particular, may be associated with HIV-related risk behaviors among Latino MSM. This runs contrary to the standard approach of exploring each potential influence as a direct correlate of risk. In this dissertation, I found no

support for examining outness as an individual- or neighborhood-level correlate of sexual risk behavior among Latino MSM. Instead, I found evidence that the deleterious influence of syndemic burden is strongest, and only significant, among Latino MSM who are more out. These findings together indicate that outness contributes to HIV risk in a complex fashion relative to the context in which it occurs. As a result, situating outness outside of the context of syndemic burden may encourage us to overlook, and therefore underestimate, its contributions to the HIV burden felt among Latino MSM. This not only limits our ability to tailor multifaceted interventions to those Latino MSM most-affected by syndemic burden, but it also may underestimate the true impact of syndemic burden on them, as well.

*Respecting the value of context: Social ecological theory*

Social ecological theory broadly encourages careful consideration for the multiple overlapping contexts that may shape human behavior. The preceding chapters, when considered both separately and together, demonstrate that it is vital to consider cultural, spatial, and syndemic contexts of HIV-related risk behaviors and their potential correlates, especially among Latino MSM. The synthesized findings discussed in the previous section crystallize the importance of attending to context. For instance, recent trends in the literature among Latino MSM have shown little or no association between interpersonal experiences of sexual orientation-based discrimination HIV risk. However, studies exploring how sexual orientation-based discrimination pervades both the community/neighborhood and broader sociocultural contexts, as was done this dissertation, may demonstrate that such discrimination exerts a more complex influence on the health of Latino MSM than anticipated. By examining the multiple contextual lenses through which Latino MSM interact with their world, we gain a more nuanced

understanding of the HIV burden experienced by this population. As a result, this dissertation has a number of implications for HIV prevention efforts and future research.

*Implications for practice and future research*

This dissertation shows that grouping all Latino MSM while ignoring their respective social and demographic profiles may weaken HIV prevention efforts. For instance, I found evidence that English-speaking and foreign-born men should be separately targeted for HIV prevention interventions aiming to reduce the impact of minority stressors. Recent intervention efforts targeting immigrant Latino MSM has shown some promising results on that front (e.g., Rhodes, Leichter, Sun, & Bloom, 2016). However, there is substantially less work seeking to reduce HIV transmission and acquisition among English-speaking Latino MSM, who may instead be captured broader interventions targeting ethnically-diverse samples of MSM due to their language proficiency. Optimal HIV prevention interventions targeting mostly English-speaking Latino MSM should be multilevel in their work to reduce the presence (e.g., stigma reduction) and impact (e.g., build resilience) of minority stressors, including in neighborhood spaces characterized by high levels of racial/ethnic discrimination.

This dissertation also shows that HIV prevention efforts should harness elements of Latino MSM's social networks in efforts to reduce risk-related behaviors. For instance, these data are novel in that they demonstrate a need to target norms-related interventions to those with strong ties to their ethnic identity. Condom use norms-related interventions may prove most vital among men with strong ethnic identities, as my findings indicate the influence of positive peer condom use norms on HIV-related risk behaviors is strongest among them. Community-focused interventions of this nature might harness lay health advisors who, unlike outsiders, can both participate and help to change perceptions of condom-related norms among peers (Rhodes et al.,

2016). Similarly, neighborhoods with a large proportion of residents strongly connected to the gay community may provide unique locations for additional interventions. Residents in these areas may experience greater exposure to adverse community norms related to sexual decision-making (Kelly, Carpiano, Easterbrook, & Parsons, 2012), including race-based partner selection. Multifaceted, multi-level resilience-based interventions that empower Latino MSM in these areas may combat the influence of these stressors on HIV-related risk behaviors.

Similarly, multicomponent interventions should utilize treatment provision to target the co-occurrence of syndemic condition in efforts to provide a comprehensive method of reducing multiple elements of syndemic burden. For example, interventions targeting Latino MSM with multiple syndemic conditions may target multiple linkages to care, including mental health providers who provide direct connections for clients with substance use/abuse counseling and financial assistance programs (e.g., SNAP). Addressing multiple conditions simultaneously may reduce the likelihood that untreated conditions (e.g., depression) may counteract gains made in other areas (e.g., less substance use). These interventions may also benefit from a holistic grounding in psychosocial strengths, which recent evidence shows may reduce HIV-related risk among MSM above and beyond the influence of syndemic burden (Hart et al., 2017).

