

# Tensions Between the Epidemiology and Psychology of HIV Risk: Implications for Pre-exposure Prophylaxis

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**Abstract** This study focuses on psychological differences in risk-taking patterns and their association with risk compensation motivations in the context of pre-exposure prophylaxis (PrEP). Participants were 257 HIV-negative MSM and transgender women recruited in New York City. The majority of participants (89.5 %,  $n = 230$ ), could be classified as either: *Intimates* (40 %), who report unprotected anal intercourse (UAI) only with a main partner believed to be HIV-negative; *Trusters* (34 %), who engaged in UAI only with casual partners believed to be HIV-negative; and *Gamblers* (26 %) who report UAI with partners of unknown serostatus. Partner-based classifications were better predictors of HIV risk perception and other traditional correlates of risk-taking (e.g. impulsivity, sexual compulsivity) than rates of UAI. The three groups differed significantly in PrEP-related risk compensation motivations: sexual pleasure (Gamblers), intimacy (Trusters) and partner pressure (Intimates). These data underscore the importance of focusing the psychological dynamics of risk perception and sexual decision-making.

**Resumen** Este estudio se enfocó en las diferencias psicológicas en los patrones de toma de riesgos y su asociación con las motivaciones de compensación de riesgo en el contexto de la profilaxis pre -exposición (PrEP). Los

participantes fueron 257 hombres que tienen sexo con hombres y mujeres transgénero VIH- Negativo reclutados en la ciudad de Nueva York. La mayoría de los participantes (89.5 %,  $n = 230$ ), se pueden clasificar como: *Intimos* (40 %), que reportan penetración anal sin condón (PASC) solo con una pareja principal la cual creen es VIH -negativo; *Los que confían* (34 %), que reportan PASC sólo con parejas casuales que creen son VIH negativo, y *Los que apuestan* (26 %) que reportan PASC con parejas de estado serológico desconocido. Las clasificaciones basadas en parejas fueron mejores predictores de la percepción de riesgo de VIH y otras correlaciones tradicionales de toma de riesgos (por ejemplo, impulsividad, compulsividad sexual) que las tasas del UAI. Los tres grupos fueron diferentes significativamente en las motivaciones de compensación de riesgo relacionados con la profilaxis pre-exposición: el placer sexual (Los que Apuestan), la intimidad (Los que confían) y la presión de la pareja (Intimos). Esta data subraya la importancia de enfocarse en la dinámica psicológica de la percepción del riesgo y la toma de decisiones sexuales.

**Keywords** HIV/AIDS MSM · Pre-exposure prophylaxis · Risk compensation · Condom use · Sexual decision-making

## Introduction

Consider four HIV-negative men living in New York City: Ben, Darryl, Greg, and John. All four participate in an HIV research study, and each is asked to provide a detailed report of his sexual behavior in the past 30 days. Ben reports four acts of unprotected anal intercourse (UAI), each with a different casual partner whose status he did not know. Darryl reports four UAI acts with casual partners, all

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of whom he believes to be HIV-negative. Greg reports four UAI acts with his HIV-negative main partner. John reports four UAI acts with his HIV-positive main partner. Which of these four men had “high-risk” sex?

From an epidemiological perspective, each man engaged in four high-risk sex acts, i.e., four acts of unprotected anal sex. However, it is difficult to quantify—or even rank order—the relative risk inherent in unprotected sex with each type of partner. If John’s HIV-positive partner is virally suppressed on antiretroviral medication, he is likely to be at decreased risk for infection compared to Ben, who is having sex with men of unknown status (and therefore unknown levels of viral suppression) [1]. Although serosorting can reduce HIV risk in some cases [2–4], Darryl’s reliance on serosorting may actually place him at increased risk for HIV and other sexually transmitted infections (STIs) [5], especially if his partners are unaware of their true HIV status [6, 7]. Greg, who restricts his UAI to his main partner, may actually be at the highest risk for infection. Although sexual agreements can be protective for some couples [8], modeling data indicate that between one-third and two-thirds of infections among gay and bisexual men may result from sex with main partners [9, 10].

