AN EXAMINATION OF PROTECTIVE FACTORS AGAINST HIV INFECTION AMONG ASIAN/PACIFIC ISLANDER MEN WHO HAVE SEX WITH MEN

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This dissertation project examined protective factors against HIV infection among API MSM. First, we evaluated the literature for scientific evidence that may explain the lower HIV prevalence among API MSM. Four of the ten hypotheses provided some partial explanations or needed further investigation: 1) API MSM's sexual networks may be primarily composed of MSM of low HIV risk profiles; 2) Prevalence of seroadaptive behaviors is higher among API MSM; 3) HIV-positive API MSM have better access to care and treatment; 4) Ethnic heritage acculturation may be protective. Second, we examined race and age mixings among API MSM. It appeared that overall patterns of race and age mixing among API MSM tended to be more assortative. API MSM were more likely to be partnered with other API men than expected and the age difference between API participants and their partners were narrower than that among other participants. In addition, young API MSM were more likely to be aware of their partners' HIV status as a majority of their partners were main partners. Finally, we found that prevalence of seroadaptive behaviors differed little by race/ethnicities, which does not point to seroadaptation as protecting API MSM against HIV infection. Of concern, the significantly lower prevalence of serodisclosure behaviors among API MSM did not appear to translate into lower levels of seroadaptation.

Our findings have significant public health implications. First, more research on how structural factors affect HIV infections among MSM are needed. Second, the socio-cultural and structural contexts of partner selection need to be explored. Third, public health professionals should be aware of changing behaviors within MSM communities so that new and innovative interventions can be developed. Fourth, a strength-based approach to studying protective factors against HIV infection among API MSM is overdue. Qualitative studies are needed to develop some strength-based conceptual frameworks. Fifth, it seems that certain Asian/API cultural issues or values would be worth investigating. Lastly, while HIV prevalence remains low among API MSM, bio-behavioral surveillance should keep monitoring HIV incidence and risk behaviors among this population and culturally appropriate interventions should be delivered to them, before it is too late to intervene.

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PREFACE

This dissertation is dedicated to my beloved mother, Kaimin Chen, for her enormous support for my educational endeavors during the past 22 years. I would never be where I am today without her love, care, encouragement, and faith in me.

谨以此博士论文献给我深爱的母亲，陈开敏。 在我 22 年的求学之路，她给我了无限的支持，对此我表示深深的感谢。如果没有她的爱，关怀，鼓励，以及对我的信任，我不会走到今天。

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1.0 BACKGROUND

As of 2006, there were an estimated 7,951 Asian/Pacific Islanders (APIs) diagnosed with AIDS in the United States, which account for about 1% of all AIDS cases (CDC, 2006b). Like the general pattern of the HIV/AIDS epidemic in the United States, API men were most affected. It was estimated that 83% of AIDS cases and 77% of HIV/AIDS cases among APIs were men (Zaidi et al., 2005). By HIV/AIDS transmission category, 68% of the males diagnosed with AIDS and 63% diagnosed with HIV/AIDS were classified in the male-to-male sexual contact category (CDC, 2006b). Existing epidemiological data shows that API men who have sex with men (MSM) engage in high HIV levels of risk behaviors. Several studies conducted among API MSM found that 44%-47% of the participants had unprotected anal intercourse (UAI) in the past 3 or 6 months (Choi, Han, Hudes, & Kegeles, 2002; Choi et al., 2004). Moreover, substance use, which has been shown to independently predict UAI among MSM, is common among API MSM. Data from the Asian Counseling and Testing (ACT) study in San Francisco reported that among young API gay and bisexual men, 89% used alcohol and 63% used illicit drugs during the past six months, among which ecstasy (47%) and marijuana (44%) were most popular (Operario, Choi, Chu, McFarland, Secura, Behel, MacKellar, Valleroy et al., 2006).

1.1 CONTEXUAL FACTORS ASSOCIATED WITH RISK BEHAVIORS AMONG ASIAN/PACIFIC ISLANDER MEN WHO HAVE SEX WITH MEN

To understand and explain why API MSM engage in high-risk HIV-related behaviors, research studies, mostly qualitative work, have been conducted to explore risk factors that may be unique to the social-cultural and structural contexts of being API gay men and MSM. It is suggested that multiple minority status (i.e. being an ethnic minority, a sexual minority, and possibly an immigrant) is highly salient for API gay men (Choi et al., 1999; Manalansan, 1996; Nemoto et al., 2003). Often, gay/bisexual men of color struggle with two identities. On the one hand, within their racial/ethnic community, cultural values and norms may strongly disapprove of homosexual desires and practices. Hence, in addition to experiencing homophobia in the larger society, gay/bisexual men of color are also exposed to homophobia within their racial/ethnic communities. On the other hand, within the gay community, racial discrimination happens to gay/bisexual men of color in both explicit and subtle ways.

Homosexuality is highly stigmatized in most API families and communities (Aoki, Ngin, Mo, & Ja, 1989; Chng et al., 2003; Wong, Chng, Ross, & Mayer, 1998). Such prevalent homophobia within the API communities is attributed to a range of API cultural values, beliefs and traditions. To begin with, sexuality remains a very private matter in many API cultures (Chng et al., 2003). Discussions about sexual issues are limited to a couple in their bedroom. In addition, Confucianism sanctions sex only as a means to continue family lineage. As a result, many young API adults have minimal experience or skills in coping with relationships, sex, and sexuality issues in later life (Chng et al., 2003). This lack of open discussion about sex and sexuality may affect API MSM negatively in their ability to negotiate safer sex with their sexual

partners. Probably the most important cultural values that contribute to the conflict between API MSM's ethnic identity and sexual identity are the importance of family and family obligations. Most Asian countries and cultures are characterized by collectivistic cultural orientation. Individuals in such cultures define their self in an interdependent manner and hence for the self to be meaningful, one cannot forsake primary support groups and relations (Smith & Bond, 1993). In API cultures, family is the primary social unit and propagation of the family name is emphasized. However, being gay means one's failure to fulfill his obligations—filial piety to parents and continuing the family lineage. Hence, most API cultures view homosexuality as a form of social deviance that brings shame and dishonor to the family and the community (Aoki et al., 1989). To fit in within one's roles and duties as a member of the family may be an important factor to the self-esteem and self-worth of a person (Luthanen & Crocker, 1992). Moreover, the family may be the most important source of social support that constitutes a powerful and safe haven for API MSM to cope with poverty, discrimination, and racism, which may be correlated with HIV risk behaviors through certain pathways such as psychological distress and depression. Indeed, a quantitative study exploring the role of family networks in relation to discrimination and HIV risk among API gay men found that the combination of high levels of discrimination and low levels of conversations with family about discrimination was associated with the highest level of unprotected anal intercourse (Yoshikawa, Wilson, Chae, & Cheng, 2004). However, oftentimes, API MSM feel forced to choose between either remaining closeted and perpetuating the family name through marriage in order to be involved with their homophobic family or living open lives without family support or acceptance (Choi et al., 1998).

As a racial minority, the conflict between ethnic identity and sexual identity is further exacerbated by API MSM's minority status. Coming out as gay not only risks losing acceptance

and support from one's family but also rejection from one's ethnic group as a whole. Research has shown that identification with one's ethnic group is positively correlated with minority individuals' level of self-esteem—the feedback about oneself from other members of one's group represents the single, most important source of self-esteem (Phinney & Chavira, 1992). Due to the conflict of the two identities, many API feel that they have to choose one identity over the other (Choi, Salazar, Lew, & Coates, 1995). Fung (1994) reported that API MSM who are gay identified but not API identified make up the largest group of API MSM. Rejection of ethnic identity can potentially lead to lowered self-esteem, which has been related to likelihood to engage in risky sex (Rotheram-Borus, Rosario, Reid, & Koopman, 1995). In addition, self-esteem is related to perceived self-efficacy which may influence the acquisition of skills necessary to negotiate safe sex with partners (Bandura, 1977). In order to gain acceptance into the mainstream gay community, some API gay men choose to engage in certain risk behaviors, such as substance use. Field observations from a study found that many Cantonese-speaking Chinese gay men are engaging in "club drug use and/or trade" in Chelsea (a gay concentrated neighborhood in New York City) as a way to gain acceptance into the predominantly "White, gay, Chelsea boy" circle (Chng et al., 2003). While some API MSM choose to reject their ethnic identity, others choose to remain closeted and reject their sexual identity. Chng and Geliga (2000) argued that API MSM who strongly identify with the ethnic community may isolate themselves from the gay community and gay-identified social networks that would expose them to safe sex messages as well as provide social support. In addition, in order to satisfy sexual urges, closeted men may go out and seek sex in places like bathrooms or parks, where risky sex is more likely to be practiced due to the nature of the sexual encounter and measures of protection may not be readily available at that moment (Choi et al., 1998).

In addition to struggling with identity issues and homophobia within their own families and communities, API gay men experience racial discrimination within the gay community as well. Although blatant racial discrimination is rare, studies on racism in general have shown that more covert or subtle forms of racism may be common, harder to detect, and have consequences that are at least as negative if not more severe, as overt racism (Dovidio, Gaertner, Anastasio, & Sanitioso, 1992). In one of the few studies that document experiences of discrimination within the gay community, participants reported that almost half (45%) of all episodes of discrimination were related to racism (P. A. Wilson & Yoshikawa, 2004). Subtle forms of racism are often expressed by stereotyping gay men of color. API gay men are usually perceived as passive, submissive, feminine, and sexually available or "easy" (Choi, Coates, Catania, Lew, & Chow, 1995). As argued by some theorists of gay Asian experience, such stereotypes have contributed to the sexual objectification of Asian men by some white men who desire them purely for their exotic eroticism (Han, 2005), but not as desirable potential partners. Negative stereotypes can keep API gay men from developing positive identities (Wat, 2002). Consequently, many API gay men have internalized negative feelings about themselves and other API gay men. The link between negative feelings about oneself and risk has been suggested in some research. For example, in a qualitative study, Choi et al. (1999) found that young API MSM who had a negative self-image were more likely to have had risky sexual encounters than those with a positive self-image, who were motivated to engage in HIV protective behavior. Moreover, some API gay men even internalize and adhere to the stereotypes as being passive and submissive to please (Poon & Ho, 2002). Not surprisingly, within this social context, many API gay men suffer low self-esteem and self-worth. According to Ona (1996), many API MSM indicated that they engaged in unsafe sex as a consequence of low self-esteem. Participants in another qualitative

study also reported that substance use offered a way for them to lose inhibition and increase feelings of sociability and confidence in settings such as bars and clubs (Nemoto et al., 2003).

The consequences of stereotyping of API gay men in terms of safe sex and HIV/AIDS is that being perceived as submissive may confer a lower status in the decision-making or negotiation about safe sex. Rather than trying to make a mutual decision, an API gay man may not be involved in the decision-making process and be expected to conform to the decision made by his partner (Tsui, 1986). In addition, feminization of API gay men takes on a prominent role within the gay community where sexual behaviors, such as who will be a "top" or a "bottom", are often dictated by perceived gendered characteristics (Han, 2007). API gay men are often expected to take on the more feminine role of sexual bottoms, which potentially exposes them to a higher risk of HIV infection. The preference for White partners, who are perceived as more socially desired, may also mean that the relationship itself has unequal power dynamics (Poon, Ho, Wong, Wong, & Lee, 2005). Han's (2007) qualitative exploration of the relationship between racism and unsafe sex among API gay men suggests that API gay men compete for the sexual favors of white men, who are seen as being in short supply, by playing the "rules" of gay expectations. "It is this competition for white male companionship, facilitated by the marginalization of gay API men in the larger gay community, that ultimately place white men in a dominant position in sexual negotiations, leading gay API men to take sexual risks to win their favor" (Han, 2007).

In summary, racism and sexual stereotyping within the gay communities as well as homophobia within their ethnic communities were identified as major factors that contribute to the observed high rates of HIV risk behaviors among API MSM. However, despite high rates of HIV risk behaviors, overall HIV prevalence has been low among API MSM compared to that

among MSM of other races/ethnicities (Table 1.1). Reasons for the lower HIV prevalence among API MSM have not been systematically examined or explored.

1.2 OBJECTIVE AND SPECIFIC AIMS

The overarching objective of this dissertation is to examine and identify protective factors against HIV infection among API MSM. This project has 3 specific aims:

1. To critically examine and evaluate the existing literature for scientific evidence that may explain the lower HIV prevalence among API MSM.
2. To examine race and age mixing patterns of sexual partnerships among API MSM.
3. To study seroadaptive and serodisclosure behaviors among API MSM, and compare these behaviors to MSM of other races/ethnicities.

2.0 LITERATURE REVIEW OF PROTECTIVE FACTORS AGAINST HIV INFECTION AMONG ASIAN/PACIFIC ISLANDER MEN WHO HAVE SEX WITH MEN

2.1 OBJECTIVE OF THE REVIEW

The objective of this paper is to critically examine and evaluate the existing literature for scientific evidence that may explain the lower HIV prevalence among API MSM. We conducted a comprehensive review of studies that addressed behavioral, biological, socio-cultural, and structural factors related to HIV acquisition and transmission.

2.2 METHODS

Two separate literature searches using PubMed, PSYCHInfo, and Ovid MEDLINE were conducted to identify articles published between January 1980 and July 2009. First, using the search terms “gay,” “bisexual,” “homosexual,” “homosexuality,” “men who have sex with men,” and “MSM,” we identified all articles that mentioned sexual identity or behavior applicable to MSM. Second, using the search terms “API,” “Asian/Pacific Islander,” “Asian,” “Asian

American," and cross-referencing terms "gay," "bisexual," "homosexual," "homosexuality," "men who have sex with men," and "MSM," we identified all articles that mentioned sexual identity or behavior applicable to API or Asian MSM. This review was limited to quantitative studies conducted among MSM in the United States that included a subsample of API or Asian MSM or those that were conducted among API or Asian MSM. Studies that aggregated API or Asian MSM with American Indian/Alaska Native and Multiracial MSM together as an "Other" racial/ethnic category were excluded. A total of 57 studies were included.

Ten hypotheses were examined and evaluated based on available scientific evidence (A summary of results are included in Table 2.1). First, we categorized each article as either supportive or non-supportive of a hypothesis. A study was determined as supportive when findings were significant ($p \leq .05$) in the direction of the hypothesis. A study was determined as non-supportive when findings were non-significant ($p > .05$) or significant in the opposite direction. Second, scientific evidence was aggregated across studies to determine whether a given hypothesis was supported or not supported by the literature.

2.3 HYPOTHESES NOT SUPPORTED BY THE SCIENTIFIC EVIDENCE

Hypothesis 1: API MSM are less likely to engage in high-risk sexual behaviors than other MSM.
Two of the most important predictors of HIV infection—multiple sex partners and unprotected anal intercourse—were examined and we found that API MSM engaged in comparable, sometimes even higher, rates of sexual risk behaviors. Of the five studies that compared numbers of sex partners between MSM of different races/ethnicities, only one conducted in Los Angeles

found that API men reported significantly lower lifetime frequencies of having more than 50 male partners (20%) and more than 6 male partners in the past 6 months (16%) compared to White men (42% & 31%, respectively) (Bingham et al., 2003). The other four studies found no significant differences in numbers of sex partners between API MSM and MSM of other races/ethnicities (Brooks, Lee, Newman, & Leibowitz, 2008; CDC, 2002; Rosser et al., 2009; Xia, Osmond, & Tholandi, 2006). The HIV Testing Survey (HITS) conducted by CDC in multiple cities across the US found that about the same proportions (26%) of API, White, Black and Latino MSM reported 2-3 partners in the past 12 months; however, a higher proportion of API men (60%) reported 4 or more partners compared to others (47%, 39%, & 45%) (CDC, 2002). A more recent statewide population-based survey in California found that 29% of API MSM reported 5 or more partners in the past 12 months compared to 28% of White MSM, 6% of Black MSM, and 26% of Latino MSM (Xia, Osmond et al., 2006). Furthermore, 15% of API men reported 2 or more UAI partners compared to 11% of White men.

