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Age and Age Discordance Associations with Condomless Sex
among Men Who Have Sex with Men

A thesis submitted in partial satisfaction of the requirements
for the degree Master of Science in Clinical Research

by

Homero Erwin del Pino

2016

ABSTRACT OF THE THESIS

Age and Age Discordance Associations with Condomless Sex
among Men Who Have Sex with Men

by

Homero Erwin del Pino

Master of Science in Clinical Research

University of California, Los Angeles, 2016

Professor Janet S. Sinsheimer, Chair

Background: We explored the effect of older partner's age and age difference between partners on condomless sex among MSM.

Methods: We analyzed data from the Sexual Acquisition Transmission of HIV Cooperative Agreement Program. We used modified Poisson regression to model the probability of a sexual encounter's being condomless as function of HIV status, substance use, older partner's age, age difference between partners, and race/ethnicity.

Results: We found an interaction between older partner's age and age difference ($p < 0.05$). Condomless sex decreased with increasing age when age difference was 5-9 years ($p = 0.005$) or ≥ 10 years ($p = 0.05$), but not when the age difference was < 5 years ($p = 0.4$). When the age difference is 5-9 years, 40% of encounters are condomless if the older partner is 32 years old, but only 23% are condomless if 54 years old.

Conclusion: Both age and age discordance play important roles in the likelihood of a sexual encounter between MSM being condomless.

The thesis of Homero Erwin del Pino is approved.

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2016

Dedication

I would like to thank my committee members for their guidance and for providing me with a positive and intellectually stimulating thesis defense experience.

I am fortunate to have worked with Dr. Arun Karlamangla, a teacher *par excellence*, whose ability to explain statistical concepts helped me to appreciate how elegant data analysis can be. I am thankful for Dr. Nina Harawa's mentorship during this project and for her ongoing support of my development as a scholar.

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Yo no hubiera logrado tanto si no fuera por el amor y al apoyo constante de mi mamá y de mi papá a lo largo de mi trayectoria educativa. Todos mis éxitos son un testimonio de su amor por mí. ¡Gracias! También les debo tanto a mis hermanos, que a pesar de que ya no se sorprenden cuando vuelvo a los estudios aún me apoyan con tanto entusiasmo.

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CHAPTER 1. MANUSCRIPT

ABSTRACT

Background: We explored the effect of older partner's age and age difference between partners on condomless sex among MSM.

Methods: We analyzed data from the Sexual Acquisition Transmission of HIV Cooperative Agreement Program. We used modified Poisson regression to model the probability of a sexual encounter's being condomless as function of HIV status, substance use, older partner's age, age difference between partners, and race/ethnicity.

Results: We found an interaction between older partner's age and age difference ($p < 0.05$). Condomless sex decreased with increasing age when age difference was 5-9 years ($p = 0.005$) or ≥ 10 years ($p = 0.05$), but not when the age difference was < 5 years ($p = 0.4$). When the age difference is 5-9 years, 40% of encounters are condomless if the older partner is 32 years old, but only 23% are condomless if 54 years old.

Conclusion: Both age and age discordance play important roles in the likelihood of a sexual encounter between MSM being condomless.

INTRODUCTION

Few studies have explored risk-taking behavior in age-discordant sexual encounters among men who have sex with men (MSM), and few have focused on the sexual risk behaviors of MSM over age 40. From the perspective of younger partners, studies have shown that sex with older MSM increases their risk for HIV infection [1-3] because older partners are more likely to be infected with HIV [4]. In North Carolina, a study found that young MSM (early 20s) living with HIV had sex partners that were on average 6 years older than they were, and they were more likely to have had partners over the age of 30 than were MSM without HIV infection [5]. A study in Los Angeles found that the odds of HIV infection were 3.5 times greater among MSM ages 23-29 who reported having sex partners who were five or more years older than they were, than among MSM who did not report older partners [6]. The same study concluded that there are “dual sources” of HIV risk for young MSM: unprotected sex with partners of any age and HIV exposure from older partners. Although an older sex partner is more likely to expose his younger partner to HIV infection because HIV prevalence increases with age, we do not know that there is more risk taking in a sexual encounter when one partner is older.