Because of these complexities, researchers who understand the spectrum of risk inherent in *any* unprotected anal sex act—especially among gay men in major metropolitan areas with relatively high HIV prevalence—may be tempted to classify all four men as “high-risk,” and simply count the *total* number of such acts as the variable of interest in prevention studies. From an epidemiological perspective, this strategy makes sense. However, these four men’s subjective *experiences* of risk-taking and sexual decision-making are likely to be vastly different. Ben is the most likely to experience or acknowledge his behavior as “risky”; he is probably aware of the risk he is taking in having unprotected sex with unknown status partners. Depending on the viral load of John’s partner and John’s knowledge of HPTN 052 results, he may experience his behavior as deliberate risk-taking or as a calculated gamble with extremely good odds. In either case, John’s commitment to a serodiscordant partner is likely to imbue his sexual decision-making with relationship dynamics and intimacy motivations that extend beyond mere calculations of transmission risk.

In contrast, it is possible that Darryl and Greg do not perceive themselves at high risk for HIV infection. Both are basing their sexual decision-making on trust in their sexual partners; each is having unprotected sex only with individuals whom he believes to be HIV-negative. To varying degrees, each man may know that his partner’s status is inherently uncertain (the partner may be having unprotected sex with others, his last HIV test may not be recent, or he may be lying about his status). But the

decision to have unprotected sex because one *trusts* a sexual partner who tells you he is negative is fundamentally different from the decision to have unprotected sex with a known positive partner or with a casual partner of unknown serostatus. Darryl’s and Greg’s subjective risk perceptions may be further differentiated by the degree of intimacy on which that trust is predicated. Darryl is trusting casual partners, and data suggest that familiarity with casual partners and/or a history of prior sex with them may result in a decreased likelihood of condom use [11, 12]. In contrast, Greg’s trust of his main partner may represent a sexual agreement in which UAI within their relationship is considered a risk reduction strategy that simultaneously promotes intimacy and attachment [8, 13].

Because each of these HIV risk acts is fundamentally different from a *psychological* perspective, combining them in epidemiological analyses may obscure important differences among individuals, with important implications for both prevention research and messaging. Hundreds of empirical analyses have investigated determinants and correlates of “HIV risk behavior,” with little consensus. In studies of U.S. samples published in the past 5 years alone, engaging in UAI has been associated with younger age [14], older age [15], sex with casual partners [16], sex with main partners [17], being HIV-positive [18, 19], being HIV-negative [20], gay community involvement [21], lack of gay-identification [22], lower levels of HIV knowledge [23], and higher levels of knowledge and optimism about HIV treatment [24]. Prevention messages often treat all UAI as “equal,” and many campaigns targeted to gay men underscore the extent to which one can never know—or trust—a partner’s HIV status [25].

In contrast, a better understanding of the psychological motives and experience inherent in different types of unprotected sex acts may help us better understand the dynamics of HIV prevention and risk. This enhanced understanding may be particularly important in the context of pre-exposure prophylaxis (PrEP) programs, in which counseling patients about their sexual decision-making is critical for both PrEP uptake and risk compensation. This study is designed to test the hypothesis that attending to psychological differences in risk-taking—operationalized in terms of participants’ reports of the perceived HIV status of their partners—will result in more accurate and nuanced findings regarding predictors and correlates of HIV risk. Specifically, it is hypothesized that distinct risk “cohorts”—defined based on patterns of sexual behavior with different types of partners—will reveal distinct patterns of association with variables traditionally used to measure risky decision-making, such as impulsivity, risk propensity, consideration of future consequences, and sexual compulsivity. Finally, it is hypothesized that, because of their different experiences of sexual risk-taking, these distinct risk cohorts may have

different motivations for risk compensation in the context of PrEP.