Thirteen studies examined rates of UAI, and all found that API MSM engaged in similar rates of UAI compared to White MSM or race/ethnicity was not associated with UAI (Bingham et al., 2003; Bingham et al., 2008; CDC, 2002, 2006a; Essien, Ross, Fernandez-Esquer, & Williams, 2005; Flores, Bakeman, Millett, & Peterson, 2009; Horvath, Rosser, & Remafedi, 2008; Lemp et al., 1994; Peterson, Bakeman, & Strokes, 2001; Raymond & McFarland, 2009a; Ruiz, Facer, & Sun, 1998; Seage et al., 1997; Xia, Osmond et al., 2006). The San Francisco/Berkeley Young Men's Study found that 27% of API young men who have sex with men (YMSM) reported UAI in the past 6 months compared to 28% of White YMSM (Lemp et al., 1994). During the same study period in Boston, Seage and colleagues (1997) found similar rates of UAI in the past 6 months among API and White YMSM. Since the introduction of

HAART, we have seen an increase in rates of UAI among MSM throughout the world (Dodds, Nardone, Mercey, & Johnson, 2000; Katz et al., 2002; Sullivan et al., 2009). The US-wide multi-state Community Intervention Trial for Youth (CITY) conducted between 1999 and 2002, which included a sample of 10,295 racially diverse gay/bisexual men aged 15-25, found that prevalence of UAI in the past 3 months was significantly lower among Black YMSM (24%), but comparable between API (36%), White (35%), and Latino YMSM (29%) (Flores et al., 2009). Of the studies that measured unprotected receptive anal intercourse (URAI), which poses the highest risk for HIV infection, none found significant differences in URAI rates between API and White MSM (Bingham et al., 2003; CDC, 2002; Raymond & McFarland, 2009a). In the HITS study, 56% of API, 68% of White, 58% of Black, and 63% of Latino reported URAI with a primary partner in the past 12 months while 44% of API, 40% of White, 41% of Black, and 45% of Latino reported URAI with a non-primary partner in the past 12 months (CDC, 2002). One study compared URAI rates across four races/ethnicities of MSM in San Francisco at the partnership-level where a respondent reported his sexual activities with up to 5 most recent partners in the past 6 months, and found that 18% of Asian men's partnerships involved URAI compared to 19% of Black men's, 17% of White men's, and 51% of Latino men's (Raymond & McFarland, 2009a). In addition, among Asian MSM, URAI rates did not differ significantly with partners of different races/ethnicities.

In summary, the reviewed studies did not support the hypothesis that API MSM are less likely to engage in high-risk sexual behaviors than other MSM. Furthermore, contrary to the stereotype that Asians are less sexually active or asexual, as portrayed in the media, findings from these quantitative studies showed that API MSM have as many sex partners as MSM of other races/ethnicities. Some of the hypotheses generated from qualitative studies, that API

MSM were too submissive or overpowered by their partners impacting their abilities to negotiate condom use, were also not supported by our findings: rates of UAI were similar across races/ethnicities and did not differ by partner's race/ethnicity.

Hypothesis 2: API MSM are less likely to abuse substances than other MSM.

The associations between substance use/abuse and sexual risk behaviors among MSM have been widely documented in the literature due to its hypothesized disinhibition effect, which may affect decision-making during sexual encounters (Chesney, Barrett, & Stall, 1998; Colfax et al., 2004; Davidson et al., 1992; Stall & Purcell, 2000; Stall, Wiley, McKusick, Coates, & Ostrow, 1986). Of the eight studies that measured any recent or lifetime substance use, seven studies did not find evidence that API MSM were less likely to use/abuse substances than others (CDC, 2006a; Greenwood et al., 2001; Halkitis, Green, & Mourgues, 2005; Halkitis, Moeller, Siconolfi et al., 2008; Palamar, Mukherjee, & Halkitis, 2008; Rhodes et al., 2007; Spindler et al., 2007). One of the first studies that measured substance use/abuse—The San Francisco Young Men's Health Study, a probability household sample of men aged 18-29—found that race/ethnicity was not associated with frequent-heavy alcohol use, polydrug use, or frequent drug use (Greenwood et al., 2001). The more recent CDC's National HIV Behavioral Surveillance survey (NHBS) conducted among MSM in 17 US metropolitan statistical areas (MSAs) found that prevalence of noninjection-drug use (most prevalent are marijuana, cocaine, ecstasy, poppers, amphetamine/methamphetamine, and other club drugs) in the past 12 months did not differ significantly by race/ethnicity, 37% among API, 46% among White, 44% among Black, and 38% among Latino (CDC, 2006a). Others examined use of specific substances, particularly methamphetamine due to its growing popularity among MSM as a "sex-enhancing drug" (Ostrow & Stall, 2008). Rhodes and colleagues (2007) found that race/ethnicity was not

associated with meth use in the past 30 days among a large sample of MSM recruited from gay bars and the Internet. Spindler and colleagues (2007) examined Viagra and meth use among MSM in San Francisco, either alone or in combination, and found that Viagra use alone was more common among White men while meth use without Viagra was more prevalent among Asian and Latino men. The one study, which showed different results, found that API men in Los Angeles and New York City were the least likely to have used cocaine, MDMA/ecstasy, marijuana, and popper in their lifetimes, but lifetime exposure to meth, ketamine, or GHB and recent use of most of these drugs were similar across races/ethnicities (Grov, Bimbi, Nanin, & Parsons,2006).

When frequency of substance use and substance use before/during sex were examined, most studies did not find racial/ethnic differences between API men and others (Greenwood et al., 2001; Halkitis, Moeller, Siconolfi et al., 2008; Stueve, O'Donnell, Duran, Doval, & Geier, 2002). Haltikis and colleagues (2008) found that API, Black and White men in New York City reported similar numbers of days of meth use in the past 6 months. Substance use before/during sex may be a more salient risk factor for UAI as its effects are more immediate on sexual behaviors. Using data from CITY, Stueve and colleagues (2002) examined event-level substance use and sexual risk behaviors. They found that race/ethnicity was not associated with being "high" during last sexual encounter with a main partner or a non-main partner. Nor was it associated with being "high" during last sexual encounter with a non-main partner and UAI or URAI. A few studies compared rates of injection drug use across races/ethnicities (Berry, Raymond, & McFarland, 2007; Bingham et al., 2003; Lemp et al., 1994). While Lemp and colleagues (1994) found API men in San Francisco were significantly less likely to have injected any drugs in the past 6 months, Berry and colleagues (2007) found no racial/ethnic differences in

injection drug use in the past year among San Franciscan MSM. The third study conducted in Los Angeles found that API and Black men were significantly less likely to have ever injected drugs or steroids compared to Latino and White men (2% & 0% vs. 8% & 13%) (Bingham et al., 2003).

In summary, the reviewed studies showed that substance use/abuse is as prevalent among API men as among men of other races/ethnicities. Certainly more studies are needed to examine situational and event-level substance use in relation to sexual risk behaviors among MSM in general, particularly among API men. Although two out of the three studies found API men were less likely to have injected drugs, considering the very low prevalence of injection drug use among MSM, it is reasonable to argue that racial/ethnic differences in injection drug use cannot account for the observed racial/ethnic disparities in HIV prevalence, for example, Black MSM (Millett, Peterson, Wolitski, & Stall, 2006).

Hypothesis 3: API MSM have lower rates of sexually transmitted diseases than other MSM.

Sexually transmitted diseases (STDs), especially ulcerative STDs, facilitate the transmission and acquisition of HIV and have been consistently documented in the MSM literature their associations with HIV infection (Fleming & Wasserheit, 1999; Rothenberg, Wasserheit, St Louis, & Douglas, 2000). Of the six studies reviewed, only one conducted in Los Angeles found that prevalence of lifetime STD was significantly lower among API men (13%) compared to White (32%), Black (26%), and Latino men (29%) (Bingham et al., 2003). The three studies conducted in San Francisco all found similar rates of STDs across races/ethnicities (Berry et al., 2007; Kim, Kent, & Klausner, 2003; McFarland, Chen, Weide, Kohn, & Klausner, 2004). Using STD surveillance data, McFarland and colleagues (2004) examined the incidences of rectal gonorrhea and early syphilis among MSM in San Francisco from 1999 to 2002, and

found that incidences of the two STDs were lower among API MSM in 1999 but rapidly surpassed that of White MSM thereafter. A more recent US-wide Internet survey conducted among MSM found that those who reported a previous STD (syphilis, chlamydia, gonorrhea, or any combination of the 3) were demographically similar to those who did not (Mimiaga et al., 2006). In addition, NHBS surveys found that prevalence of STD testing in the past year did not differ by race/ethnicity (API vs. White vs. Black vs. Latino = 38% vs. 40% vs. 45% vs. 45%) (CDC, 2006a).

In summary, the reviewed studies did not support the hypothesis that API MSM have lower rates of STDs than other MSM. However, the literature of STDs among MSM, particularly API MSM, has its limitations. No data exist for HIV and STD co-infections among API MSM, which is an important indicator of HIV transmission due to the synergistic effects of both diseases (Rothenberg et al., 2000). Moreover, no study investigated STD treatment-seeking behaviors or sexual risk behaviors during STD treatment among MSM.

Hypothesis 4: API MSM are more likely to know their HIV status, hence less likely to expose their partners to HIV, than other MSM.

HIV testing has been a cornerstone of HIV prevention as it links positive MSM to medical care and treatment, and has been recommended as a routine test for MSM engaging in high-risk sexual behaviors. Of the 11 studies reviewed, we found no evidence that API men were more likely to have ever been tested for HIV or are tested more frequently than other MSM (Berry et al., 2007; Bingham et al., 2003; CDC, 2002, 2005, 2006a; Helms et al., 2009; Horvath, Oakes, & Rosser, 2008; D. A. MacKellar et al., 2006; D. A. MacKellar et al., 2007; Mimiaga et al., 2006; Raymond, Bingham, & McFarland, 2008). In addition, findings of two studies were in the opposite direction (Helms et al., 2009; Mimiaga et al., 2006).

Rates of HIV testing ever were high (about 90%) across races/ethnicities among community samples of MSM while lower (about 80%) among an Internet sample of MSM (CDC, 2002, 2006a; Horvath, Oakes et al., 2008). Rates of testing during the preceding year were generally lower for all racial/ethnic groups of MSM, clustering around 60% (CDC, 2005, 2006a; D. A. MacKellar et al., 2006). In the six-city Young Men's Survey (YMS), MacKellar and colleagues (2006) found that race was not associated with testing within the past year (API vs. White vs. Black vs. Latino = 49% vs. 56% vs. 53% vs. 52%). In another multisite study of MSM attending STD clinics, Helms and colleagues (2009) found that API men were significantly more likely to have never had a HIV test than White men; however, longer or shorter inter-test interval did not differ between API and White men. Four studies examine unrecognized HIV infections and found no evidence that API men were less likely to have unrecognized infections than White men (Bingham et al., 2003; Helms et al., 2009; D. MacKellar et al., 2007; Raymond et al., 2008). The NHBS surveys conducted in Los Angeles and San Francisco found that only Black race was independently associated with unrecognized HIV infection (Raymond et al., 2008). MacKellar and colleagues (2007) found lower rates of HIV-infected unaware among API YMSM (1.8%) compared to White (4.1%), Black (27.9%), and Latino (8.4%), although the difference between API and White was not significant.

In summary, HIV testing behaviors among API MSM were similar to other MSM. Recently, increasing attention has been focused on acute/early HIV infections (a window period between acquisition of the virus and completion of seroconversion when levels of viral load are extremely high in the blood and semen, leading to heightened infectiousness) as they may be contributing to as much as half of new infections among MSM each year (Pilcher et al., 2004; Stekler et al., 2008; Zetola & Pilcher, 2007). Future research in this area should investigate

racial/ethnic differences in rates of acute/early HIV infection and examine sexual risk behaviors among those diagnosed with the infection.

Hypothesis 5: API MSM are more likely to utilize HIV prevention intervention services than other MSM.

With recent setbacks in biomedical research in HIV prevention, e.g. vaccine and microbicide, HIV behavioral interventions remain as the central tenant of HIV prevention in reducing HIV-related risk behaviors. Reviews of HIV behavioral interventions among MSM in the US found that these interventions are efficacious in reducing sexual risk behaviors (Johnson et al., 2008).

We found two studies that examined reach and coverage of HIV prevention intervention services among MSM (CDC, 2006a; D. A. MacKellar et al., 2006). The NHBS surveys found that similar proportions of racial/ethnic groups of MSM reported receiving free condoms (API vs. White vs. Black vs. Latino = 84% vs. 78% vs. 81% vs. 82%), individual-level intervention (API vs. White vs. Black vs. Latino = 12% vs. 11% vs. 20% vs. 19%), and group-level intervention (API vs. White vs. Black vs. Latino = 5% vs. 5% vs. 14% vs. 10%) (CDC, 2006a). As these data shows, reach and coverage of individual- and group-level interventions are very low. In the YMS study, MacKellar and colleagues (2006) found that race/ethnicity was not associated with receiving HIV counseling. No empirical data exist for HIV prevention, whether testing or behavioral counseling, at the provider-level. One study found that racial/ethnic minority MSM were significantly less likely to have disclosed their sexual orientation to their health care providers compared to White MSM in San Francisco (Bernstein et al., 2008). Hence, racial/ethnic minority MSM may be less likely to receive MSM-specific interventions at the provider-level.

In summary, the two reviewed studies did not support the hypothesis that API MSM are more likely to utilize HIV prevention intervention services than other MSM. Evaluation and operational research of HIV prevention services or programs remain a largely ignored area of research. In addition, although MSM have been most affected by the HIV/AIDS epidemic in the US, only a few evidence-based HIV interventions exist for this population, e.g. MPowerment and Popular Opinion Leader. How such interventions are implemented at the community level by local HIV prevention organizations is rarely documented, hence their effectiveness on changing HIV-related risk behaviors is unclear.

Hypothesis 6: Some ethnic groups within the API MSM population engage in higher rates of risk behaviors than others.

Since early in the HIV/AIDS epidemic, it was reported that some ethnic groups within the API population were disproportionately affected than others (Woo et al., 1988). Data from HIV/AIDS case reports in the US (50 states and District of Columbia) from 1985 to 2002 showed that most HIV/AIDS cases were among APIs born in Philippines, Vietnam, and India (Zaidi et al., 2005). However, reasons for such disparities between ethnic groups among the API population are unclear. Hence, we hypothesize that some ethnic groups within the API MSM population engage in higher risk behaviors than others.

Of the ten studies reviewed, eight did not find evidence that ethnicity was associated with HIV-related risk behaviors (Chae, Yoshikawa, Chae, & Yoshikawa, 2008; Choi, Coates et al., 1995; Choi et al., 2002; Choi et al., 2004; Choi, Operario, Gregorich, & Han, 2003; Choi et al., 2005; Matteson, 1997; Shapiro & Vives, 1999). The majority of the studies comprised of about 30% of Filipinos in their samples. Choi and colleagues (1995; Choi et al., 2002; Choi et al., 2004; Choi et al., 2003; Choi et al., 2005) found that ethnicity was not associated with UAI,

unprotected insertive anal intercourse (UIAI), URAI, or being high or buzzed during sex among MSM in west coast cities. Nor was ethnicity associated with having multiple partners or having UAI with drug or alcohol (Shapiro & Vives, 1999). The other two studies found some differences between ethnic groups. Operario and colleagues (2006) found that Koreans and Vietnamese in San Francisco reported more club drug and polydrug use, while Yoshikawa and colleagues (2004) found that South Asians (Indian, Pakistani, or Bangladeshi) reported higher levels of UAI than East Asians (Chinese, Korean, or Japanese) in a US northeastern city.