Researchers who have compared the sexual behaviors of younger and older MSM, have found inconsistent findings: Either young MSM were more likely than older MSM to engage in anal sex without using a condom [7-9], or both age groups engaged in condomless sex equally [10-12]. This inconsistency may be the result of ignoring confounding by potential influences of age discordance between partners on risk-taking behaviors. Complicating efforts to articulate risks for older MSM in age discordant couples, different studies employ different cutoff ages for who counts as young (<25,

≤25, <30, ≤30 years old). These differences conflate the sexual behaviors and motivations of “older” MSM in their late 20s, with those of MSM in their 40s and 50s.

This study explores the impact of the older partner’s age and age discordance in a couple on the likelihood of risky behavior in a sexual encounter. We hypothesized that older MSM in sexual encounters are more likely to engage in high-risk behaviors with partners who are ≥10 years younger than they are, compared with partners that are closer in age. To address this, we analyzed the effects of the older partner’s age and the age difference between partners on reported condom use in sexual encounters. We tried to answer the following questions: (1) What is the association between the age of the older partner and condomless sex; (2) Is there a threshold age above which age is no longer associated with condomless sex; (3) What is the association between age discordance in a couple and condomless sex; (4) Is the association between age of the older partner and condomless sex affected by age discordance?

METHODS

Overview

This study analyzed data from the three U.S. sites (Los Angeles, Chicago, Raleigh-Durham) for NIDA’s Sexual Acquisition and Transmission of HIV—Cooperative Agreement Program (SATHCAP), a cross-sectional study that examined the role of drug use in the sexual transmission of HIV from traditional high-risk groups, such as MSM and drug users, to lower risk groups [13]. The study recruited participants in two phases, between 2005-2006 and 2006-2008.

Description of Data

Original Data Source

SATHCAP employed respondent-driven sampling (RDS) and a dual high-risk group sampling approach that relied on peer recruitment for a combined, overlapping sample of MSM and drug users. The study was conducted in two phases that were identical except for slight changes to the recruitment scheme in phase 2; phase 1 respondents were not eligible to participate in phase 2. Participants were (1) at least 18 years old, (2) identified as male, female, or transgender, (3) engaged in any sexual activity with a male or female partner in the last six months, and (4) used drugs. Eligible participants completed questionnaires and provided biological samples for HIV, STIs, and drug use. A total of 8,355 individuals (MSM, heterosexual men, women) enrolled across the three sites.

Analytic Sample

We restricted our analysis to 969 self-identified males from the SATHCAP sample who reported having sex with men at least once in the prior six months; some also had sex with women. We chose sexual encounter dyads as our unit of analysis because participants provided data on the last encounter they had with their three most recent sex partners in the prior six months, including the type of sex they engaged in (anal, oral, group), their sexual role (top or bottom), condom use (or not), and whether they or their partner used any alcohol or drugs prior to sex. We excluded encounters with women, transgenders, and minors, and analyzed up to three sexual encounters per

participant, for a total of 1,726 encounters. For multivariable analyses, we dropped 6 dyads (0.35%) of “other, other” race/ethnicity and 37 (2.1%) dyads missing substance use information, leaving 1,683 dyads for the multivariable regression.

Measures

The dependent variable, condomless sex, was defined as anal sex (insertive or receptive) without a condom; it was dichotomized from the original count variable listing 10 sexual activities. Predictor variables included characteristics of both participants in the sexual encounter: (1) race/ethnicity pairings [10 pairings of White, Black/African-American, Hispanic, other]); (2) HIV status concordance (categorical: concordant positive, concordant negative, discordant-but-know-partner-status, discordant-partner status-unknown); (3) any substance use before sex by either sex partner, dichotomized, from a listing of 12 drugs (marijuana, methamphetamines, speedball, crack, cocaine, heroin, other opiates, ecstasy, poppers, special K, GHB, and Viagra), including an option for “other drugs” and binge drinking; (4) age difference between partners, treated both as a continuous variable (absolute age difference) and categorized into three levels, <5, 5-9, ≥10 years difference; and (5) age of the older partner coded both as continuous (centered at 44) and categorical, <40, 40-49, ≥50 years old. We also controlled for site (Los Angeles, Chicago, Raleigh-Durham) and study phase (phase 1 or phase 2).