## Methods

### Participants and Procedures

These data are taken from a large-scale study examining PrEP acceptability, comprehension of PrEP messages, and motivation for risk compensation. Participants were recruited in New York City using passive recruitment methods (i.e., flyers, internet postings), active recruitment methods (i.e., outreach at bars, events, community-based organizations), and participant referral. Eligible participants were HIV-uninfected men and transgender women, 18 years of age or older, who reported at least one act of unprotected anal sex with a male partner in the past 30 days. Participants completed a single study visit at a research lab in New York City. All procedures were reviewed and approved by the Human Research Protections Program at the City University of New York. Each participant provided written informed consent and was compensated \$40 for a 2-hour visit.

### HIV Risk Behavior Measurements

The timeline follow-back (TLFB) semi-structured interview [26], modified for the assessment of sexual risk behavior [27], was used to collect information about sexual behavior in the preceding month. Number of UAI acts were then stratified by serostatus and partner type, yielding six potential totals for each participant: total UAI with HIV-positive main partners; total UAI with HIV-positive casual partners; total UAI with status-unknown main partners; total UAI with status-unknown casual partners; total UAI with HIV-negative main partners; and total UAI with HIV-negative casual partners.

### Psychological Measurements

Participants completed five validated measures utilized in past research as psychosocial predictors of HIV risk behavior. The *Barratt Impulsiveness Scale* [28] is a 30-item scale ( $\alpha = 0.86$ ) associated with behavioral measures of risk-taking [29]. To measure propensity for health-related risk taking, participants completed the six item Health/Safety Subscale ( $\alpha = 0.62$ ) of the *Domain-Specific Risk-Taking Scale* (DOSPERT) [30]. The *Consideration of Future Consequences Scale* [31] is a 12-item measure ( $\alpha = 0.79$ ) of differences in consideration of distal versus immediate behavioral consequences. The *Sexual Compulsivity Scale* [32] is a 10-item scale

( $\alpha = 0.87$ ) that measures feelings related to sexually compulsive behavior, sexual preoccupation, or sexual intrusive thoughts. Finally, participants completed the anxiety and depression subscales ( $\alpha = 0.85$  and  $0.86$ , respectively) of the *Brief Symptom Inventory* [33].

In addition, participants completed two scales related specifically to risk perception and condom use. First, participants were asked to indicate how likely they thought they were to get HIV in their lifetime, on a scale from 0 (“not at all likely”) to 100 (“I will definitely get HIV in my lifetime”). Second, participants completed the Condom Motivations and Barriers Scale, derived from our past work on attitudes toward condoms among gay and bisexual men [34]. This measure includes four subscales: risk reduction motivations ( $\alpha = 0.71$ ); pleasure reduction barriers ( $\alpha = 0.72$ ); partner pressure barriers ( $\alpha = 0.81$ ) and intimacy interference barriers ( $\alpha = 0.88$ ).

### PrEP Risk Compensation Intentions

Participants were asked to imagine they were taking PrEP, and were then asked a series of seven questions about how likely they would be to engage unprotected sex *if they were taking PrEP*, rated on a 6-point scale (1 = not at all likely to 6 = extremely likely). The different questions asked about both specific partner types (e.g., your main partner, someone you just met) and about sexual positioning (e.g., insertive versus receptive anal sex). Responses to the seven risk compensation intention questions were averaged ( $\alpha = 0.94$ ), with higher scores indicating greater likelihood of risk compensation (i.e., greater likelihood of unprotected sex on PrEP).

### Statistical Analysis

All data were analyzed with SPSS version 20.0. Frequencies of UAI with each partner type were calculated to examine patterns of concurrent (or divergent) sexual behavior and create distinct “risk cohorts,” i.e., individuals who engage in UAI only with distinct partner types. One-way analysis of variance and Chi square tests were used to examine demographic and psychosocial differences among identified risk cohorts. Finally, Pearson correlations were conducted to examine the associations between condom use motivations and risk compensation intentions associated with PrEP use for the different risk cohorts.