In summary, the reviewed studies found that ethnicity was not associated with HIV-related risk behaviors among the API MSM population. Reasons why a few ethnic groups within the API MSM population are more affected by HIV/AIDS than others remain to be investigated, e.g. are Filipino MSM more likely to seek partners of their own ethnicity or partners who engage in high-risk sexual behaviors?

2.4 HYPOTHESES FOR WHICH THERE IS INSUFFICIENT SCIENTIFIC EVIDENCE OR PARTIALLY SUPPORTED

Hypothesis 7: API MSM's sexual networks place them at lower risk for HIV infection than other MSM.

The transmission and spread of STDs/HIV within a community in part depends on the underlying structure of the network of sexual contacts, also known as the sexual network, which may have a greater impact than individual risk behaviors (Anderson, Medley, & May, 1986; Aral, 1999; Doherty, Padian, Marlow, & Aral, 2005; Jacquez, Simon, Koopman, Sattenspiel, &

Perry, 1988). Studies of sexual networks are intended to understand the transmission dynamics of STDs/HIV within and across "core" (high-risk) and "peripheral" (low-risk) groups. Since HIV prevalence is higher among White/Black/Latino MSM, older MSM, and those who engage in casual sex, API MSM would be at higher risk for HIV infection if their sexual network is mostly composed of MSM from these socio-demographic groups. Conversely, we hypothesize that API MSM are more likely to have main partners, partners of the same race/ethnicity, or partners of similar ages that make up their sexual networks.

Very few studies actually examined the structure and organization of MSM's sexual networks and the findings are rather complex. Of the three studies that obtained data on respondents' partner status, none found significant differences in partner status between MSM of different races/ethnicities (Bingham et al., 2003; CDC, 2006a; Halkitis, Moeller, & Pollack, 2008). YMS Phase 2 conducted in Los Angeles found that similar proportions of API, White, Black, and Latino YMSM (47%, 52%, 45%, & 49%) reported any non-steady anal-sex-partners in the past 12 months (Bingham et al., 2003). Two studies examined age differences between respondents and their partners and the findings are mixed (Berry et al., 2007; Bingham et al., 2003). Berry and colleagues (2007) analyzed 2004 NHBS data from San Francisco, and found that API MSM were more likely to have a partner within 10 years of their own age compared to White MSM (81.1% vs. 67.6%). When the age difference was measured at 5-year intervals, only Black MSM were found to have a significantly higher proportion of partners who were of a different age group than White MSM (Bingham et al., 2003). Of the three studies that examined partner's race/ethnicity, all found that API MSM went beyond their own racial/ethnic group to find partners or were not more likely to have partners of the same race/ethnicity (Berry et al., 2007; Bingham et al., 2003; Raymond & McFarland, 2009b). In Bingham and colleagues' (2003)

study conducted in Los Angeles, 87% of API MSM reported anal-sex partners of a different race/ethnicity compared with 73% of Black, 48% of Latino, and 37% of White MSM. The majority of API MSM's partners were White (62%) and they reported the lowest prevalence of Black partners. These findings of race mixing patterns among API MSM were similar to the results of a study focusing on API men where the researchers found that about two third of API participants' sex partners were non-API men (Choi et al., 2003). However, they also found that API MSM were more likely to have UAI with an API partner than with a non-API partner.

In summary, findings from these studies revealed a rather complex picture of API MSM's sexual networks. Although the data showed that a majority of API MSM seek sex partners beyond their own racial/ethnic group, almost all of these studies were conducted in the two gay concentrated urban cities in west coast and may not be generalizable to sexual mixing patterns among API MSM in other places. In addition, the findings of age mixing patterns were not conclusive and the methodologies used had limitations (Catania, Binson, & Stone, 1996). But these quantitative data of age mixing do not support the stereotype that API men are more likely to be partnered with much older White men. Lastly, while it is important to examine sex partner's race and age, they should be examined in conjunction with sexual risk behaviors.

Hypothesis 8: API MSM engage in higher rates of seroadaptive behaviors than other MSM.

Seroadaptation—broadly defined as diverse community-originated strategies undertaken to reduce HIV transmission or acquisition risk by deliberately selecting sexual partners of the same HIV serostatus or by modifying sexual practices depending on knowledge of one's own and one's partner's serostatus—has been hypothesized to explain the observed discrepancies in UAI, STDs, and new HIV infections (Le Talec & Jablonski, 2008; Mao et al., 2006; Parsons et

al., 2005; Snowden, Raymond, & McFarland, 2009; Truong et al., 2006; Van de Ven et al., 2002).

One study examined serosorting (choosing to have only sex partners of the same serostatus) among a racially diverse HIV-negative MSM recruited from a Gay Pride festival in Atlanta (Eaton et al., 2007). Among this sample of 628 men, rates of serosorting (defined as limiting unprotected sexual partners to those of the same HIV status) across races/ethnicities were similar: API vs. White vs. Black vs. Latino = 30% vs. 41% vs. 24% vs. 35%. In the multivariate analysis, race/ethnicity was not independently associated with serosorting. Honest disclosure and discussion of one's own and sex partner's serostatus are critical to effective seroadaptive behaviors. Of the two studies that examined whether participants have asked or discussed serostatus with sex partners, both did not find significant associations with race/ethnicity (Bingham et al., 2003; Rietmeijer, LLoyd, & McLean, 2007). Among MSM attending Denver Metro Health Clinic, 40% of Asian, 38% of White, 39% of Black, and 32% of Latino reported having a discussion of serostatus with 100% of partners (Rietmeijer et al., 2007). Meeting sex partners on the Internet has been hypothesized to facilitate serostatus disclosure because the Internet affords one anonymity (Bolding, Davis, Hart, Sherr, & Elford, 2005; Grov et al., 2007). As suggested by qualitative interviews with API MSM, the Internet is a major venue for API MSM to meet sex partners (Poon et al., 2005). Hence, if API MSM are more likely to use the Internet to find sex partners, they would be more likely to know their partners' serostatus. We did not find any study that directly measured the relationship between meeting sex partners online and serostatus disclosure, however, two studies examined whether there were racial/ethnic differences in where MSM met their partners (Halkitis, Moeller, & Pollack, 2008; Horvath, Rosser et al., 2008). In their large US-wide online survey of YMSM, Horvath and

colleagues (2008) found that race/ethnicity was not associated with having met partners exclusively online, exclusively offline, or both online and offline. Haltikis and colleagues (2008) found that API men in New York City were more likely to meet casual partners at work/school, but not on the Internet (API vs. White = 57% vs. 55%) or other venues.

Seroadaptive behaviors also include men having sex partners of a different serostatus but do not engage in unprotected sex. Hence, we reviewed seven studies that reported serodiscordant unprotected sex among MSM (Denning & Campsmith, 2005; O'Leary et al., 2005; Osmond, Pollack, Paul, & Catania, 2007; Raymond et al., 2006; Schwarcz et al., 2007; Whittington et al., 2006; Xia, Osmond et al., 2006). In a population-based sample of MSM in California, Xia and colleagues (2006) found that API men were less likely to have serodiscordant UAI in the past 12 months (API vs. White vs. Black vs. Latino = 0% vs. 9% vs. 17% vs. 19%). Behavioral assessment collected by Stop AIDS Project in San Francisco also reported that API men had significantly lower levels of potentially serodiscordant UAI (Raymond et al., 2006). The other five studies examined unprotected sex among HIV+ and HIV- MSM separately and found that race/ethnicity was not a significant correlate. Using data from the Urban Men's Health Study in San Francisco, Schwarz and colleagues (2007) found that race was not associated with UIAI among HIV+ MSM with non-primary partners who were HIV-/unknown (API vs. White vs. Black vs. Latino = 0% vs. 17% vs. 16% vs. 19%) or URAI among HIV- MSM with non-primary partners who were HIV+/unknown (API vs. White vs. Black vs. Latino = 7% vs. 5% vs. 7% vs. 6%). In the multisite Seropositive Urban Men's Intervention Trial study, the prevalence of AI with HIV-/unknown non-main partners among API HIV+ men was lower compared to White, Black and Latino men (17% vs. 38%, 31%, & 35%), however, race/ethnicity was not significantly associated with condom use for AI (O'Leary et al., 2005).

In summary, we found insufficient evidence to either support or reject our hypothesis that seroadaptive behaviors are more prevalent among API MSM than other MSM because: 1) the majority of the reviewed studies included very small subsamples of API MSM or HIV+ API MSM (n <=15) (Denning & Campsmith, 2005; Eaton et al., 2007; O'Leary et al., 2005; Raymond et al., 2006; Rietmeijer et al., 2007; Schwarcz et al., 2007; Xia, Osmond et al., 2006); 2) during the past 2 years, definitions and measures of seroadaptive behaviors have been refined and expanded (Le Talec & Jablonski, 2008; Snowden et al., 2009); 3) contextual factors (e.g. disclosure and discussion of serostatus, intention to engage in seroadaptive behaviors) were very limited in almost all studies.

Hypothesis 9: API HIV-positive MSM have better access to medical treatment and care than other MSM.

Linking HIV+ persons to medical treatment and care is an important part of HIV prevention as HIV+ persons on antiretroviral therapy have lower viral load and hence reduces their infectivity and onward HIV transmission if they engage in high-risk sexual behaviors (Gray et al., 2001; Mannheimer, Friedland, Matts, Child, & Chesney, 2002; Porco et al., 2004). Research in access to HIV treatment and care as well as adherence to HIV drugs is scarce among MSM in general and absent for API MSM in particular. We did not locate any study regarding HIV treatment and care that included a subsample of API men. However, we included one study that measured trends in AIDS incidence and survival among MSM as a proxy to them receiving HIV treatment and care (Blair, Fleming, & Karon, 2002). Using AIDS case reports from all states in the US, Blair and colleagues (2002) found that between 1996 (HAART was introduced) and 1998, AIDS incidence declined among all racial/ethnic groups of MSM, but to a greater degree among API men (43%) compared with White (39%), Black (23%) and Latino (35%) men.

Accordingly, AIDS deaths declined among all MSM, 69% among API, 65% among White, 53% among Black, and 60% among Latino. From 1996 to 1999, AIDS rate (per 100,000) was lowest among API (9.1, 6.3, 5.2, & 5.5) compared with White (17.9, 12.9, 11.0, & 9.9), Black (66.2, 56.2, 50.7, & 49.3), and Latino (39.3, 31.8, 29.0, & 27.3). However, survival rates of at least 24 months after diagnosis of immunological AIDS in 1997 were similar across races/ethnicities (API vs. White vs. Black vs. Latino = 95% vs. 94% vs. 89% vs. 94%).

In summary, we could not directly examine whether or not our hypothesis is supported by the literature. Despite the importance of HIV treatment and care, research in access to treatment and care, quality of care received, as well as adherence to treatment is very limited.

Hypothesis 10: API MSM are less acculturated into American and/or gay culture, which may lead to lower risk behaviors.

According to the U.S. Census Bureau (2004), APIs are one of the fastest growing racial/ethnic groups in the United States. In March 2004, the API population was estimated 12.9 million or 4.4% of the total U.S. population, almost tripled since 1980. And it is projected that the API population will increase to 9% of the U.S. total by the year 2050 due largely to immigration (U.S. Census Bureau, 2004). Studies of API MSM showed that 50% to 75% of the participants were born outside of the US (Chae et al., 2008; Choi et al., 2002; Choi et al., 2004; Matteson, 1997). Research in the relationship between immigration and/or acculturation to American culture and health found that higher acculturation to American culture may have negative effects on one's health (Abraido-Lanza, Chao, & Florez, 2005; An, Cochran, Mays, & McCarthy, 2008; Goel, McCarthy, Phillips, & Wee, 2004; Kandula et al., 2008; Koya & Egede, 2007; Singh & Siahpush, 2002). Moreover, some empirical evidence suggests that higher acculturation to gay culture or more connection to gay community may increase MSM's risk

behaviors, e.g. substance use (Stall et al., 2001). Hence, we hypothesize that foreign-born API MSM, who make up a majority of API MSM, engage in lower HIV-related risk behaviors.

Ten studies examined the relationship between nativity (US-born vs. foreign-born) and unprotected anal intercourse, substance use, and HIV infection (Chae et al., 2008; Choi, Coates et al., 1995; Choi et al., 2002; Choi et al., 2003; Choi et al., 2005; Lloyd, Faust, Roque, & Loue, 1999; Matteson, 1997; Operario, Choi, Chu, McFarland, Secura, Behel, MacKellar, & Valleroy, 2006; Shapiro & Vives, 1999; Yoshikawa et al., 2004) and the findings are mixed. Choi et al.'s studies (1995; 2002; 2003; & 2005) conducted in the west coast cities among API MSM found that nativity was not associated with UAI, UIAI, or URAI. In their sample of API men in a northeastern city, Yoshikawa and colleagues (2004) found that US-born APIs reported higher rates of UAI with primary partner, but no difference in rates of UAI with secondary partners. In terms of substance use, two studies found that US-born API MSM were more likely to be high or buzzed on alcohol, marijuana, or GHB during sex in the past 6 months and more likely to report frequent drug use, club drug use, or polydrug use (K.H. Choi et al., 2005; Operario et al., 2006). In addition, US-born API MSM were more likely to be HIV infected than foreign-born API MSM (4.1% vs. 2.0%) (K.H. Choi et al., 2004).

As acculturation is such a complex concept, using birthplace as a measure of it is quite crude. In his study of a small sample of Filipino, Chinese, and Korean MSM in a large Midwestern city, Matteson and colleagues (1997) found that birthplace was not associated with risk taking, but high acculturation to Asian culture was associated with high functioning in terms of safe sex. A study conducted among Latino YMSM also found that those connected to their ethnic community were about 40% less likely to report recent UAI with a male partner, and 60% less likely to have engaged in UAI during the last sexual contact with a non-main male partner

(O'Donnell et al., 2002). Among US Asian college students, heritage acculturation significantly predicted conservativism in attitudes toward casual sex while mainstream acculturation predicted liberty in attitudes toward casual sex (Ahrold & Meston, 2009). Chae and colleagues (2008) used preference for language spoken as a measure of acculturation among API MSM; however, they did not find an association between preference for language spoken and UAI.

In summary, we found that nativity was not associated with unprotected anal intercourse among API MSM, but with substance use and HIV infection. The association between nativity and HIV infection may be confounded by the fact that most API MSM immigrated from countries with lower HIV prevalence than that in the US. Very limited evidence suggests that high acculturation to one's own ethnic culture may have protective effect. Certainly, refined measures of acculturation to American/gay/ethnic cultures are needed to examine the relationship between acculturation and HIV-related risk behaviors among API MSM.

2.5 CONCLUSIONS

In this paper, we evaluated the existing scientific evidence that may explain the lower HIV prevalence among API MSM compared to MSM of other races/ethnicities (Specific Aim 1). Restricted by the small number of studies that included subsamples of API MSM or studies primarily focusing on API MSM, we were not able to find strong evidence to fully support any of the ten hypotheses hypothesizing to protect API MSM against HIV infection. We found that six of our hypotheses were not supported by the literature, that rates of unprotected anal intercourse, substance use, and STDs are not lower, rates and frequency of HIV testing and

utilization of HIV prevention services are not higher, and ethnicity is not associated with HIV-related risk behaviors among API MSM compared to MSM of other races/ethnicities. However, certain areas are either understudied or require stronger evidence. For example, the effects of different substances used before/during sex and their associations with unprotected sex; HIV-STD co-infections among API MSM; acute/early HIV infections; and evaluation and operational research of HIV prevention intervention programs or services.