Analysis

We used modified Poisson regression to model the likelihood of a sexual encounter being risky (i.e., involving condomless sex) as a function of the predictors listed above, accounting for clustering within participants (with unstructured correlation among observations from the same participant). We chose this approach over logistic regression because the binary outcome (condomless sex) was not rare (>5% probability) [14-16]. We tested for interaction between age of the older partner and age difference between partners. We used SAS 9.4[®] to conduct the analyses.

RESULTS

Sexual Encounter Characteristics

Participants reported a mean of two partners in the prior 6 months. Almost 1/3 of all sexual encounters involved condomless sex (n=536, 31%). The older partner in the plurality of sexual encounters was 40-49 years old (n=832, 48%). Only 20% (n=345) of encounters occurred between individuals with ≤ 2 -year age difference, and 39% (n=680) of the encounters had a ≥ 10 year age difference between partners.

More than half of the sexual encounters included at least one partner of unknown HIV status (54%); of these encounters, 28% were condomless. Although known seroconcordant HIV-positive sexual encounters were a small proportion of all sexual encounters (16%), they reported the highest levels of condomless sex (43%). Known serodiscordant sexual encounters (both partners know their status, and they are different) were the smallest proportion of all encounters (10%), of which 27% reported condomless sex. Seroconcordant HIV-negative sexual encounters (21%) reported the

second highest level of condomless sex, 32%. Sexual encounters with one Hispanic and one White partner reported the highest proportion of condomless sex (42%) compared with all other racial/ethnic pairings. At least one of the partners in the dyad used drugs or binged on alcohol before sex in 64% (n=1,096) of the encounters, and 34% of these involved condomless sex. See Table I.

Multivariable Analysis

In modified Poisson regression main effects model, when age of the older partner was examined as a categorical variable (results not tabulated), reported condomless sex decreased as the age of the older partner increased: Relative to encounters in which the older partner was ≥ 50 years old, there was a 36% higher probability of condomless sex when the older partner in the dyad was < 40 years old ($p=0.01$) (RR= 1.36, 95% CI=1.07—1.72), and a 26% higher probability of condomless sex when the older partner was 40-49 years old ($p=0.03$) (RR=1.26, 95% CI=1.02— 1.55). When we examined age as a continuous variable, the probability of condomless sex dropped by 1% with each increasing year of age for the older partner, although this was marginally statistically significant ($p=0.05$) (RR=0.99, 95% CI=0.98 – 1) – See Table 2. Age discordance was not independently associated with condomless sex in the main effects models ($p \geq 0.4$). Relative to sexual encounters among HIV-positive concordant couples, encounters in serodiscordant couples (in which the status of both partners was known and different) were 32% less likely to involve condomless sex ($p=0.007$), and encounters in which one of the partners' status was unknown were 29% less likely to involve condomless sex ($p=0.0008$). Sexual encounters between Hispanic and White partners were 40% ($p=0.006$) more likely to be condomless than encounters in which both partners were

Black; no other statistically significant racial/ethnic differences were observed. Sexual encounters in which there was any substance use (including binge drinking) by either of the partners were 28% ($p=0.004$) more likely to be condomless than encounters in which there was no substance use — see Table II.

Interaction between Age and Age Difference

In interaction testing, there was a statistically significant interaction between the older partner's age and the age difference between partners ($p<0.05$). See Table III. Age difference modified the effect of the older partner's age on condomless sex: there was a 3% relative reduction in condomless sex per year of aging of the older partner in encounters with a 5-9 year age difference ($p=0.005$), and a 2% relative reduction in condomless sex per year of aging of the older partner if the age difference was ≥ 10 years ($p=0.052$). Thus, for example, in the referent group (concordant HIV-positive status, both partners Black, no substance use), when the age difference between partners is 5-9 years, the probability of a sexual encounter's being condomless was 40% if the older partner was 32 years old, and only 23% when the older partner was 54 years old. The age of the older partner had no association with condomless sex when the between-partner age difference was <5 years ($p=0.4$). See Figure 1.