## Results

A total of 257 eligible participants enrolled in the study between January 2012 and January 2013. As presented in Table 1, participants ranged in age from 18 to 66, and the

**Table 1** Demographic and behavioral descriptors of the sample and risk cohorts ( $n = 257$ )

	Total ( $N = 257$ )	Intimates ( $N = 92$ )	Trusters ( $N = 78$ )	Gambler ( $n = 60$ )
	$n$ (%)	$n$ (%)	$n$ (%)	$n$ (%)
Median age (IQR)	30 (25.0–41.5)	29 (24–36.8) <sup>a</sup>	28 (23–40.2) <sup>a</sup>	33 (25.3–45) <sup>b</sup>
Gender				
Male	248 (96.5)	90 (97.8)	77 (98.7)	55 (91.7)
Transwoman	9 (3.5)	2 (2.2)	1 (1.3)	5 (8.3)
Race/ethnicity				
White	93 (36.2)	42 (45.7) <sup>a</sup>	3 (39.7) <sup>a</sup>	13 (21.7) <sup>b</sup>
Black	86 (33.5)	28 (28.3) <sup>a</sup>	23 (29.5) <sup>a</sup>	29 (48.3) <sup>b</sup>
Latino	61 (23.7)	19 (20.7)	16 (20.5)	15 (25.0)
Other	17 (6.6)	5 (5.4)	8 (10.3)	3 (5.0)
BA degree or more	106 (41.2)	50 (54.3) <sup>a</sup>	31 (39.7) <sup>ab</sup>	15 (25.0) <sup>b</sup>
Annual income > \$20K	125 (48.6)	54 (58.7) <sup>a</sup>	36 (46.2) <sup>ab</sup>	22 (36.7) <sup>b</sup>
In a relationship	141 (54.9)	88 (95.7) <sup>a</sup>	16 (20.5) <sup>b</sup>	21 (35.0) <sup>b</sup>
Lifetime History of STI	125 (48.6)	37 (40.2)	38 (48.7)	30 (50.0)
HIV test in past 3 months	108 (42.0)	38 (41.3)	39 (50.0)	19 (31.7)
	M (SD)	M (SD)	M (SD)	M (SD)
Number of anal sex acts	5.9 (5.7)	7.0 (6.0) <sup>a</sup>	4.8 (5.1) <sup>b</sup>	5.7 (5.9) <sup>ab</sup>
Total number of UAI	4.8 (5.6)	6.3 (6.1) <sup>a</sup>	3.1 (4.4) <sup>b</sup>	4.9 (5.6) <sup>ab</sup>
Percent of anal acts that were unprotected	82.9 (26.8)	89.3 <sup>a</sup> (24.1) <sup>a</sup>	74.4 (30.3) <sup>b</sup>	85.4 (23.2) <sup>a</sup>
Number of UAI with casual partners	1.9 (3.6)	–	2.7 (4.3)	3.5 (3.3)
Personal risk for HIV	31.3 (25.1)	21.0 (20.6) <sup>a</sup>	32.4 (25.0) <sup>b</sup>	41.7 (25.1) <sup>c</sup>

Within rows, variables with different superscripts vary significantly at  $p < 0.05$

STI sexually transmitted infection, UAI unprotected anal intercourse

vast majority had a male gender identity (96.5 %) and identified as gay (68 %) or bisexual (26 %). Participants were well distributed in terms of race/ethnicity, education level, and income, and almost half (48.2 %) reported being “partnered”, which included a legal spouse, partner, lover, or boyfriend. Almost half the sample reported having been diagnosed with an STI in their lifetime, and 42 % reported having been tested for HIV in the past 3 months.