Four of the hypotheses examined provide partial explanations or suggest future research directions. First, contrary to popular beliefs, API MSM may be more likely to have partners close to their own ages, which reduces their risk for HIV infection. Future research in age mixing patterns among API MSM should refine the methodology, examine how partner's race interact with age, and assess sexual risk behaviors with partners of different age cohorts in more details. Second, evidence regarding seroadaptive behaviors is far from convincing primarily due to the very small samples of API MSM in the studies and limited measures of these behaviors. Future studies of API MSM should address these limitations as well as examine the contexts within which seroadaptive behaviors occur. Third, trends in AIDS incidence and survival suggest that HIV-positive API MSM may have better access to and reception of medical care and treatment. Direct measures of these important structural factors are needed. Fourth, limited evidence suggest that ethnic heritage acculturation may be protective. However, the ways in which acculturation to American and/or gay cultures interact with one's own ethnic culture and how they affect sexual risk behaviors among API MSM need to be explored both qualitatively and quantitatively.

Previous epidemiological studies of MSM primarily focused on risk factors of HIV infection, while largely ignored to explore strengths and resilience among this population. While

API MSM may indeed experience higher levels of homophobia, racism and sexual stereotyping within their ethnic communities and the gay community, strengths and resilience among API MSM may have moderated and/or mediated the relationships between homophobia, racism and sexual stereotyping and HIV infection, which are poorly understood and understudied. Recently, several researchers have argued that interventions are most likely to succeed when they are designed to support and enhance naturally occurring sources of resiliency and strength given the adversities faced by gay men of color (Diaz, Peterson, & Choi, 2008). Thus, in addition to identifying risk factors, it is also important to identify sources of resilience and strength at multiple levels within the ecological framework. Considering the low HIV prevalence among API MSM, a strength-based approach to identify protective factors among API MSM may be especially informative to HIV prevention for API MSM themselves as well as for other racial minority MSM.

3.0 RACE AND AGE MIXING PATTERNS AMONG ASIAN/PACIFIC ISLANDER MEN WHO HAVE SEX WITH MEN

3.1 INTRODUCTION

The transmission and spread of sexually transmitted diseases within a community in part depends on the underlying structure of the network of sexual contacts, also known as the sexual network (Anderson et al., 1986; Jacquez et al., 1988). Just as social, economic, cultural, and political forces determine the distribution of STDs/HIV by putting certain individuals at higher risk for infection, such forces also shape the structure and organization of sexual networks by affecting the availability of sex partners and influencing partnership choices, which may have a greater impact than individual risk behaviors (Aral, 1999; Doherty et al., 2005; Laumann & Youm, 1999). Indeed, it has been observed that although African American men who have sex with men (MSM) do not engage in high-risk sexual behaviors at greater rates than other racial groups of MSM, they are disproportionately affected by HIV, leading several researchers to hypothesize that the sexual networks of African American MSM may account for the high HIV prevalence and incidence (Millett et al., 2006).

One way to examine sexual networks is to investigate patterns of sexual mixing, that is, the extent to which people have sexual partners from similar/like with like (assortative mixing) or different/like with unlike (dissortative mixing) networks (Gupta, Anderson, & May, 1989).

Several empirical studies that examined sexual mixing patterns within and across racial and age groups of MSM provided support to the hypothesis that sustained high HIV prevalence among African American MSM may be explained by the synergistic effect of assortative (more likely to have sex with other African American MSM) and dissortative (more likely to have older sex partner) mixings (Berry et al., 2007; Bingham et al., 2003).

A similar hypothesis applied to API MSM's sexual networks may explain the observed discrepancy between risk behaviors and HIV infection among API MSM, that is, comparable or even higher rates of HIV risk behaviors, increasing STDs rates, but much lower HIV prevalence and stable incidence (Diaz, Peterson, & Choi, 2008; Catania et al., 2001; Osmond et al., 2007; Bingham et al., 2003; Raymond et al., 2006). In a cross-race study of sexual mixing among MSM, it was found that API MSM tended to exhibit assortative mixing patterns in terms of the age of partners, but not in terms of partners' race (Berry et al., 2007). However, Choi and colleagues (2003) found high rates of sexual mixing beyond both API MSM's immediate ethnic social networks and partner differences in age. In light of these different findings, which may be due to different sampling methods and definitions of sexual mixing, we conducted this study to 1) examine race mixing patterns of sexual partnerships among API MSM participants from two waves of the National HIV Behavioral Surveillance (NHBS) Surveys conducted in San Francisco during 2004 and 2008. As social, cultural, economic, and political factors change over time and affect the structure of social networks, sexual networks, and patterns of sexual mixing may change as well. It is suggested that when long-term results are sought, care needs to be taken over changes in network structure (Keeling, 2005); 2) in addition, we also examined the partnerships with API MSM reported by men of other race/ethnicity; 3) we investigated age

mixing patterns between men under the age of 29 with partners age 29 or older and compared their sexual risk behaviors with these partners across races.

3.2 METHODS

3.2.1 Sampling and Recruitment

NHBS uses time-location sampling (TLS) to sample MSM in 21 US cities. NHBS is a collaboration between CDC and local health jurisdiction. (MacKellar et al., 2007; MacKellar, Valleroy, Karon, Lemp, & Janssen, 1996; Magnani, Sabin, Saidel, & Heckathorn, 2005). The TLS methodology is used to approximate a probability sample (quasi-probability sample) in hidden or hard-to-reach populations through creation of a sampling frame that comprises the universe of venues, days, and time periods where and when the population can be found to congregate. A formative research phase constructed an up-to-date universe or sampling frame of gay-identified recruitment venues, which included bars, dance clubs, cruising areas, bookstores, gyms, social organizations, churches, street locations, and other venue types and the days and time periods of attendance in San Francisco. From the roster of all possible venue-day-time (VDT) periods, a random sample of VDT was drawn. At the randomly selected VDT, the attendance of all potentially eligible subjects was recorded and individuals entering or exiting the venue or crossing a predetermined line were intercepted, assessed for eligibility and invited to participate. Intercepts and interviews were done consecutively without choice on the part of field staff until all staff are occupied. Once a staff was available, intercepts and interviews resumed. In

the analysis, data were weighted according to the sample fraction obtained at the VDT and adjustments are made to standard errors to account for clustering.

During recruitment, recruiters briefly described NHBS-MSM to men who have not previously participated and asked if they were willing to participate in a brief screening. They were then screened for eligibility. Men normally were approached for recruitment in public, but eligibility screening occurred in a private area of the venue or in a designated interviewing space near the venue. Persons eligible for the study were male gender (not transgender), age 18 years and older, being a resident of any of ten Bay Area counties, were able to complete the interview in English or Spanish, and had to be consecutively approached by the staff at the randomly selected VDT (i.e., they could not approach staff on their own or at a later time). Of note, identifying as MSM at the time of screening was not an eligibility criterion, thus allowing non-gay identified MSM to participate and reducing the risk that persons who did not wish to initially acknowledge male-male sexual behavior would not be excluded.

After determining eligibility, interviewers provided informed consent information to the respondents and addressed any questions. Consent to participate was obtained verbally. Computer-assisted interviewer-administered interviewing was conducted per national protocol. NHBS in 2004 was determined to be a non-research surveillance activity by both the CDC Institutional Review Board and University of California San Francisco's Committee on Human Research (UCSF CHR). NHBS in 2008 had IRB clearance from both CDC and UCSF. The analysis of the data was approved by University of Pittsburgh IRB.

3.2.2 Measures

The San Francisco NHBS-MSM survey contained two main groups of measures: 1) Individual socio-demographics including age, race/ethnicity, education, sexual orientation, etc.; most recent HIV test result; and number of sex partners in the past six months; 2) A sexual activity matrix assessing sexual partner and partnership characteristics. The sexual activity matrix elicited detailed partner-by-partner information on up to five partners over the last six months from each respondent. Respondents with more than five partners were asked to report on the five partners they had sex with most recently in the six-month period. For each partner, demographic characteristics including age, race, type of partner (e.g. main, causal, anonymous), and place met partner were recorded. Then for each partner, respondents were asked to report on the number of times they engaged in protected and unprotected insertive and receptive anal intercourses, as well as partner's HIV status.

Race mixing: For this study, we used five races to categorize participants and their partners: API, White, Black, Latino, and Mixed/Other. In the survey, participants self-identified their own race/ethnicity using the following questions: "Are you Latino/Hispanic? Yes/No" All participants responding "Yes" were classified as Latino/Hispanic and nothing else. If "No", they were then asked, "Which of the following racial group or groups do you consider yourself to be? (Check all that apply) Asian, African American/Black, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Caucasian, Other (specify)". Those respondents reporting either "Asian" or "Native Hawaiian/Pacific Islander" or both were classified as API. Due to small numbers, those who responded to more than one of the racial groups or those who identified as American Indian/Alaska Native were classified as Mixed/Other race. Observations with an

"other" response written in were examined and re-coded if appropriate (e.g., "Irish" would be re-coded to "White"), otherwise classified as Mixed/Other race. Those who refused to report their race were excluded from the analysis (n=6). The same procedure was used to classify the race/ethnicity of participants' sexual partners.

Age mixing: Participants self reported both their ages ("What is your date of birth?") and each of their partner's age (e.g. "How old is partner 1?"). From the sexual activity matrix, dichotomous variables--anal intercourse (AI), unprotected anal intercourse (UAI), unprotected insertive and receptive anal intercourse (UIAI & URAI)—were computed measuring whether participants had any of these sexual activities with any of the reported partners.

3.2.3 Statistical Analysis

Race mixing: Based on the distribution of each racial group of MSM respondents' and their reported partners' race in the sample, we calculated an expected number of same-race partnerships that would occur if there were no choice (that partnerships form randomly in terms of race). We then calculated the actual observed number of same-race partnerships and compared it with the expected number of same-race partnerships using the χ^2 test. Chi-square or Fisher's exact tests were used to compare sociodemographic characteristics of participants and their partnerships between 2004 and 2008. All statistical analyses were conducted using SPSS version 14.0.

Age mixing: An HIV prevalence of 5% has been suggested to be the "tipping point" in the expansion of HIV epidemics. Based on the distribution of participants' self-reported most recent HIV test results by their ages, we found that HIV prevalence ranges from 0% up to just about 5%

among participants under the age of 29 while it is over 15% among participants age 29 and older, hence we restricted our analyses to participants under the age of 29 from NHBS 2004. First, we compared socio-demographic characteristics and sexual risk behaviors between participants who reported no partner age 29 or older and those who reported at least one partner age 29 or older. Second, among participants who reported at least one partner age 29 or older, we compared their partnership characteristics and sexual activities with all partners across participants' races/ethnicities. Finally, we examined participants' URAI with just partners age 29 or older and compared it across participants' races/ethnicities. Chi-square or Fisher's exact tests were used to detect statistical significance (p <.05) for the comparisons. All statistical analyses were conducted using SPSS version 14.0.

3.3 RESULTS

3.3.1 Race Mixing

Socio-demographics of API participants and their partnerships

One thousand five hundred and sixty eight MSM were included in the analysis of 2004 NHBS data. Of them, 197 (12.6%) were API, 870 (55.5%) were White, 110 (7.0%) were Black, 295 (18.8%) were Latino, and 96 (6.1%) were of mixed or other race/ethnicity. The 2008 NHBS had 531 participants, of whom 51 (9.6%) were API, 285 (53.7%) were White, 40 (7.5%) were Black, 127 (23.9%) were Latino, and 28 (5.3%) were of mixed or other race/ethnicity. As seen in Table 3.1, a majority of API MSM (60.4% & 62.7%) were between the ages of 26 and 40 in both 2004

and 2008 surveys. Educational attainment was high, with 68.5% and 70.6% having a college degree or higher in both surveys. Over half of the API MSM (64.5% & 58.8%) were born outside of the United States; however, a majority of them (55.9% & 66.7%) had been living in the United States for over 10 years. Most of the API MSM were employed fulltime and self identified as gay in both survey waves. None of these socio-demographic characteristics of API participants differed significantly between the 2004 and 2008 surveys. Almost 10.0% of the API MSM in the 2004 survey reported a positive or unknown HIV serostatus from their most recent test result while 8.1% reported as such in the 2008 survey ($p = .44$).

Three hundred and sixty eight in 2004 and 107 partnerships in 2008 were reported by API MSM (mean = 1.9 & 2.1), respectively. Similar to API participants' ages, a majority of their partners (64.0% & 54.5%) were between the ages of 26 and 40. Partners' type differed significantly between 2004 and 2008, with more anonymous partnerships reported in 2004 than in 2008 (30.9% vs. 7.1%, $p < .01$). Over half of the partners (58.6% & 62.5%) were met at bars, cafes, nightclubs or restaurant and on the Internet. Although not statistically significant, API participants in the 2004 survey reported that 30.0% of their partners were of unknown HIV status, compared to 19.6% reported in the 2008 survey ($p = .05$)

Patterns of Race Mixing among API Participants

As seen in Table 3.2, of the 368 partnerships reported by API MSM in 2004, 70 (19.0%) were with other API MSM, which was significantly more than the expected number of 54 ($\chi^2 = 4.54$, $p = .03$). The observed API MSM same-race partnerships were 30% more than expected (ratio = 1.30). The majority of the partnerships (n = 248, 67.4%) were with Caucasian MSM, almost the same as expected ($p = 239$). Notably, the observed partnerships between API MSM

and other racial minority MSM were significantly less than expected ($p_s < .01$). The observed API-Black and API-Latino partnerships were 80.0% and 56.0% less than expected.

Similar patterns of race mixing among API MSM were seen in 2008. A slightly lower proportion of partnerships (12.7%) were with other API MSM. Although the observed API-API partnerships were not significantly more than the expected in 2008, the observed/expected ratio of 1.18 was similar to that of 2004. Again, the majority of the partnerships (n=78, 72.9%) were with Caucasian MSM, while the observed API-Black and API-Latino partnerships were much less than expected (44.0% & 64.0%).

Partnerships with API MSM among Participants of other races/ethnicities

In addition to examining API participants' reported partnerships, we also examined participants of other races/ethnicities' reported partnerships with API MSM in both years. Of the 1932 and 656 partnerships reported by Caucasian participants in 2004 and 2008, 232 and 70 (12.0% & 10.7%) were with API MSM (Table 3.3). The observed partnerships with API MSM among Caucasian participants were neither significantly more or significantly less than expected in both years ($\chi^2 = .21$, $p = .65$ & $\chi^2 = 1.00$, $p = .31$). Consistent with API participants' reported partnerships with Black and Latino MSM, Black and Latino participants reported fewer partnerships with API MSM than expected in both 2004 and 2008. For example, of the 636 and 318 partnerships reported by Latino participants in both years, only 40 and 16 (6.3% & 5.0%) were with API MSM, which were significantly less than the expected numbers of 81 and 28 ($\chi^2 = 20.76$, $p < .01$ & $\chi^2 = 4.91$, $p = .03$).

3.3.2 Age Mixing

Socio-demographic and Behavioral Characteristics

A total of 334 MSM under the age of 29 from NHBS 2004 were included in the analysis. Among them, 185 (55.4%) reported at least one partner age 29 or older. As seen in Table 3.4, those who had at least one partner age 29 or older were significantly older (66.5% were between 25-28) than those who had no partner age 29 or older (32.2% were between 25-28) ($p < .01$). In addition, those who had at least one partner age 29 or older were more likely to be born outside of the US (64.7% vs. 20.1%, $p < .01$) and less likely to self identify as bisexual (6.5% vs. 18.1%, $p < .01$). No racial group of MSM was more likely to have a partner age 29 or older than the others. In terms of sexual risk behaviors, the two groups of men did not differ in rates of UAI (50.3% vs. 46.3%, $p = .47$), UIAI (35.7% vs. 36.2%, $p = .92$), and URAI (37.8% vs. 32.9%, $p = .35$). Although not statistically significant, HIV prevalence was higher among those who had at least one partner age 29 or older than those who did not (6.3% vs. 1.5%, $p = .10$).