Stated alternatively, the older partner's age modified the effect of age difference on condomless sex. Thus, for example: if the older partner was 32 years old, the encounter was 40% more likely to involve condomless sex if the age difference was 5-9 years ($p=0.02$), and 36% more likely if the age difference was ≥ 10 years ($p=0.057$), than if the age difference was <5 years. On the other hand, if the older partner was 54 years

old, the encounter was 32% less likely to involve condomless sex if the age difference was 5-9 years ($p=0.03$), and 18% less likely if the age difference was ≥ 10 years (although this latter finding was not statistically significant, $p=0.16$), than if the age difference was <5 years. When the older partner was 44 years old (median age), age difference did not affect the probability of condomless sex ($p>0.5$). See Figure 1.

DISCUSSION

Our study sheds new light on the complicated relationship between age and risk-taking sexual behavior in MSM, and on the important role played by age discordance between partners. We found that even after controlling for HIV status concordance and substance use, (1) sexual encounters between men are less likely to involve condomless sex as the age of the older partner increases, but only if there is age discordance of at least 5 years between partners; and (2) condomless sex is less likely when there is age discordance between partners than when there is age similarity (less than 5 year age difference), but only in older couples; while in younger couples, condomless sex is more likely when there is age discordance than when there is age similarity.

Substance use by either of the sex partners increased the probability of condomless sex in our study. Given the mean age of our sample, this finding is consistent with reports demonstrating that sexual risk behaviors among middle-aged and older MSM increase with substance use [17, 18].

Relative to sero-concordant couples, condomless sex was less common in sero-discordant couples and in encounters in which one of the partners' HIV status was

unknown, but it was not rare in either group. Inconsistent condom use between serodiscordant partners—whether of known or unknown HIV status— continue to challenge HIV-transmission prevention efforts. People between 25 and 44 years old represent 40% of people living with an undiagnosed HIV infection [19]. It is estimated that HIV transmission from people with an undiagnosed HIV infection, and people with diagnosed HIV but not in treatment, together account for more than 90% of the 45,000 new HIV infections in 2009 [20]. Our findings imply that because the age of the older sex partner in an encounter and age discordance between partners interact to determine the probability of condomless sex, resources to test and identify new cases of HIV, as well as efforts to retain people in care, should focus especially on younger men who have sex with men 5 or more years younger than them, and older men who have sex with men of similar age. Strategically targeting behavior change interventions and HIV testing and care messages to MSM based on their age and the age of their partners may have a bigger impact on risky sexual behaviors and HIV transmission than indiscriminately promoting HIV testing to the entire MSM population.

Limitations

The limitations of these findings include the RDS method that resulted in participants recruiting others so much like themselves that the sample may not be fully representative of all MSM [21]. Moreover, using drugs was an inclusion criterion of the study, so the sample does not represent MSM who refrain from drug use. There are also the limits inherent to self-report about sexual behaviors. Nevertheless, our study is a step forward in addressing sexual age mixing because it is approached from the

standpoint of the older sex partner, whereas most studies of sexual age mixing have been focused primarily on younger MSM [22, 23].

CONCLUSION

Our study demonstrates that in age-discordant sexual encounters among MSM, the age of the older sex partner by itself does not tell us whether he will engage in sexual behaviors that increase the probability of HIV acquisition for younger MSM. Rather, it is the interaction between the age of the older partner and the age difference between partners that predicts whether a sexual encounter will be condomless. Our study shows that as the age of the older sex partner increases, the probability of condomless sex decreases if there is at least a 5 years age difference between partners. In other words, the high prevalence of HIV in older MSM—an epidemiological fact— by itself does not imply increased HIV transmission from older to younger men. The difference in the sexual behaviors of older MSM vis-à-vis younger vs. similar-age sex partners may significantly modify the risk of transmission. These findings have two implications. First, they suggest that we focus HIV pre-exposure prophylaxis (PrEP) messages and resources on younger MSM who frequently have sex partners who are at least 5 years younger than they are, as well as older MSM who frequently have sex with men close in age. Second, they challenge us to reframe how we think about the risk for HIV infection that older MSM pose to younger ones to ensure that we eschew approaches that may inadvertently fuel ageism or the HIV stigmatization of older MSM.