#### Patterns of HIV Risk Behavior

Overall, the total number of unprotected anal sex acts ranged from 1 to 37 ( $M = 4.82$ ,  $SD = 5.55$ ). Over 50 % of the sample ( $n = 129$ ) reported UAI with a main partner, and 59.5 % ( $n = 153$ ) reported UAI with a casual partner. Twenty participants reported engaging in UAI with a known HIV-positive partner. Of those, 65 % ( $n = 13$ ; 5.1 % of the total sample) engaged in UAI with their serodiscordant main partner, while 35 % ( $n = 7$ ; 2.7 % of the total sample) reported UAI with an HIV-positive casual partner. Almost 30 % of the sample ( $n = 73$ ) reported engaging in UAI with a partner whose status they did not know. Finally, 77 % of

the sample ( $n = 198$ ) reported UAI with a partner they believed to be HIV-negative. Of these, 57.1 % ( $n = 113$ , 44 % of the total sample) reported UAI with an HIV-negative main partner, while 51.5 % ( $n = 102$ ; 39.7 % of the total sample) reported UAI with HIV-negative casual partners. Cross-tabs were then conducted to assess whether participants could be classified into distinct “cohorts” based on their patterns of sexual risk.

Ninety-two participants (35.6 % of the sample) reported UAI *only* with a main partner who they believed to be HIV-negative. These individuals were classified as “Intimates,” because their UAI occurs only in the context of an intimate relationship. An additional 78 participants (30.3 %) reported UAI with casual partners, but *only* with casual partners who they believed to be HIV-negative. These individuals were classified as “Trusters,” because their UAI is predicated on trusting a casual partner about his negative serostatus. From an epidemiological perspective, both Trusters and Intimates could be classified as serosorters, i.e., they restrict their unprotected sex to HIV-negative partners. However, these groups were separated in the analyses that follow, in order to examine whether they exhibited psychological differences

based on potentially different experiences of unprotected sex. Finally, 60 participants (23.3 %) reported UAI with casual partners of unknown HIV status. These individuals were classified as “Gamblers.” Sixty percent ( $n = 36$ ) of Gamblers reported that *all* of their UAI acts were gambling, the remainder combined gambling acts with intimate or and/or trusting acts. As noted above, only 7.8 % of the sample ( $n = 20$ ) had engaged in UAI with know HIV-positive partners, and the remaining seven participants were difficult to classify, because they reported multiple “main” partners. Therefore, the analyses that follow were restricted to the three largest groups ( $n = 230$ ): Gamblers ( $n = 60$ ), Trusters ( $n = 78$ ), and Intimates ( $n = 92$ ).

Table 1 includes descriptive data and demographic comparisons among the three risk cohorts. Compared to the other two cohorts, Gamblers were older, less likely to be White and more likely to be Black. Compared to Intimates, Gamblers were also less educated and reported lower income; however neither of these groups differed significantly from Trusters in education or income. By definition, the Intimates were significantly more likely to be in a relationship. The small number of Intimates who reported not being in a relationship ( $n = 4$ ) had ended their relationship during the 30 day reporting period.

Finally, Table 1 presents differences among the three risk cohorts in sexual behavior and risk perception. Compared to the other two groups, Trusters reported the fewest number of total anal sex acts, fewest unprotected sex acts, and the lowest percentage of unprotected sex acts. Intimates believed themselves to have the lowest likelihood of becoming HIV infected in their lifetime (21 %), followed by Trusters (32.4 %), and then Gamblers (41.7 %).

#### Psychosocial Differences Among Risk Cohorts

Table 2 compares two methods of examining the association between psychosocial variables and risk behavior. The first column of the table presents a traditional approach, examining bivariate correlations between each psychosocial predictor and the total number of UAI acts, in order to identify psychosocial factors associated with greater levels of risk-taking. The only significant parameter that emerges is a negative correlation between depression scores and UAI, such that as depression increases, total number of UAI acts decreases. The next three columns present an alternative approach, which compares average scores on each psychosocial variable among the three risk cohorts. Gamblers scored significantly higher than the other two groups on four of the six variables, including impulsivity, risk propensity, consideration of future consequences, and sexual compulsivity. Gamblers also reported significantly higher depression scores than Intimates. There were no differences among the three cohorts in anxiety scores.