Racial Differences of Partnership and Behavioral Characteristics

Among men who had at least one partner age 29 or older, 39 (21.2%) were API, 56 (30.4%) were White, 15 (8.2%) were Black, 57 (31.0%) were Latino, and 17 (9.2%) were of mixed or other races (Table 3.5). The 5 racial groups of men did not differ in age ($p = .30$) and HIV status ($p = .80$), although it appeared that more Black men were between 18-24 (46.6%) and HIV prevalence was higher among Black (7.1%) and Latino men (9.3%). A total of 513 partnerships were reported by all men, of which 88 were reported by API (mean = 2.3), 175 reported by White (mean = 3.1), 37 reported by Black (mean = 2.5), 164 reported by Latino (mean = 2.9), and 49 reported by men of mixed or other race (mean = 2.9). Partners' ages

differed significantly as White and Black men were more likely to have partners over the age of 40 than others (19.7% & 13.5% vs. 9.2%, 8.1%, & 8.9%, $p = .02$). Partners' races differed significantly as well ($p < .01$). Seventy seven percent and 75.4% of API and White men's partners were White while 48.7% and 48.8% of Black and Latino men's partners were White. Rates of AI, UAI, UIAI, and URAI all differed significantly across races. AI, UAI, and UIAI were significantly less likely to occur with Black men's partnerships compared to men of other race's (86.5% vs. 100.0%, 98.9%, 97.5%, & 100.0%, $p < .01$; 27.0% vs. 50.0%, 62.9%, 44.2%, & 59.2%, $p < .01$; 0% vs. 40.9%, 44.6%, 36.8%, & 40.8%, $p < .01$). URAI was significantly less likely to occur with both Black and Latino men's partnerships compared to others' (27.0% & 20.2% vs. 40.9%, 46.3%, & 49.0%, $p < .01$). Partners' HIV statuses did not differ significantly, however, it is worth noting that all men reported at least 25.0% of their partners' HIV status as unknown.

Sex with Partners Age 29 or Older

As seen in Table 3.6, 64 of API men's partnerships (72.7%), 125 of White men's partnerships (71.4%), 26 of Black men's partnerships (70.2%), 99 of Latino men's partnerships (60.4%), and 33 of men of mixed or other race's partnerships (67.3%) were with partners age 29 or older. URAI was significantly less likely to occur with Black and Latino men's partnerships compare to others' (19.2% & 24.2% vs. 42.2%, 48.0%, & 45.5%, $p < .01$). Among the partnerships that URAI was involved, API and Latino men's partners were significantly more likely to be main partners compared to other men's partners (51.9% & 54.1% vs. 23.3%, 0%, & 6.7%, $p < .01$). In addition, the proportion of anonymous partners was lowest among API men's partners (14.8%). Although not statistically significant, API men only reported 7.4% of their

URAI partners' HIV status as unknown while White men reported 36.7%, Black men reported 40.0%, Latino men reported 12.5%, men of mixed or other race reported 40.0%.

3.4 DISCUSSION

In this paper, we examined whether patterns of race and age mixing among API MSM may place them at lower risk of HIV infection (Specific Aim 2). First, we examined race mixing patterns of API MSM's sexual partnerships in 2004 and 2008. We found that in both years API MSM tended to be partnered more with other API MSM than expected. Moreover, API MSM reported significantly less partnerships with other racial minority MSM than expected, especially Black MSM. This is consistent with results from a previous study (Bingham et al., 2003). These findings suggested that API MSM's sexual mixing patterns by race of partners were more assortative than dissortative. As HIV prevalence is much higher among MSM of other racial groups, the observed assortative mixing among API MSM suggest that the composition of API MSM's sexual networks may be one of the factors protecting API MSM from more HIV infections. Such structural factors can override individual risk behaviors. Indeed, we found that rates of sexual risk behaviors were similar between API MSM and MSM of other races, except Black MSM, in both 2004 and 2008 (data not shown).

As observed from our data, the structure of API MSM's sexual network is only one contributing factor, among many others, to the low HIV prevalence among this sub-population. As found in our study, still a majority of API MSM's sexual partnerships were with White MSM. This is not surprising considering that Whites consist of the majority of MSM population and

hence are more available as sexual partners. We also found that other racial minority MSM were significantly less likely to have API partners. In a study that measured psychosocial and structural factors related to partner selection among MSM, Raymond and McFarland (2009b) found that Black MSM were reported as the least preferred sex partners, believed at higher risk for HIV, counted less often among friends, were considered hardest to meet, and perceived as less welcome at the common venues that cater to gay men in San Francisco.

We also examined age mixing between men under the age of 29 with partners age 29 or older. We found that men who had partners age 29 or older tended to be older, to be born outside of the US, and to self-identify as gay than those who did not have partners age 29 or older. A recent study examining age mixing among MSM in Australia found that overall patterns of age mixing tend to be assortative (D. P. Wilson, 2009), which supports our finding that men who had older partners were also older themselves. No one racial group of men was more likely to have had partners age 29 or older than others. However, White and Black men were more likely to have partners over the age of 40 than others. In addition, there were more Black men between the ages of 18-24 than men of other races. In another words, the age gap between Black men and their partners tended to be wider. On the other hand, it is worth noting that a higher proportion of API men (74.3%) were between the ages of 25-28 than men of other races, and yet their partners did not tend to be older than those of other men's. The narrower age gap between API men and their partners suggests that age mixing is more assortative among API MSM. These findings are similar to the results of previous studies (Bingham T.A. et al., 2003; Berry et al., 2007). Furthermore, the stereotype that API gay men tend to be partnered with much older men is not supported by our results.

We also found that API men engaged in similar rates of unprotected anal sex compared to men of other races/ethnicities, except that Black men were significantly less risky. However, when we took a deeper look at URAI with just partners age 29 or older, API men may actually be at lower risk for HIV infection in that their URAI partners were more likely to be main partners and awareness of their URAI partners' HIV status was significantly higher. On the other hand, none of Black men's URAI partners was a main partner and almost half of their URAI partners were of unknown HIV status.

There are several limitations of this study. First, time-location sampling does not reach MSM who do not frequent venues in San Francisco where MSM can be found. However, MSM who frequent venues tend to mix sexually with other MSM more than those who do not, hence epidemiologically more relevant to infectious disease transmission. In addition, we focused our analyses on the partnership-level data, which represent part of MSM's sexual networks. Second, because of the unique context of San Francisco gay culture, findings may not be generalizable to MSM of other geographic areas. Third, our categorization of race into five groups may be restrictive and simplistic as within-category differences may exist, e.g. ethnical differences among API or Latino men.

Although investigations of race and age mixings may explain epidemiologically the HIV disparities between MSM of difference races/ethnicities, race and age themselves are not amenable to prevention interventions. Hence, future research in this area should investigate in-depth partner selection processes as partner choice is intentional, non-random, and could be a result of personal preferences or structural factors (Berry et al., 2007; Klovdahl, 1985). In addition, investigation of how other patterns of mixing, e.g. race and economic status, interact with age mixing may provide further insight into the dynamics of MSM's sexual networks.

Finally, for API MSM, it appeared that sexual risk behaviors with older partnered occurred mostly within main partnerships, which in turn protect themselves from HIV infection as they would be more likely to have accurate knowledge of their main partner's HIV- status than casual or anonymous partner's HIV-status. This stronger tendency to establish main partnerships among API MSM may be attributed to the influence of Asian cultural values that emphasizing stability and family relationships. Future studies should measure such cultural constructs, which appeared to be protective, in association with HIV risk behaviors and infection among API MSM.

4.0 RACIAL/ETHNIC DIFFERENCES IN SEROADAPTIVE AND SERODISCLOSURE BEHAVIORS AMONG MEN WHO HAVE SEX WITH MEN

4.1 INTRODUCTION

Based on the notion that HIV transmission and acquisition do not occur with unprotected anal intercourse (UAI) between sex partners of the same HIV serostatus, seroadaptation—broadly defined as diverse community-originated strategies undertaken to reduce HIV transmission or acquisition risk by deliberately selecting sexual partners of the same HIV serostatus or by modifying sexual practices depending on knowledge of one's own and one's partner's serostatus—has generated interest among researchers that may explain the observed discrepancies between increasing rates of UAI and sexually transmitted infections (STIs) and stable HIV incidences (Le Talec & Jablonski, 2008; Mao et al., 2006; Osmond et al., 2007; Parsons et al., 2005; Truong et al., 2006; Van de Ven et al., 2002; Xia, Molitor et al., 2006). Several studies have documented prevalent and increasing adoption of seroadaptive behaviors (serosorting, seropositioning, negotiated safety, etc.) among both HIV-negative and HIV-positive men who have sex with men (Mao et al., 2006; Parsons et al., 2005; Snowden et al.2009; Golden et al., 2008).

Although in theory such harm reduction strategies would prevent HIV infection, in practice they carry different level of risks due to a range of biological and contextual factors.

Among HIV-positive persons, there is the possibility that transmission of HIV actually does occur (i.e., superinfection) with implications for drug resistance and treatment options (Blish et al., 2008). Among HIV-negative men, it is possible that they may test HIV antibody negative but actually be in the highly infectious pre-seroconversion window (acute infection) (Pilcher, Eaton, Kalichman, Bisol, & de Souza, 2006). In addition, the effectiveness of seroadaptive behaviors relies on accurate knowledge of one's own and his partner's serostatus, which involves open discussion and honest disclosure. Unfortunately, such desired scenario may not occur for a range of reasons. First, HIV testing is not universal among MSM, with Black and Latino MSM having lower testing rates (Do et al., 2005; Manning, Thorpe, & Ramaswamy, 2007; Xia, Osmond et al., 2006). Second, some men may hide their HIV status in fear of rejection. One study found that 42% of HIV-positive MSM reported sex without disclosing their status (Ciccarone et al., 2003). Third, substance use and mood and emotional state may impair decision making. Fourth, some men may lack the necessary skills to openly discuss issues around HIV status and may wrongly assume their partners' serostatus based on perception or using covert ways to find it out. It has also been noted that the Internet may be a new and particularly important contextual factor for HIV seroadaptation in that the anonymity afforded by the Internet may facilitate HIV serostatus disclosure (Bolding et al., 2005; Grov et al., 2007).

To our knowledge, no empirical study has examined racial/ethnic differences in seroadaptive behaviors among MSM. In this paper, we compared rates of several seroadaptive behaviors between MSM of different races/ethnicities. In addition, we examined racial/ethnic differences in serodisclosure behaviors among MSM who engaged in some form of seroadaptive behavior.

4.2 METHODS

4.2.1 Sampling and Recruitment

As a part of a longitudinal investigation of seroadaptive behaviors among MSM, a cross-sectional baseline survey of MSM attending public venues was conducted in San Francisco between November 2007 and October 2008 using time-location sampling (TLS). The TLS methodology is used to approximate a probability sample (quasi-probability sample) in hidden or hard-to-reach populations through creation of a sampling frame that comprises the universe of venues, days, and time periods where and when the population can be found to congregate. A formative research phase constructed an up-to-date universe or sampling frame of gay- or MSM-identified recruitment venues, which included bars, dance clubs, cruising areas, bookstores, gyms, social organizations, churches, street locations, and other venue types and the days and time periods of attendance in San Francisco. From the roster of all possible venue-day-time (VDT) periods, a random sample of VDT was drawn. At the randomly selected VDT, the attendance of all potentially eligible subjects was recorded and individuals entering or exiting the venue or crossing a predetermined line are intercepted, assessed for eligibility, and invited to participate. Intercepts and interviews were done consecutively without choice on the part of field staff until all staff were occupied. Once a staff was available, intercepts and interviews resumed. In the analysis, data are weighted according to the sample fraction obtained at the VDT and adjustments are made to standard errors to account for clustering.

During recruitment, recruiters briefly described the study to men who have not previously participated and asked if they were willing to participate. Men who have not previously

participated were referred to an interviewer who administered the eligibility screener. Men normally were approached for recruitment in public, but eligibility screening occurred in a private area of the venue or in a designated interviewing space near the venue. Persons eligible for the study were male gender (not transgender), age 18 years and older, being a resident of any of ten Bay Area counties, were able to complete the interview in English or Spanish, and had to be consecutively approached by the staff at the randomly selected VDT (i.e., they could not approach staff on their own or at a later time). Of note, identifying as MSM at the time of screening was not an eligibility criterion, thus allowing non-gay identified MSM to participate and reducing the risk that persons who did not wish to initially acknowledge male-male sexual behavior would not be excluded.

After determining eligibility, interviewers provided informed consent information to the respondents and addressed any questions. Written informed consent was obtained from participants. Staff then oriented participants to the handheld computer-assisted interview. Once participants were familiar with the operation of the handheld computer, they completed the self-administered survey. The study was approved by both University of California San Francisco's Committee on Human Research (UCSF CHR) and University of Pittsburgh IRB.

4.2.2 Measures

Socio-demographics. Participants' socio-demographic characteristics, including race/ethnicity, age, education, employment, annual income, country of birth, and sexual orientation were assessed. In addition, participants reported races/ethnicities and ages of their partners as well as places where they met the partners.

Seroadaptive behaviors. Seroadaptive behaviors are based on respondent's self-reported HIV serostatus, the reported serostatus of their partners, and the sexual practices with each partner in the preceding six months. The survey instrument asked men the date of their most recent HIV test and the result of that test and questions on a partner-by-partner basis for up to five partners in the last six months. If men had more than five partners in the six-month period they were asked to report on the five partners they had sex with most frequently. For each partner, the participant was asked the partner's HIV serostatus, the partnership type (main, casual, anonymous, and exchange), the numbers of episodes of receptive anal intercourse (RAI), unprotected receptive anal intercourse (URAI), insertive anal intercourse (IAI), and unprotected insertive anal intercourse (UIAI). From these measures and drawing from the published literature on serosorting, a hierarchical schema of seroadaptive behaviors for HIV-negative and HIV-positive MSM (men who were unsure of their HIV status were excluded) was constructed that comprised the following mutually exclusive categories (Figures 4.1 and 4.2):

No sex: Men who reported no sex partners at all in the last six months.

No anal sex: Men who reported no anal sex partners in the last six months. This category may include men having oral sex only.

100% condom use: This category comprised men who did have AI during the study period, but reported using condoms for all episodes of AI, for all partners, for both insertive and receptive positions. Abstaining from sex, anal sex or 100% condom use is not considered as a seroadaptive behavior; that is, at least some UAI must occur to qualify as seroadaptation in our schema.

Pure serosorting: Men are considered pure serosorters if they had some UAI, but only had partners who were their same serostatus. That is, they are not considered pure serosorters if they used condoms 100% of the time with all partners nor if they had any partner of opposite or

unknown serostatus regardless of whether they used condoms with them. The rationale of pure serosorting is that partner selection is based on serostatus, not condom negotiation.

Negotiated safety: For HIV-negative men only, a negotiated safety indicator is constructed as men who reported one main partner of HIV-negative serostatus, with whom he had unprotected sex, and also reported other non-main partner(s) with whom he used condoms 100% of the time regardless of non-main partner(s)' serostatus. HIV-negative men whose behavior match this description, but who had had anal sex with exclusively HIV-negative partners are classified as pure serosorters, and are not considered to practice negotiated safety.

Condom serosorting: Men are classified as condom serosorters if they did not fit into the above categories, had at least one partner of unknown HIV serostatus or of known serodiscordant status (i.e., potentially serodiscordant), but they only had UAI with known seroconcordant partners. In contrast to pure serosorting, the rationale for condom serosorting is that condom negotiation is based on HIV serostatus, not partner selection.

Seropositioning: To be classified as a seropositioner, the respondent had to report UAI with a potentially HIV serodiscordant partner, but all episodes of potentially serodiscordant UAI were in the insertive position for HIV-negative respondents and in the receptive position for HIV-positive respondents. Moreover, respondents classified as seropositioners did not meet the criteria of any of the above categories.