Table I. Sexual Encounters and Characteristics Linked to Condomless Sex

	Sexual Encounters n (%)	Condomless Sexual Encounters n (%)
Total	1,726	536 (31%)
Age of Older Partner		
<40 years old	472 (27%)	153 (32%)
40-49 years old	832 (48%)	269 (32%)
≥50 years old	422 (24%)	114 (27%)
Age Discordance		
<5 years	576 (33%)	173 (30%)
5-9 years	470 (27%)	148 (31%)
≥10 years	680 (39%)	215 (32%)
HIV Status		
Both positive	268 (16%)	116 (43%)
Both negative	361 (21%)	115 (32%)
One positive, one negative	165 (10%)	44 (27%)
One known status, one unknown status	932 (54%)	261 (28%)
Race/Ethnicity		
Both Hispanic	133 (8%)	40 (30%)
Hispanic, Black	128 (7%)	44 (34%)
Hispanic, White	142 (8%)	60 (42%)
Hispanic, Other	51 (3%)	11 (22%)
Both Black	808 (47%)	229 (28%)
Black, White	151 (9%)	49 (32%)
Black, Other	65 (4%)	16 (25%)
Both White	181 (10%)	67 (37%)
White, Other	61 (4%)	19 (31%)
Other, Other	6 (0.35%)	1 (17%)
Any Substance Use by Either Partner		
No	593 (34%)	157 (26%)
Yes	1,096 (64%)	371 (34%)
Missing	37 (2%)	

Table II. Modified Poisson Regression Model of Factors Associated with Condomless Sex— Main Effects (age continuous)

Variable	Relative Risk	95% Confidence Limits	p-value
HIV Status			
Concordant- positive	Referent		
Concordant- negative	0.81	(0.64 to 1.03)	0.09
Discordant	0.68	(0.52 to 0.90)	0.007
Discordant-unknown	0.71	(0.58 to 0.87)	0.0008
Race			
Both Black	Referent		
Both Hispanic	1.09	(0.80 to 1.5)	0.56
Hispanic, Black	1.18	(0.88 to 1.58)	0.27
Hispanic, White	1.40	(1.08 to 1.79)	0.006
Hispanic, Other	0.84	(0.48 to 1.49)	0.55
Black, White	1.16	(0.91 to 1.49)	0.22
Black, Other	0.97	(0.62 to 1.51)	0.90
Both White	1.14	(0.87 to 1.50)	0.33
White, Other	1.11	(0.77 to 1.62)	0.56
Age (continuous, centered on 44)			
Older partner in dyad	0.99	(0.98 to 1.00)	0.051
Age Difference			
<5 years	Referent		
5-9 years	1.03	(0.86 to 1.25)	0.73
>10 years	1.08	(0.90 to 1.29)	0.42
Any Substance Use			
No	Referent		
Yes	1.28	(1.08 to 1.51)	0.004

Table III. Modified Poisson Regression Model of Factors Associated with Condomless Sex— Interaction Model (age of the older partner * age difference)

Variable	Relative Risk	95% Confidence Limits	p-value
HIV Status			
Concordant- positive	Referent		
Concordant- negative	0.82	(0.65 to 1.04)	0.09
Discordant	0.68	(0.52 to 0.89)	0.005
Discordant-unknown	0.71	(0.58 to 0.87)	0.001
Race			
Both Black	Referent		
Both Hispanic	1.11	(0.81 to 1.53)	0.50
Hispanic, Black	1.18	(0.89 to 1.59)	0.24
Hispanic, White	1.40	(1.09 to 1.81)	0.008
Hispanic, Other	0.87	(0.51 to 1.52)	0.64
Black, White	1.16	(0.91 to 1.48)	0.22
Black, Other	1.01	(0.65 to 1.57)	0.96
Both White	1.15	(0.88 to 1.51)	0.30
White, Other	1.10	(0.76 to 1.59)	0.62
Age (continuous, centered on 44)			
Older partner in dyad	1.01	(0.99 to 1.02)	0.38
Age Difference			
<5 years	Referent		
5-9 years	0.94	(0.77 to 1.14)	0.55
>10 years	1.03	(0.87 to 1.22)	0.74
Any Substance Use			
No	Referent		
Yes	1.29	(1.09 to 1.52)	0.003
Age Interaction (age of older partner * age difference)			
Age older partner x Age difference (< 5 years)	Referent		
Age older partner x Age difference (5-9 years)	0.97	(0.94 to 0.99)	0.007
Age older partner x Age difference (10+ years)	0.98	(0.96 to 1.00)	0.04

Figure 1. Interaction between Age of the Older Partner and Age Difference and the Probability that the Sexual Encounter will be Condomless