This dissertation also lays the foundation for a number of exciting future studies. First and foremost, this dissertation provides strong evidence that research targeting Latino MSM — rather than including them as part of ethnically-diverse samples — is key. Detailed research among Latino MSM will allow us a deeper understanding of the heterogeneity that exists within this group (as evidenced by the moderation analyses in this dissertation, for example). Studies that seek to compare across racial/ethnic groups are valuable in identifying possible population-level trends, but the present dissertation demonstrates the long-overdue need to craft Latino-

specific studies to explore a range of relevant factors that often get lost in the design of group-level averages, including the complex study of ethnicity- and sexuality-related factors. Latino MSM have long been considered a hard-to-reach population, but a number of studies, including this dissertation's parent study (NYCM2M), have utilized novel recruitment methods to reach a large number of participants (Koblin et al., 2013). As a result, researchers should feel empowered to design comprehensive studies focused predominantly on Latino MSM that move beyond individual-level correlates of risk behaviors in efforts to expand our understanding of HIV trends among this population.

More specifically, research should focus on studying HIV-related risk behaviors in light of their many relevant contexts. Future research should attend to the potential moderating role of acculturation factors on the associations between HIV risk and other potential correlates. For instance, research should explore how acculturation may modify the separate associations between both syndemic burden and psychosocial strengths (i.e., social capital, social support) with HIV-related risk behaviors. Broadly speaking, research on syndemics would greatly benefit from honing our understanding of the heterogeneous impact of syndemic burden on MSM overall, and Latino MSM in particular. In spite of limited evidence among ethnically-diverse samples (Starks et al., 2014), this research could use latent class analysis to identify different classes of syndemic stress among Latino MSM. Similarly, research should explore how other cultural factors that are often studied among Latinos (e.g., masculinity/*machismo*, fatalism) may modify the relationship between peer condom use norms and HIV risk. These avenues of research will allow us to understand the complex contextual role that cultural factors may play in shaping the disproportionate and growing HIV burden experienced by Latino MSM.

Additional research at the neighborhood-level could also provide a deeper understanding of how spatial contexts are associated with HIV risk. For instance, future research could utilize geospatial analyses to determine how proximity to potential risk-related environments (e.g., bars, clubs) within given neighborhood types may be associated with HIV-related risk behaviors. Residing in a gay enclave may not be associated with HIV-related risk (Kelly et al., 2012), but limited work has explored how proximity to a gay enclave, or to risk environments within an enclave, may be associated with HIV-related risk (including sex under the influence of drugs/alcohol) MSM. Among Latino MSM, this may be doubly interesting to compare to similar examinations between proximity and risk environments within both gay and Latino ethnic enclaves and a non-enclave comparison neighborhood. This research could strengthen our understanding of the multiple relevant elements of neighborhood contexts may be related to the HIV burden among Latino MSM.

### *Limitations*

The overall dissertation project has a number of limitations worthy of note. First, these data are cross-sectional in nature, which prohibit me from exploring the possible shifting influence of less static factors (e.g., acculturation, neighborhood environments) over time. However, this study is novel in its approach to each of these influences, and has provided evidence important to both interventions and avenues of future research. Second, this study relied on self-report data for a number of sensitive, stigmatized behaviors. Still, computer-based data collection methods (i.e., ACASI) shown to reduce social desirability bias in responses were used, which inspires added confidence in our methods and findings. Third, the use of time-space venue-based sampling may have resulted in oversampling men who are more integrated in bar cultures, which limits the representative nature of the sample. That said, a number of methods

were used to reduce this possibility, including the use of internet-based sampling methods via gay social and sexual smartphone applications.

In addition, the study had limited diversity among foreign-born residents, which made further delineating by country of origin unfeasible. However, numerous studies on Latino MSM use a US-/foreign-born dichotomy, thereby allowing our results to be interpretable in conjunction with the broader literature. Moreover, these findings may be less generalizable to the experiences of more recent immigrants due the limited representation of Latino groups who have seen recent growths in immigration (i.e., Dominicans). Lastly, due a limited sample size I relied on an up-aggregated neighborhood classification (i.e., NTA), which may inaccurately estimate the neighborhood effects felt at the more fine-grain neighborhood census-tract level. However, this level of analysis is included both within the American Community Survey (which provided some of the tested neighborhood correlates) and other work from the parent study on White and Black MSM. This allows for greater comparison across multiple studies from the same data set to build a comprehensive understanding of neighborhood effects, which was a key goal behind elements of this dissertation.

### *Conclusion*

This dissertation demonstrates evidence of the unique importance of cultural, spatial, and syndemic contexts in the study of the disproportionate HIV burden experienced among Latino MSM. Among Latino MSM in the United States specifically, this dissertation was among the first to examine a) acculturation as a moderator of the associations between minority stressors, peer condom use norms, and HIV-related risk behaviors, b) gay- and ethnicity-related neighborhood correlates of HIV-related risk behaviors, and c) outness as a moderator of the association between population-relevant syndemic factors and HIV-related risk behaviors. This



dissertation provides strong evidence of the need for more complex research targeting Latino MSM. Future research should build off of each of these studies by exploring how broader social ecological contexts may further potentiate HIV risk, rather than relying on the continued studied of decontextualized individual-level correlates. This dissertation not only lays the groundwork for future avenues of research, but also opens the possibility of tailored multicomponent, multi-level interventions that attend to the relevant heterogeneity found among Latino MSM.

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