No discernable strategy: This final category contains men who reported any AI but did not meet the criteria for any of the above categories. These men reported at least one episode of serodiscordant UAI in the insertive position for HIV-positive men and in the receptive position for HIV-negative men.

Serodisclosure behaviors. Serodisclosure behaviors were examined among men who engaged in any of the seroadaptive behaviors (pure serosorting, negotiated safety, condom serosorting, and seropositioning). All respondents were asked, "Did you and this partner discuss each other's HIV status?" and "Did you know this partner's HIV status before you had sex for the first time?" In addition, HIV-negative respondents were asked, "Did you ask this partner when his last HIV test was?" "Did you ask this partner if he had high risk sex since their last HIV test?" and "How confident are you that this partner's HIV status was still negative when you had sex with him for the first time?"

4.2.3 Statistical Analysis

We compared socio-demographic characteristics and rates of seroadaptive and serodisclosure behaviors between MSM of different races/ethnicities using Chi-square test or Fisher's exact test to detect statistically significant differences (at $p<0.05$). All statistical analyses were conducted using SPSS version 14.0.

4.3 RESULTS

Socio-demographic characteristics

A total of 1213 men completed the interview. Of these, 1199 reported on their races/ethnicities and were included in the analyses (Table 4.1). One hundred and forty six (12.2%) men self-identified as Asian or Pacific Islander (API), 628 (52.4%) were White, 81 (6.8%) were Black,

242 (20.2%) were Latino, and 102 (8.5%) were of mixed or other race/ethnicity. Participants differed significantly in all socio-demographic characteristics across races/ethnicities. White participants were more likely to be older than others (21.7% vs. 5.5%, 12.3%, 6.6% & 10.8% aged 51 or older, $p < .01$). API participants were more likely to have obtained a college or above level education than others (72.6% vs. 56.2%, 38.3%, 39.2% & 47.1%, $p < .01$) and to be foreign-born (56.8% vs. 6.4%, 2.5%, 30.6% & 18.6%, $p < .01$). Black participants were more likely to self-identify as bisexual than others (21.0% vs. 6.2%, 6.8%, 12.0% & 13.7%, $p < .01$). Self-reported HIV status also differed significantly. A lower proportion of API men were HIV-positive or unsure of their HIV status compared to White, Black, Latino and men of other/mixed race/ethnicity (17.1% vs. 29.2%, 32.0%, 33.0% & 34.3%, $p < .01$). Of note, 16.0% and 14.0% of Black and Latino men were unsure of their HIV status.

Seroadaptive behaviors

Among HIV-negative men, about half reported no sex partner, no anal sex, or used condom 100% of time across races/ethnicities (Table 4.2.1). Rates of seroadaptive behaviors did not differ significantly across races/ethnicities. Pure serosorting was the most prevalent seroadaptive behavior used by all men, 26.4% among API, 21.6% among White, 18.2% among Black, 21.0% among Latino, and 26.9% among men of mixed or other race/ethnicity. No Black man reported negotiated safety, while 9.1% of them reported seropositioning.

Among HIV-positive men, although not statistically significant, 29.4% of API reported 100% condom use, compared to 12.0% of White, 15.4% of Black, and 17.4% of Latino (Table 4.2.2). Rates of seroadaptive behaviors did not differ significantly across races/ethnicities. Different from HIV-negative men, seropositioning was the most prevalent seroadaptive behavior used by HIV-positive men, 11.8% among API, 14.0% among White, 23.1% among Black, and

13.0% among Latino. By our definition, HIV-positive men with no discernable strategy engaged in serodiscordant UAI in the insertive position. Black and Latino men were significantly more likely to report no strategy compared to others (30.8% & 34.8% vs. 17.6%, 14.0% & 13.6%, p = .02).

Serodisclosure behaviors

Among men who engaged in any seroadaptive behaviors, API men reported 169 partnerships, White men reported 878 partnerships, Black men reported 101 partnerships, Latino men reported 281 partnerships, and men of mixed or other race/ethnicity reported 157 partnerships (Table 4.3). A significantly higher proportion of API men's partners were met through the Internet than others (34.9% vs. 25.5%, 27.7%, 17.8% & 24.8%, p = .01). All men reported that they did not discuss HIV status with about a third of their partners and there was a trend difference that API men did not discuss HIV status with partners at a higher rate (p = .08). Accordingly, API men reported that they did not know their partners' HIV statuses before having sex for the first time at a significantly higher rate compared to others (42.8% vs. 23.9%, 29.5%, 27.2% & 20.8%, p < .01). Among HIV-negative men, it appeared that Latino men and men of mixed or other race/ethnicity asked their partner when his last HIV test was and if he had high risk sex since last HIV test at significantly higher rates compared to others (58.4% & 55.8% vs. 46.6%, 41.7% & 50.0%, p < .01; and 50.0% & 52.9% vs. 33.1%, 35.0%, & 36.8%, p < .01). When asked to rate their confidence in partner's HIV-negative status, API and Black men said they were completely confident at significantly lower rates compared to others (18.8% & 20.6% vs. 28.4%, 28.9% & 30.8%, p < .01). In addition, Black men reported that they were not confident at all in 17.6% of their partnerships.

4.4 DISCUSSION

In this paper we examined and compared rates of seroadaptive and serodisclosure behaviors among a racially/ethnically diverse sample of MSM in San Francisco (Specific Aim 3). We found that about 40% of HIV-negative men and over 30% of HIV-positive men engaged in pure serosorting, negotiated safety, condom serosorting, or seropositioning. Rates of seroadaptive behaviors differed little by race/ethnicities among both HIV-negative and HIV-positive men. This conclusion is consistent with a previous study that examined serosorting among MSM recruited from a Gay Pride festival (Eaton et al., 2007). Our results are also consistent with a review by Millet et al. (2006) finding that UAI with known HIV-positive partners was not likely to account for the disparity in HIV prevalence among Black MSM. Taken together, the racial/ethnic disparities in HIV prevalence observed among MSM in the US do not appear to be strongly related to differences in seroadaptive behaviors.

However, significantly higher proportions of Black and Latino men (16.0% & 14.0%) were not able to engage in any seroadaptive behaviors as they were unsure of their HIV status compared to API and White men (5.5% & 5.3%). We also found that prevalence of 100% condom use was about twice higher among HIV-positive API men compared to HIV-positive White, Black, and Latino men, although not statistically significant. Furthermore, seropositioning, which may pose higher risk for HIV acquisition and transmission, was more prevalent among Black men. Contrary to the results of previous studies of UIAI among HIV-positive MSM (O'Leary et al., 2005; Schwarz et al., 2007), we found significant differences in rates of no discernable strategy, e.g. UIAI, between HIV-positive men of difference

races/ethnicities. Over 30% of both Black and Latino HIV-positive men reported no strategy compared to about 15% of others.

While seroadaptive behaviors were prevalent among participants, we found that participants did not engage in serodisclosure behaviors with over a third of their partners. Two previous studies examining whether participants have asked or discussed serostatus with partners found that race/ethnicity was not a significant correlate (Bingham et al., 2003; Rietmeijer et al., 2007). However, we found significant racial/ethnic differences in disclosure behaviors. API were notably the least likely to discuss HIV serostatus with their partners, to know their partners' serostatus before first having sex, to ask if their partner had high risk sex since their last HIV test, and to have complete confidence in their partners' HIV-negative serostatus. However, these differences in disclosure behaviors did not appear to translate into lower levels of seroadaptation among API in our study population nor to explain the lower prevalence of HIV among API.

There are several limitations of our study. First, time-location sampling does not reach MSM who do not visit MSM-identified venues. In addition, findings may not be generalizable to MSM of other geographic areas. Second, the cross-section design of the study was not able to examine whether participants intentionally adopted seroadaptive behaviors or they were just post-hoc rationalization of having engaged in risky sex. Third, the schema of seroadaptive behaviors may not have captured all the community-originated prevention strategies. Fourth, the small sample sizes of HIV-positive MSM may have limited our power to detect significant differences across races/ethnicities. Future research should assess intentions of engaging in seroadaptive behaviors and the effectiveness of different seroadaptive behaviors in preventing HIV infection, and explore other possible seroadaptive behaviors within the community and contextual factors affecting the adoption of such behaviors.

Fortunately for the present, our findings do not point to seroadaptation as fostering or enhancing the racial/ethnic disparities in HIV prevalence among MSM. Our study, together with others, confirms that seroadaptive behaviors are common strategies adopted by MSM around the world. Seroadaptation is an example of MSM community generated response to the on-going HIV epidemic after the introduction of HAART and safe sex burn-out. This implies that condom distribution and safe sex are not the only prevention measures adopted by MSM. Public health professionals should be well aware of the happenings within the MSM community in order to better assist HIV prevention efforts. By researching in such emerging new behaviors, e.g. serosorting, we will be in a better position to adapt preventions to the changes within the MSM community or design new behavioral interventions, e.g. serodisclosure skill-building. While letting MSM have different options for "safe sex", such interventions are likely to keep them informed of the risks associated with their choices and hence help them make better decisions regarding the sexual behaviors they engage in.

5.0 CONCLUSIONS

Previous epidemiological studies of HIV risk behaviors among API MSM found high rates of unprotected anal sex and substance use among this population. However, despite the adversities API MSM may encounter due to the socio-cultural and structural contexts of homosexuality, racism, and stereotyping within API and gay communities, HIV prevalence has been much lower among API MSM compared to that among MSM of other races/ethnicities. This dissertation project examined protective factors against HIV infection among API MSM.

In the first paper, we examined and evaluated the existing literature for scientific evidence that may explain the lower HIV prevalence among API MSM. Four of the ten hypotheses that were examined provided some partial explanations or needed further investigation. First, API MSM's sexual networks may be primarily composed of MSM of low HIV risk profiles, e.g. age. Second, rates of seroadaptive behaviors may differ between MSM of difference races/ethnicities. Third, HIV-positive API MSM may have better access to and reception of medical care and treatment. Fourth, ethnic heritage acculturation may be protective. However, due to methodological issues and lack of data, none of these hypotheses could be fully supported by the existing scientific literature. Consequently, we analyzed data from two empirical studies to further examine two of the above hypotheses: 1) patterns of race and age mixing among API MSM; and 2) seroadaptive and serodisclosure behaviors among MSM.

In examining patterns of race and age mixing among API MSM compared to MSM of other races/ethnicities, we found that API MSM were more likely to be partnered with other API men than expected, while least likely to have Black and Latino sex partners. In terms of age mixing, young API MSM (under the age of 29) were no more likely to have older partners than young MSM of other races/ethnicities. On the contrary, the age gaps between API participants and their partners were narrower than those of other men and their partners. In addition, we found that although young API MSM engaged in higher rates of URAI with older partners compared to young Black and Latino MSM, they were more likely to be aware of their partners' HIV status due to the fact that a majority of their partners were main partners. It appeared that overall patterns of race and age mixing among API MSM tended to be more assortative.

In the third paper, we found that significant proportions of MSM engaged in some form of seroadaptive behavior and rates of seroadaptive behaviors did not differ across races/ethnicities among both HIV-negative and HIV-positive men. However, among HIV-positive MSM, 100% condom use was about twice higher among API men compared to others. In addition, HIV-positive API MSM were less likely to report no strategy (e.g. UIAI) compared to Black and Latino MSM. While seroadaptive behaviors were prevalent among this sample of MSM, we found that participants did not engage in serodisclosure behaviors with over a third of their partners, which may jeopardize the effectiveness of seroadaptive behaviors in reducing HIV transmission and acquisition risk. In particular, rates of serodisclosure behaviors were significantly lower among API and Black MSM compared to others.

In summary, our review of the literature and findings from the two empirical studies provided limited understanding of protective factors against HIV infection among API MSM in that: 1) the relatively small number of epidemiological studies of API MSM primarily focused on

risk factors of HIV infection. While API MSM may indeed experience higher levels of homophobia, racism and sexual stereotyping within their ethnic and gay communities, strengths and resilience among API MSM may have moderated and/or mediated the relationships between homophobia, racism and sexual stereotyping and HIV infection, which are poorly understood and understudied; 2) although patterns of race and age mixing tended to be more assortative among API MSM, these demographic factors themselves are not amenable to prevention interventions. It seemed that investigations of socio-cultural factors influencing partner selection processes would provide more insights into the structure and organization of API MSM"s sexual networks; 3) rates of seroadaptive behaviors differed little by race/ethnicities among both HIV-negative and HIV-positive men, which does not point to seroadaptation as protecting API MSM against HIV infection. Of concern, the significantly lower rates of serodisclosure behaviors among API MSM observed in our study did not appear to translate into lower levels of seroadaptation among this population.

Our findings have significant implications for both public health research and practice. First, more research on how structural factors, e.g. medical access and treatment for HIV and quality of care, affect HIV infections among some sub-populations of MSM are needed. Second, socio-cultural and structural contexts of partner selection need to be explored using qualitative methods in order to develop more theory-driven sexual network studies, which will inform the designs of sexual network based HIV interventions. Third, public health professionals and researchers should be aware of changing behaviors and environment within the MSM community so that new and innovative interventions, e.g. serodisclosure skill-building, can be developed. Fourth, a strength- or resilience-based approach to studying protective factors against HIV infection among API MSM, which requires a shift from a risk-factor-driven paradigm, is

overdue. Qualitative studies are needed to develop some strength- or resilience-based conceptual frameworks among this population at first. Fifth, it seems that certain cultural issues or values unique to API men would be worth investigating. For example, how do the role and value of family affect decision-making in relation to partner selection or risk behaviors? Does the structure of API families offer more instrumental and emotional support to HIV-positive API MSM? Lastly, while HIV prevalence remains low among API MSM, bio-behavioral surveillance should keep monitoring HIV incidence and risk behaviors among this population and culturally appropriate interventions should be delivered to them, before it is too late to intervene.

APPENDIX A

TABLES

Table 1.1. Comparisons of HIV prevalence rates between API, White, Black, and Latino MSM

	Study/Year/Site	Methodology	Sample Characteristics	API	White	Black	Latino	Ratio (API as reference)
Schwarcz, S. et al. (2007)	UMHS/2002/ San Francisco	RDD	N=1976 (API=3%) Age range: 18+	16%	25%	38%	31%	1.0: 1.6: 2.4: 1.9
Bingham, T.A. et al. (2003)	YMS-II/2000/ Los Angeles	TLS	N=438 (API=1%) Age range: 23-29	6%	7%	26%	15%	1.0: 1.2: 4.3: 2.5
Valleroy, L.A. et al. (2000)	YMS-I/1998/ 7 US cities	TLS	N=3449 (API=6%) Age range: 15-22	3%	3%	14%	7%	1.0: 1.0: 4.7: 2.3
Catania, J.A. et al. (2001)	UMHS/1997/ LA-NY-SF-Chic	RDD	N=2867 (API=4%) Age range: 18+	9%	16%	29%	19%	1.0: 1.8: 3.2: 2.1
Lemp, G.F. et al. (1994)	The SF/Berkeley YMS/1992/SF-Berkeley	TLS	N=425 (API=11%) Age range: 17-22	4%	8%	21%	10%	1.0: 2.0: 5.3: 2.5

Note: RDD=Random Digit Dialing; TLS=Time-Location Sampling.