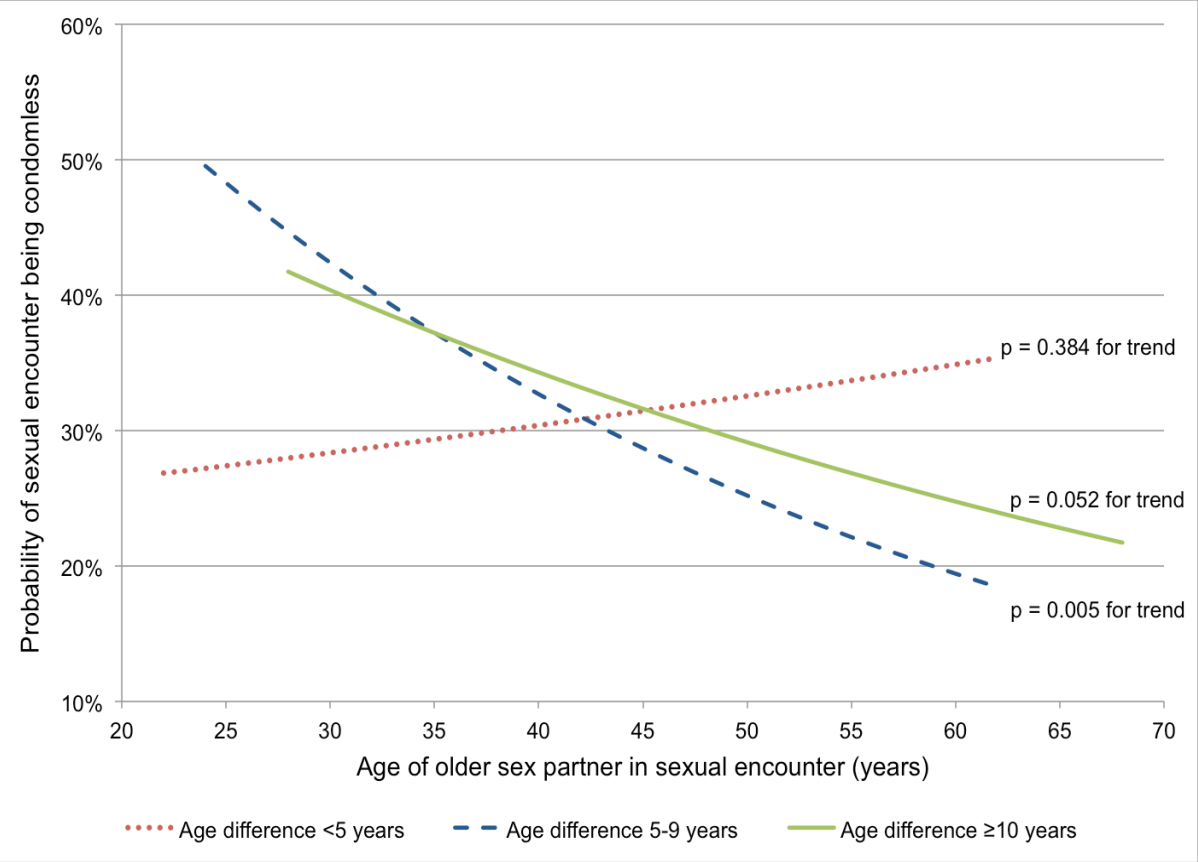


Figure 1. Model-predicted probability that a sexual encounter in the referent group (concordant HIV-positive status, both partners Black, no substance use) will be condomless as a function of age of the older partner (continuous) and age discordance between partners (<5, 5-9, ≥ 10 years).

CHAPTER TWO: STATISTICAL APPENDIX

Logistic Regression

In our first analyses we did not analyze sexual dyads, but instead analyzed data at the level of the individual participant. The binary outcome (condomless sex) led us to use logistic regression to model the likelihood of a sexual encounter's being condomless as a function of the participants' race/ethnicity, HIV status, age (categorized as 18-39, 40-49, and ≥ 50 years old), having a younger sex partner, binge drinking (four or more drinks) or meth use before sex—see Table IV. In this model, only White race and the participants' being HIV-positive were statistically significant (White race, OR=1.56, 95% CI=1.17—2.08; HIV-positive, OR= 1.28, 95% CI=1.01 – 1.62).