Table 2.1. Summary of findings for hypotheses explaining lower HIV prevalence among API MSM

	Supportive Studies	Nonsupportive Studies
Hypotheses Not Supported by the Scientific Evidence		
1.API MSM are less likely to engage in high-risk sexual behavior than other MSM.		
API MSM have fewer male sex partners than other MSM.	Bingham et al., 2003	Brooks et al., 2008 CDC, 2002 Rosser et al., 2009 Xia et al., 2006
API MSM have lower rates of unprotected anal intercourse than other MSM.		Bingham et al., 2003 Bingham et al., 2008 CDC, 2002 CDC MMWR, 2006 Essien et al., 2005 Flores et al., 2009 Horvath et al., 2008 Lemp et al., 1994 Peterson et al., 2001 Raymond et al., 2009a Ruiz et al., 1998 Seage et al., 1997 Xia et al., 2006
2.API MSM are less likely to abuse substances than other MSM.		
API MSM are less likely to abuse alcohol or drugs than other MSM.	Grov et al., 2006	CDC MMWR, 2006 Greenwood et al., 2001 Haltikis et al., 2005 Haltikis et al., 2008 Palamar et al., 2008 Rhodes et al., 2007 Spindler et al., 2007
API MSM abuse alcohol or drugs at lower frequency or are less likely to use alcohol or drugs before sex than other MSM.	Palamar et al., 2008	Greenwood et al., 2001 Haltikis et al., 2008 Stueve et al., 2002
API MSM are less likely to use injection drugs than other MSM.	Bingham et al., 2003 Lemp et al., 1994	Berry et al., 2007
3.API MSM have lower rate of sexually transmitted diseases than other MSM.	Bingham et al., 2003	Berry et al., 2007 Kim et al., 2003 McFarland et al., 2004 Miniaga et al., 2008 Morris et al., 2006

Table 2.1. continued

4.API MSM are more likely to know their HIV status, hence less likely to expose their partners to HIV, than other MSM.		
API MSM are more likely to have ever been tested for HIV than other MSM.		Bingham et al., 2003 Berry et al., 2007 CDC, 2002 CDC MMWR, 2006 Helms et al., 2009 Horvath et al., 2008 Mimiaga et al., 2008
API MSM are more likely to be tested for HIV during the past 12 months or more frequently than other MSM.		Bingham et al., 2003 CDC MMWR, 2005 CDC MMWR, 2006 Helms et al., 2009 MacKellar et al., 2006
API MSM are less likely to have unrecognized HIV infection than other MSM.		Bingham et al., 2003 Helms et al., 2009 MacKellar et al., 2007 Raymond et al., 2008
5.API MSM are more likely to utilize HIV prevention intervention services than other MSM.		CDC MMWR, 2006 MacKellar et al., 2006
6.Some ethnic groups within the API MSM population engage in higher rates of risk behaviors than others.	Operario et al., 2006 Yoshikawa et al., 2004	Chae et al., 2008 Choi et al., 1995 Choi et al., 2002 Choi et al., 2003 Choi et al., 2004 Choi et al., 2005 Matteson et al., 1997 Shapiro et al., 1999
Hypothesis for which There is Insufficient Scientific Evidence or Partially Supported		
7.API MSM's sexual networks place them at lower risk for HIV infection than other MSM.		
API MSM are more likely to have main partners or in primary relationships than other MSM.		Bingham et al., 2003 CDC MMWR, 2006 Halkitis et al., 2008
API MSM are more likely to have partners similar to their own age than other MSM.	Berry et al., 2007	Bingham et al., 2003
API MSM are more likely to have partners of their own race than other MSM.		Bingham et al., 2003 Berry et al., 2007 Raymond et al., 2009b

Table 2.1. continued

8.API MSM engage in higher rates of seroadaptive behaviors than other MSM.		
API MSM are more likely to serosort than other MSM.		Eaton et al., 2007
API MSM are more likely to use the Internet to find sexual partners, which facilitates disclosure, or more likely to discuss serostatus with partners.		Bingham et al., 2003 Halkitis et al., 2008 Horvath et al., 2008 Rietmeijer et al., 2007
API MSM are more likely to use condoms with serodiscordant partners than other MSM.	Xia et al., 2006 Raymond et al., 2006	Denning et al., 2005 O'Leary et al., 2005 Osmond et al., 2007 Schwarz et al., 2007 Whittington et al., 2006
9.API HIV-positive MSM have better access to medical treatment and care than other MSM.	Blair et al., 2002	
10.API MSM are less acculturated into American and/or gay culture, which may lead to lower risk behaviors.		
Foreign-born API MSM are less likely to engage in unprotected anal intercourse than US-born API MSM.	Matteson et al., 1997 Yoshikawa et al., 2004	Chae et al., 2008 Choi et al., 1995 Choi et al., 2002 Choi et al., 2003 Choi et al., 2005 Lloyd et al., 1999 Shapiro et al., 1999 Yoshikawa et al., 2004
Foreign-born API MSM are less likely to abuse substances than US-born API MSM.	Choi et al., 2005 Operario et al., 2006	
Foreign-born API MSM are less likely to be HIV infected than US-born API MSM.	Choi et al., 2005	

Table 3.1. Socio-demographic characteristics of API MSM participants and their partnerships in 2004 and 2008

	2004	2008	
	N/% (Total=197)	N/% (Total=51)	*p*
a. Participants			
Age			
18-25	43 (21.8%)	11 (21.6%)	0.12
26-30	58 (29.4%)	20 (39.2%)	
31-40	76 (38.6%)	12 (23.5%)	
41-50	16 (8.1%)	8 (15.7%)	
51+	4 (2.0%)	0 (0%)	
Education			
HS or less	16 (8.1%)	2 (3.9%)	0.20
Some college	46 (23.4%)	13 (25.5%)	
College	97 (49.2%)	20 (39.2%)	
Post graduate	38 (19.3%)	16 (31.4%)	
Employment			
Fulltime	136 (69.0%)	37 (74.0%)	0.65
Part-time	19 (9.6%)	5 (10.0%)	
Unemployed	23 (11.7%)	6 (12.0%)	
Other	19 (9.6%)	2 (4.0%)	
Country of birth			
US	70 (35.5%)	21 (41.2%)	0.45
Foreign	127 (64.5%)	30 (58.8%)	
Years in the US			
<=5	26 (20.5%)	4 (13.3%)	0.16
6-10	30 (23.6%)	6 (20.0%)	
11-20	38 (29.9%)	6 (20.0%)	
>=21	33 (26.0%)	14 (46.7%)	
Sexual Orientation			
Gay	177 (89.8%)	46 (92.0%)	0.17
Bisexual	18 (9.1%)	2 (4.0%)	
Heterosexual/Other	2 (1.0%)	2 (4.0%)	
HIV status (self reported most recent test)			
HIV-	166 (90.2%)	45 (91.8%)	0.44
HIV+	11 (6.0%)	1 (2.0%)	
Unknown	7 (3.8%)	3 (6.1%)	
b. Partnerships of participants			
Age			
<=25	70 (20.0%)	25 (22.3%)	0.11
26-30	78 (22.3%)	26 (23.2%)	
31-40	146 (41.7%)	35 (31.3%)	
41-50	42 (12.0%)	23 (20.5%)	
51+	14 (4.0%)	3 (2.7%)	
Type			
Main	86 (23.5%)	31 (27.7%)	<0.01
Casual	167 (45.6%)	73 (65.2%)	
Anonymous	113 (30.9%)	8 (7.1%)	
Place met			
Bar, café, nightclub or restaurant	110 (30.0%)	38 (33.9%)	0.41
Internet	105 (28.6%)	32 (28.6%)	
Through friends	53 (14.4%)	13 (11.6%)	

Table 3.1. continued

Bathhouses, sex clubs or PSEs	49 (13.4%)	9 (8.0%)	
Other	50 (13.6%)	20 (17.9%)	
HIV status reported by participants			
HIV +	21 (5.7%)	4 (3.6%)	0.05
HIV -	236 (64.3%)	86 (76.8%)	
Unknown	110 (30.0%)	22 (19.6%)	

Table 3.2. Sexual mixing patterns by race among API MSM participants

2004 Partnerships (N=368)					
Race of Partner	Observed	Expected	Chi-square	Observed/expected ratio	*P*
API	70	54	4.54	1.30	0.03
White	248	239	0.33	1.04	0.57
Black	6	30	19.36	0.20	<0.01
Latino	36	81	25.01	0.44	<0.01
Mixed/Other	8	26	12.46	0.31	<0.01
2008 Partnerships (N=107)					
Race of Partner	Observed	Expected	Chi-square	Observed/expected ratio	*P*
API	13	11	0.32	1.18	0.57
White	78	62	4.06	1.26	0.04
Black	5	9	1.56	0.56	0.21
Latino	10	28	11.26	0.36	<0.01
Mixed/Other	1	6	4.17	0.17	0.04

Table 3.3. Partnerships with API MSM among MSM participants of other races/ethnicities

	2004				2008			
	White	Black	Latino	Mixed /Other	White	Black	Latino	Mixed /Other
Total partnerships	1932	235	636	216	656	62	318	60
API partners								
Observed	232	7	40	15	70	3	16	7
Expected	239	30	81	26	62	9	28	6
Chi-square	0.21	17.79	20.76	4.65	1.00	3.71	4.91	0.17
Observed/expected ratio	0.97	0.23	0.49	0.57	1.13	0.33	0.57	1.17
P	0.65	<0.01	<0.01	0.03	0.31	0.05	0.03	0.68

Table 3.4. Socio-demographic characteristics and sexual risk behaviors of men who are under the age of 29 and reported at least one partner age 29 or older versus men did not report any partner >=29

	Had no partner 29 or older (Total N = 149)		Had partner 29 or older (Total N = 185)		
	N	%	N	%	*p*
Age					
18-20	21	14.1%	6	3.2%	<0.01
21-24	80	53.7%	56	30.3%	
25-28	48	32.2%	123	66.5%	
Race					
API	31	20.8%	39	21.2%	0.93
White	49	32.9%	56	30.4%	
Black	9	6.0%	15	8.2%	
Latino	48	32.2%	57	31.0%	
Mixed/Other	12	8.1%	17	9.2%	
Education					
HS or less	31	20.8%	34	18.4%	0.13
Some college	59	39.6%	58	31.4%	
College	55	36.9%	80	43.2%	
Post graduate	4	2.7%	13	7.0%	
Employment					
Fulltime	89	59.7%	117	63.6%	0.14
Part-time	28	18.8%	25	13.6%	
Unemployed	21	14.1%	18	9.8%	
Other	11	7.4%	24	13.0%	
Country of birth					
US	119	79.9%	119	35.3%	<0.01
Foreign	30	20.1%	65	64.7%	
Sexual orientation					
Gay	116	77.9%	168	90.8%	<0.01
Bisexual	27	18.1%	12	6.5%	
Heterosexual/other	6	4.0%	5	2.7%	
HIV status					
HIV-	126	92.0%	153	87.9%	0.10
HIV+	2	1.5%	11	6.3%	
Unknown	9	6.6%	10	5.7%	
UAI					
Yes	69	46.3%	93	50.3%	0.47
No	80	53.7%	92	49.7%	
UIAI					
Yes	54	36.2%	66	35.7%	0.92
No	95	63.8%	119	64.3%	
URAI					
Yes	49	32.9%	70	37.8%	0.35
No	100	67.1%	115	62.2%	

Table 3.5. Partnership characteristics and sexual risk behaviors among men who are under the age of 29 and reported at least one partner age 29 or older

	API		White		Black		Latino		Mixed/Other		
Participants	N=39	%	N=56	%	N=15	%	N=57	%	N=17	%	*p*
Age											
18-20	1	2.6%	1	1.8%	2	13.3%	1	1.8%	1	5.9%	0.30
21-24	9	23.1%	18	31.1%	5	33.3%	21	36.8%	3	17.6%	
25-28	29	74.3%	37	66.1%	8	53.3%	35	61.4%	13	76.5%	
HIV status											
HIV-	31	83.8%	50	92.6%	13	92.9%	46	85.2%	12	85.7%	0.80
HIV+	2	5.4%	2	3.7%	1	7.1%	5	9.3%	1	7.1%	
Unknown	4	10.8%	2	3.7%	0	0%	3	5.6%	1	7.1%	
Partnerships	N=88	%	N=175	%	N=37	%	N=164	%	N=49	%	
# of partners											
mean	2.6		8.9		3.9		6.5		6.2		0.18
Age											
<21	1	1.2%	2	1.2%	1	2.7%	11	6.8%	4	8.9%	0.02
21-24	10	11.5%	10	5.9%	4	10.8%	22	13.7%	3	6.7%	
25-28	12	13.8%	31	18.5%	6	16.2%	29	18.0%	5	11.1%	
29-39	56	64.4%	92	54.8%	21	56.8%	86	53.4%	29	64.4%	
40-49	6	6.9%	29	17.3%	5	13.5%	13	8.1%	4	8.9%	
50+	2	2.3%	4	2.4%	0	0%	0	0%	0	0%	
Race											
API	11	12.5%	5	2.9%	1	2.7%	10	6.1%	5	10.2%	<0.01
White	68	77.3%	132	75.4%	18	48.7%	80	48.8%	32	65.3%	
Black	0	0%	5	2.9%	9	24.3%	19	11.6%	5	10.2%	
Latino	7	7.9%	25	14.3%	7	18.9%	52	31.7%	6	12.2%	
Other	2	2.3%	8	4.6%	2	5.4%	3	1.8%	1	2.0%	
Type											
Anonymous	19	21.6%	65	37.1%	8	21.6%	51	31.3%	15	30.6%	0.15
Casual	49	55.7%	71	40.6%	23	62.2%	83	50.9%	25	51.0%	
Main	20	22.7%	39	22.3%	6	16.2%	29	17.8%	9	18.4%	
HIV status											
HIV-	64	72.7%	98	56.0%	26	70.3%	91	55.5%	31	63.3%	0.08

Table 3.5 continued

HIV+	2	2.3%	13	7.4%	0	0%	9	5.5%	1	2.0%	
Unknown	22	25.0%	64	36.6 %	11	29.7%	64	39.0 %	17	34.7%	
AI											
Yes	88	100.0 %	173	98.9 %	32	86.5%	159	97.5 %	49	100.0 %	<0.01
No	0	0%	2	1.1%	5	13.5%	4	2.5%	0	0%	
UAI											
Yes	44	50.0%	110	62.9 %	10	27.0%	72	44.2 %	29	59.2%	<0.01
No	44	50.0%	65	37.1 %	27	73.0%	91	55.8 %	20	40.8%	
UIAI											
Yes	36	40.9%	78	44.6 %	0	0%	60	36.8 %	20	40.8%	<0.01
No	52	59.1%	97	55.4 %	37	100.0 %	103	63.2 %	29	59.2%	
URAI											
Yes	36	40.9%	81	46.3 %	10	27.0%	33	20.2 %	24	49.0%	<0.01
No	52	59.1%	94	53.7 %	27	73.0%	130	79.8 %	25	51.0%	

Table 3.6. Cross-race comparisons of sexual risk behaviors with *only* partners age 29 or older among men who are under the age of 29

	API		White		Black		Latino		Other		*p*
	N	%	N	%	N	%	N	%	N	%	
Partners >= 29 years old	64		125		26		99		33		
URAI											
Yes	27	42.2%	60	48.0%	5	19.2%	24	24.2%	15	45.5%	<0.01
No	37	57.8%	65	52.0%	21	80.8%	75	75.8%	18	54.5%	
URAI partner type											
Anonymous	4	14.8%	24	40.0%	2	60.0%	7	29.2%	3	20.0%	<0.01
Casual	9	33.3%	22	36.7%	3	40.0%	4	16.7%	11	73.3%	
Main	14	51.9%	14	23.3%	0	0%	13	54.1%	1	6.7%	
URAI partner HIV status											
HIV+	2	7.4%	6	10.0%	0	0%	2	8.3%	1	6.7%	0.09
HIV-	23	85.2%	32	53.3%	3	60.0%	19	79.2%	8	53.3%	
Unknown	2	7.4%	22	36.7%	2	40.0%	3	12.5%	6	40.0%	