We then added the sex partners' race/ethnicity and HIV status— see Table V. In this model, only the sex partner's being HIV-positive was statistically associated with condomless sex (OR=1.67, 95% CI=1.16 – 2.40). Finally, we tested for an interaction between the participant's HIV status and his sex partners' HIV status. In this model, neither the interaction nor any other variables were statistically significant ($p > 0.05$)— see Table VI.

Modified Poisson Regression

As mentioned in Chapter 1, we used modified Poisson regression to model the likelihood of a sexual encounter's being condomless sex as a function age, age difference, race/ethnicity pairing, HIV status concordance, and alcohol or substance use by either partner. We chose this approach over logistic regression because the binary outcome (condomless sex) was not rare ($> 5\%$ probability). This matters because when an outcome event is not rare (such as the prevalence of HIV in our sample) or the

prevalence of exposure in the population is not stable (such as the HIV incidence rate in our sample), logistic regression would overestimate the relative risk from the resulting odds ratio [14-16]. Simply converting an odds ratio to relative risk would provide invalid confidence limits and inconsistent estimates for relative risk [14]. Moreover, unlike our logistic regression models, this analysis was conducted at the level of the sexual dyad, not at the individual level.

Multivariate Analysis

We examined the age of the older partner as a categorical variable (<40, 40-49, ≥50 years old) in modified Poisson regression main effects model. The results were not tabulated in Chapter 1, but will be presented here. Relative to encounters in which the older partner was ≥50 years old, there was a 36% higher probability of condomless sex when the older partner in the dyad was <40 years old ($p=0.01$) (RR= 1.36, 95% CI=1.07—1.72), and a 26% higher probability of condomless sex when the older partner was 40-49 years old ($p=0.03$) (RR=1.26, 95% CI=1.03—1.55).

Relative to < 5 years age difference, neither a 5-9 year nor ≥10 year age difference between partners was statistically significant: $p=0.7$ and $p=0.4$, respectively. Relative to sexual encounters among HIV-positive concordant couples, encounters in serodiscordant couples (in which the status of both partners was known and different) were 32% less likely to involve condomless sex ($p=0.006$), and encounters in which one of the partners' status was unknown were 29% less likely to involve condomless sex ($p=0.0007$). The relative risk remains the same as the main effects model in Chapter 1 where the age of the older partner was examined as a continuous variable, except that the p-values became more significant by 0.001 and 0.0001, respectively. The

probability of condomless sex in an HIV-negative concordant encounter was not significantly different relative to HIV-positive concordant encounters. Sexual encounters between Hispanic and White partners were 41% ($p=0.007$) more likely to be condomless than encounters in which both partners were Black; no other statistically significant racial/ethnic differences were observed. Sexual encounters in which there was any substance use (including binge drinking) by either of the partners were 28% ($p=0.003$) more likely to be condomless than encounters in which there was no substance use; a drop in p-value of 0.001 compared to the analysis in Chapter 1. See Table VII.

Table IV. Logistic Regression Model 1 of Factors Associated with Condomless Sex

Variable	Odds Ratio	95% Confidence Limits	p-value
HIV Status			
Negative	Referent		
Positive	1.28	(1.02 to 1.62)	0.04
Race			
Black	Referent		
Hispanic	1.28	(0.93 to 1.76)	0.13
White	1.56	(1.17 to 2.08)	0.003
Other	0.80	(0.40 to 1.6)	0.53
Age (Categorical)			
≥ 50 years old	Referent		
40-49 years old	1.10	(0.80 to 1.51)	0.20
< 40 years old	1.25	(0.89 to 1.77)	0.55
Younger Partner			
No	Referent		
Yes	0.94	(0.72 to 1.23)	0.66
Alcohol Use			
No	Referent		
Yes	0.94	(0.75 to 1.18)	0.61
Meth Use			
No	Referent		
Yes	1.13	(0.90 to 1.41)	0.29

Table V. Logistic Regression Model 2 of Factors Associated with Condomless Sex—
(including sex partners' characteristics)

Variable	Odds Ratio	95% Confidence Limits	p-value
HIV Status			
Negative	Referent		
Positive	1.06	(0.814 to 1.378)	0.67
Sex Partner's HIV Status			
Negative	Referent		
Don't know	0.97	(0.74 to 1.28)	0.82
Positive	1.67	(1.16 to 2.40)	0.006
Race/Ethnicity			
Black	Referent		
Hispanic	1.15	(0.80 to 1.67)	0.45
White	1.38	(0.98 to 1.96)	0.07
Other	0.77	(0.38 to 1.57)	0.47
Sex Partner's Race/Ethnicity			
Black	Referent		
Hispanic	1.19	(0.81 to 1.76)	0.37
White	1.11	(0.80 to 1.55)	0.53
Other	1.3	(0.74 to 2.30)	0.37
Age (Categorical)			
≥ 50 years old	Referent		
40-49 years old	1.10	(0.89 to 1.78)	0.55
< 40 years old	1.25	(0.80 to 1.51)	0.20
Younger Partner			
No	Referent		
Yes	0.96	(0.74 to 1.26)	0.78
Alcohol Use			
No	Referent		
Yes	0.99	(0.79 to 1.24)	0.91
Meth Use			
No	Referent		
Yes	1.08	(0.86 to 1.35)	0.51

Table VI. Logistic Regression Model 3 of Factors Associated with Condomless Sex— Interaction Model (participant’s HIV status * sex partner’s HIV status)

Variable	Odds Ratio	95% Confidence Limits	p-value
Race/Ethnicity			
Black	Referent		
Hispanic	1.16	(0.80 to 1.69)	0.42
White	1.39	(0.98 to 1.96)	0.07
Other	0.74	(0.36 to 1.51)	0.41
Sex Partner’s Race/Ethnicity			
Black	Referent		
Hispanic	1.21	(0.82 to 1.78)	0.33
White	1.11	(0.80 to 1.55)	0.53
Other	1.32	(0.74 to 2.33)	0.34
Age (Categorical)			
≥ 50 years old	Referent		
40-49 years old	1.11	(0.81 to 1.54)	0.49
< 40 years old	1.27	(0.90 to 1.80)	0.18
Younger Partner			
No	Referent		
Yes	0.97	(0.74 to 1.27)	0.81
Alcohol Use			
No	Referent		
Yes	0.97	(0.77 to 1.22)	0.80
Meth Use			
No	Referent		
Yes	1.10	(0.88 to 1.37)	0.43
Participant’s HIV Status [P]			
Positive	Referent		
Negative	0.93	*	0.39
Sex Partner’s HIV status [SP]			
Positive	Referent		
Don’t know	0.89	*	0.24
Negative	0.86	*	0.20
HIV Status Interaction (participant’s [P] status * sex partner’s [SP] status)			
P or SP HIV+	Referent		
P HIV-, SP don’t know	1.08	*	0.39
P and SP HIV-	1.20	*	0.11

* SAS9.4® does not provide confidence limits on interaction terms.

Table VII. Modified Poisson Regression Model of Factors Associated with Condomless Sex— Main Effects (age categorical)

Variable	Relative Risk	95% Confidence Limits	p-value
HIV Status			
Concordant- positive	Referent		
Concordant- negative	0.82	(0.65 to 1.04)	0.1
Discordant	0.68	(0.52 to 0.9)	0.006
Discordant-unknown	0.71	(0.58 to 0.86)	0.0007
Race			
Both Black	Referent		
Both Hispanic	1.1	(0.8 to 1.50)	0.56
Hispanic, Black	1.18	(0.88 to 1.58)	0.27
Hispanic, White	1.41	(1.10 to 1.81)	0.006
Hispanic, Other	0.84	(0.48 to 1.48)	0.56
Black, White	1.17	(0.91 to 1.49)	0.22
Black, Other	0.98	(0.63 to 1.51)	0.92
Both White	1.14	(0.87 to 1.50)	0.34
White, Other	1.09	(0.75 to 1.59)	0.56
Age (Categorical)			
≥ 50 years old	Referent		
40-49 years old	1.26	(1.03 to 1.55)	0.03
< 40 years old	1.36	(1.07 to 1.73)	0.01
Age Difference			
< 5 years	Referent		
5-9 years	1.03	(0.86 to 1.24)	0.74
>10 years	1.08	(0.91 to 1.29)	0.39
Any Substance Use			
No	Referent		
Yes	1.28	(1.09 to 1.51)	0.003

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