Table 4.1. Socio-demographic characteristics of participants by race/ethnicity

	API N=146	%	White N=628	%	Black N=81	%	Latino N=242	%	Other N=102	%	*p*
Age											
18-25	31	21.2%	77	12.3%	17	21.0%	68	28.1%	33	32.4%	<.01
26-30	46	31.5%	84	13.4%	16	19.8%	56	23.1%	19	18.6%	
31-40	49	33.6%	168	26.8%	19	23.5%	67	27.7%	22	21.6%	
41-50	12	8.2%	163	26.0%	19	23.5%	35	14.5%	17	16.7%	
51+	8	5.5%	136	21.7%	10	12.3%	16	6.6%	11	10.8%	
Education											
HS or less	6	4.1%	78	12.4%	16	19.8%	52	21.5%	16	15.7%	<.01
Some college	34	23.3%	197	31.4%	34	42.0%	95	39.3%	38	37.3%	
College	68	46.6%	218	34.7%	17	21.0%	70	28.9%	36	35.3%	
Post graduate	38	26.0%	135	21.5%	14	17.3%	25	10.3%	12	11.8%	
Employment											
Fulltime	98	67.1%	380	60.6%	45	55.6%	139	57.4%	56	54.9%	<.01
Part-time	18	12.3%	69	11.0%	14	17.3%	56	23.1%	13	12.7%	
Unemployed	9	6.2%	41	6.5%	7	8.6%	10	4.1%	12	11.8%	
Other	21	14.4%	137	21.9%	15	18.5%	37	15.3%	21	20.6%	
Annual income											
<10,000	16	11.0%	79	12.6%	16	19.8%	45	18.7%	25	24.8%	<.01
10,000-29,999	32	22.1%	156	24.8%	21	25.9%	77	32.0%	22	21.8%	
30,000-49,999	34	23.4%	143	22.8%	19	23.5%	60	24.9%	22	21.8%	
50,000-69,999	18	12.4%	97	15.4%	12	14.8%	31	12.9%	15	14.9%	
70,000-89,999	23	15.9%	60	9.6%	6	7.4%	15	6.2%	10	9.9%	
>=90,000	22	15.2%	93	14.8%	7	8.6%	13	5.4%	7	6.9%	
Country of birth											
Foreign	83	56.8%	40	6.4%	2	2.5%	74	30.6%	19	18.6%	<.01
US	63	43.2%	588	93.6%	79	97.5%	168	69.4%	83	81.4%	
Sexual orientation											
Gay	135	92.5%	577	91.9%	60	74.1%	207	85.5%	85	83.3%	<.01
Bisexual	9	6.2%	43	6.8%	17	21.0%	29	12.0%	14	13.7%	
Straight/Other	2	1.4%	8	1.3%	4	4.9%	6	2.5%	3	2.9%	
HIV status											
HIV-	121	82.9%	445	70.9%	55	67.9%	162	66.9%	67	65.7%	<.01
HIV+	17	11.6%	150	23.9%	13	16.0%	46	19.0%	22	21.6%	
Unsure	8	5.5%	33	5.3%	13	16.0%	34	14.0%	13	12.7%	

Table 4.2.1. Seroadaptive behaviors among HIV-negative participants by race/ethnicity

	API		White		Black		Latino		Other		
	N=121	%	N=445	%	N=55	%	N=162	%	N=67	%	*p*
No sex	21	17.4%	54	12.1%	11	20.0%	28	17.3%	14	20.9%	.14
No anal sex	16	13.2%	79	17.8%	10	18.2%	15	9.3%	4	6.0%	.02
100% condom use	34	28.1%	109	24.5%	13	23.6%	47	29.0%	14	20.9%	.63
Pure serosorting	32	26.4%	96	21.6%	10	18.2%	34	21.0%	18	26.9%	.59
Negotiated safety	8	6.6%	24	5.4%	0	0%	7	4.3%	4	6.0%	.41
Condom serosorting	2	1.7%	24	5.4%	6	10.9%	9	5.6%	4	6.0%	.15
Seropositioning	3	2.5%	25	5.6%	5	9.1%	12	7.4%	3	4.5%	.33
No strategy	5	4.1%	34	7.6%	0	0%	10	6.2%	6	9.0%	.16

Table 4.2.2. Seroadaptive behaviors among HIV-positive participants by race/ethnicity

	API		White		Black		Latino		Other		
	N=17	%	N=150	%	N=13	%	N=46	%	N=22	%	*p*
No sex	2	11.8%	25	16.7%	2	15.4%	2	4.3%	1	4.5%	.17
No anal sex	2	11.8%	25	16.7%	0	0%	6	13.0%	6	27.3%	.27
100% condom use	5	29.4%	18	12.0%	2	15.4%	8	17.4%	6	27.3%	.18
Pure serosorting	1	5.9%	20	13.3%	2	15.4%	4	8.7%	4	18.2%	.71
Condom serosorting	2	11.8%	20	13.3%	0	0%	4	8.7%	1	4.5%	.45
Seropositioning	2	11.8%	21	14.0%	3	23.1%	6	13.0%	1	4.5%	.62
No strategy	3	17.6%	21	14.0%	4	30.8%	16	34.8%	3	13.6%	.02

Table 4.3. Partnership characteristics and serodisclosure behaviors among men who engaged in pure serosorting, negotiated safety, condom serosorting, or seropositioning

	API (N=50)		White (N=230)		Black (N=26)		Latino (N=76)		Other (N=35)		
Partner characteristics	N=169	%	N=878	%	N=101	%	N=281	%	N=157	%	*p*
Race											
API	27	16.3%	137	16.4%	13	13.1%	43	16.2%	16	10.9%	<.01
White	122	73.5%	551	65.9%	55	55.6%	153	57.7%	90	61.6%	
Black	4	2.4%	41	4.9%	17	17.2%	15	5.7%	17	11.6%	
Latino	11	6.6%	84	10.0%	11	11.1%	46	17.4%	22	15.1%	
Other	2	1.2%	23	2.8%	3	3.0%	8	3.0%	1	0.7%	
Age											
<=25	37	23.7%	190	22.9%	21	21.6%	74	28.8%	40	27.2%	.03
26-30	32	20.5%	167	20.1%	19	19.6%	54	21.0%	43	29.3%	
31-40	58	37.2%	290	34.9%	25	25.8%	75	29.2%	37	25.2%	
41-50	27	17.3%	137	16.5%	23	23.7%	43	16.7%	22	14.9%	
>=51	2	1.3%	45	5.4%	9	9.3%	11	4.3%	5	3.4%	
Place met											
Bar, café, nightclub	49	29.0%	295	33.6%	30	29.7%	110	39.1%	54	34.4%	.01
Internet	59	34.9%	224	25.5%	28	27.7%	50	17.8%	39	24.8%	
Sex club, bathhouse or PSE	24	14.2%	165	18.8%	23	22.8%	64	22.8%	23	14.6%	
Other	37	21.9%	194	22.1%	20	19.8%	57	20.3%	41	26.1%	
Serodisclosure behaviors											
Discussed HIV status											
Yes	96	56.8%	578	66.1%	71	70.3%	187	66.5%	110	70.1%	.08
No	73	43.2%	297	33.9%	30	29.7%	94	33.5%	47	29.9%	
Knew partner's status before 1st sexual encounter											
Yes	83	57.2%	539	76.1%	62	70.5%	163	72.8%	103	79.2%	<.01
No	62	42.8%	169	23.9%	26	29.5%	61	27.2%	27	20.8%	
Asked partner when his last HIV test was											
Yes	62	46.6%	210	41.7%	34	50.0%	111	58.4%	58	55.8%	<.01
No	71	53.4%	293	58.3%	34	50.0%	79	41.6%	46	44.2%	
Asked if partner had high-risk sex since last test											
Yes	44	33.1%	176	35.0%	25	36.8%	95	50.0%	55	52.9%	<.01
No	89	66.9%	327	65.0%	43	63.2%	95	50.0%	49	47.1%	
Confidence in partner's HIV-negative status											
Not at all confident	13	9.8%	23	4.6%	12	17.6%	14	7.4%	16	15.4%	<.01
Somewhat confident	25	18.8%	95	18.9%	16	23.5%	38	20.0%	21	20.2%	

Table 4.3. continued

Pretty confident	70	52.6%	242	48.1%	26	38.2%	83	43.7%	35	33.6%
Completely confident	25	18.8%	143	28.4%	14	20.6%	55	28.9%	32	30.8%

APPENDIX B

FIGURES

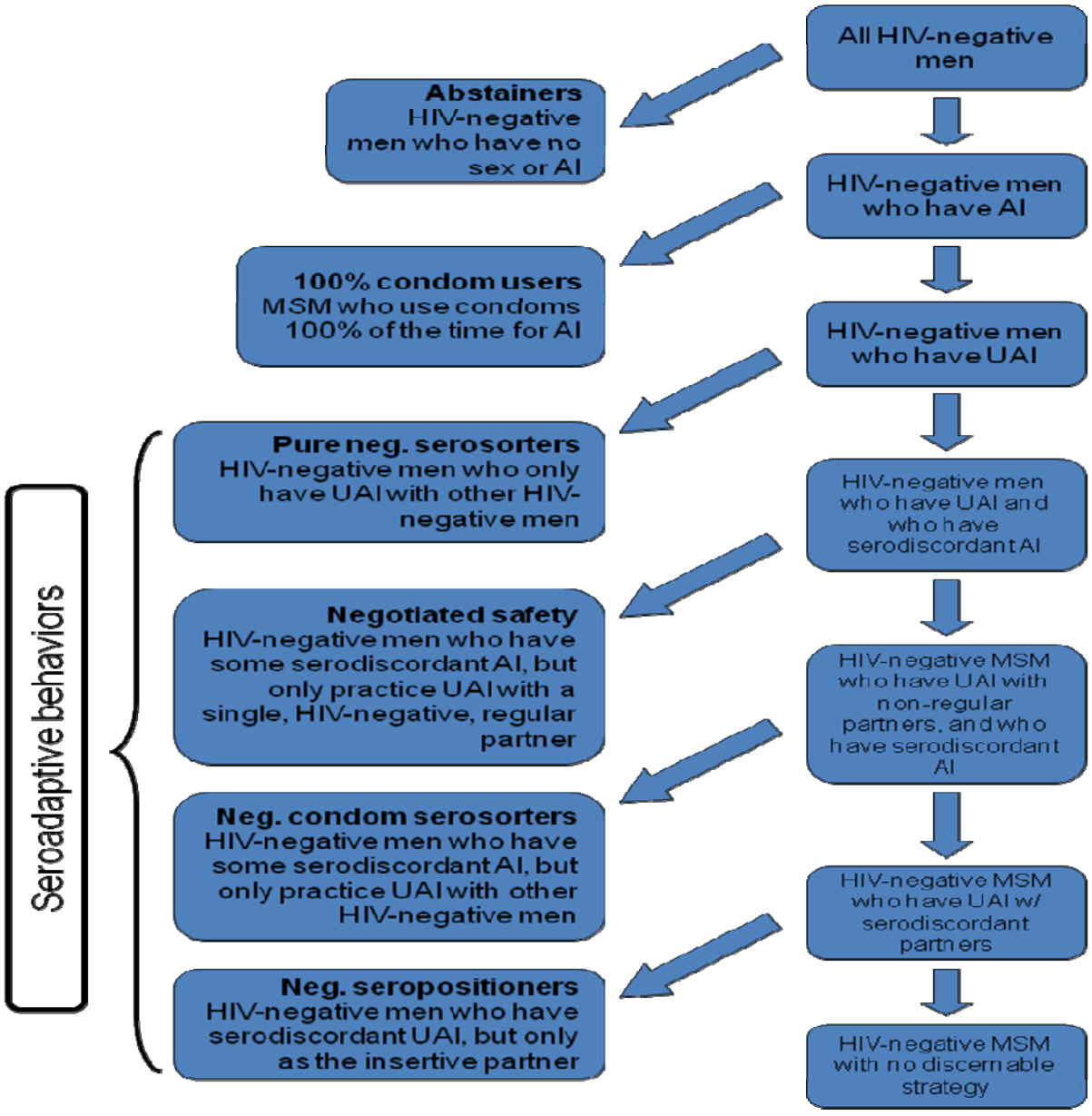

Figure 4.1. Schema of Seroadaptive Behaviors among HIV-negative MSM

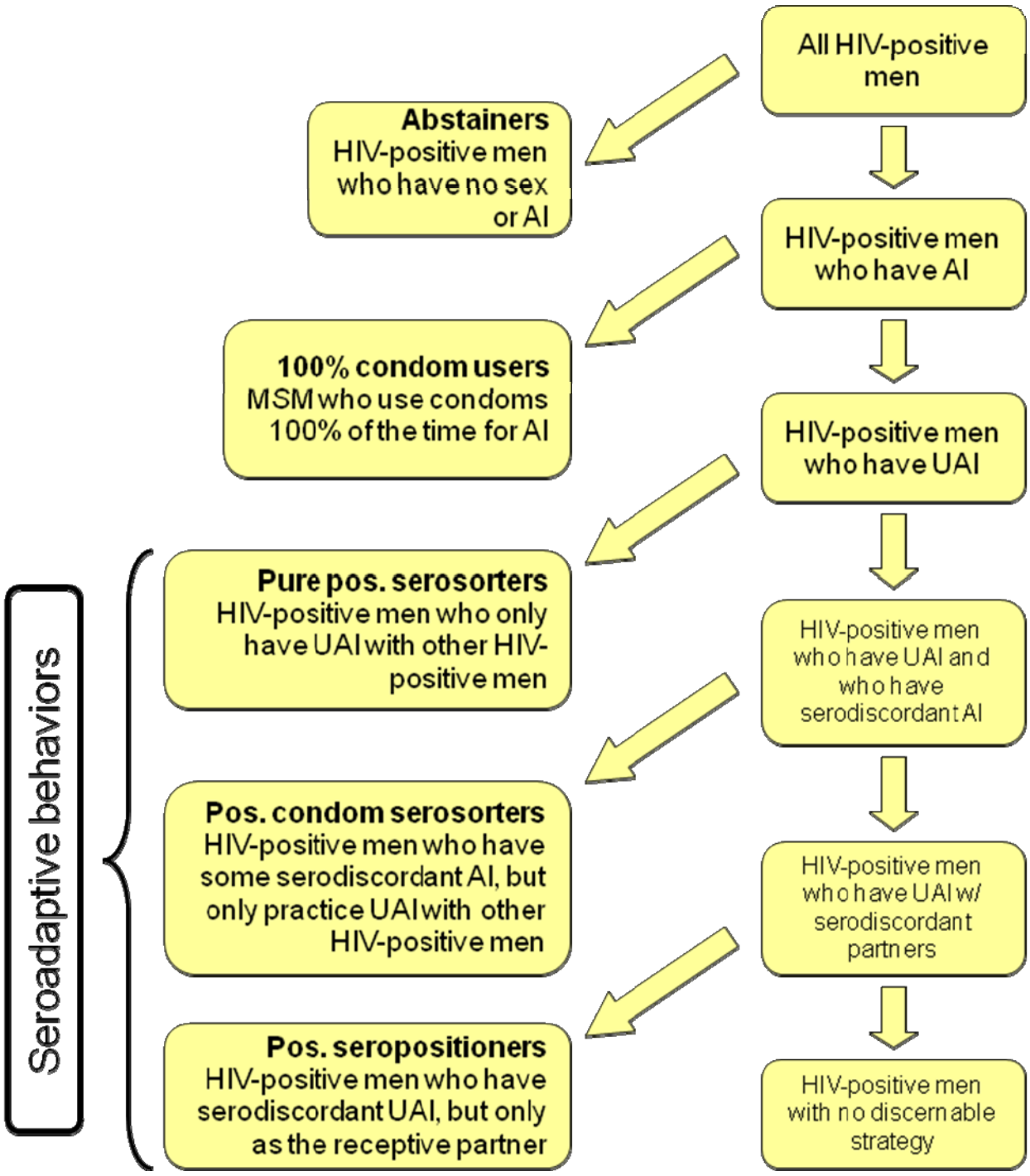

Figure 4.2. Schema of Seroadaptive Behaviors among HIV-positive MSM

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