#### Risk Compensation Intentions on PrEP

Gamblers scored significantly higher on risk compensation intentions ( $M = 3.5$ ,  $SD = 1.4$ ) compared to both Intimates ( $M = 2.6$ ,  $SD = 1.4$ ) and Trusters ( $M = 2.8$ ,  $SD = 1.4$ ), who did not differ significantly from each other,  $F(2,220) = 7.83$ ,  $p < 0.01$ . Table 3 presents the correlations between risk compensation intentions and condom motivations/barriers. For Intimates, risk compensation intentions were positively associated with pleasure interference and partner pressure barriers to condom use. For Trusters, risk compensation intentions were negatively associated with risk reduction motivations for condom use and positively associated with intimacy barriers. For Gamblers, risk compensation intentions were significantly positively associated only with pleasure interference barriers.

#### Discussion

This paper draws attention to the important distinction between the epidemiological realities of HIV transmission and the psychological experience of sexual decision-making. Epidemiological data demonstrate the risks associated with *any* act of UAI, including sex with both casual and main partners, and with partners of unknown serostatus as well as those who report being HIV-negative. In contrast, these data build on past research on serosorting [35, 36] to examine the extent to which MSM and transgender women restrict their UAI to a particular type of partner. These findings suggest that examining specific “risk cohorts”—operationalized in terms of participants’ reports of their relationship with and perceived HIV status of their partners—may enhance understanding of both psychological variables traditionally associated with risky decision-making and motivations for risk compensation in the context of PrEP use.

In this sample, a large percentage of MSM and transgender women engaged in only specific categories of HIV risk behavior. The majority of participants ( $n = 194, 75.6\%$ ) restricted their UAI to a single partner type, and 89.5 % of participants ( $n = 230$ ) could be classified into one of three risk cohorts: *Intimates* (40 %), who engage in UAI only with a main partner whom they believe to be HIV-negative; *Trusters* (34 %), who engaged in UAI only with main or casual partners whom they believe to be HIV-negative; and *Gamblers* (26 %) who report UAI with casual partners of unknown serostatus. Consistent with past research on UAI with main partners, Intimates reported the highest number of anal sex acts, number of unprotected sex acts, and percentage of anal acts that were unprotected. However, Intimates differed in their level of UAI only from Trusters; they did not differ significantly from Gamblers. These findings

**Table 2** Comparison between analysis of associations between risk behavior and psychological variables and psychological differences between risk cohorts ( $n = 230$ )

	Total UAI r	Intimates ( $n = 92$ ) M	Trusters ( $n = 78$ ) M	Gamblers ( $n = 60$ ) M	Omnibus $p$
Impulsiveness	-0.06	62.8 <sup>a</sup>	65.1 <sup>a</sup>	70.8 <sup>b</sup>	0.000
Health risk propensity	-0.02	21.2 <sup>a</sup>	22.4 <sup>a</sup>	25.4 <sup>b</sup>	0.002
Consideration of future consequences	-0.00	42.7 <sup>a</sup>	41.8 <sup>a</sup>	38.8 <sup>b</sup>	0.014
Sexual compulsivity	-0.04	16.0 <sup>a</sup>	18.2 <sup>b</sup>	22.1 <sup>c</sup>	0.000
Depression	-0.16**	0.71 <sup>a</sup>	0.92 <sup>ab</sup>	1.18 <sup>b</sup>	0.002
Anxiety	-0.09	0.70	0.74	0.92	ns

\*\*  $p < 0.01$ ; within rows, variables with different superscripts vary significantly at  $p < 0.05$

**Table 3** Correlations with PrEP risk compensation intentions by cohort ( $n = 230$ )

Condom Motivations and Barriers Subscale	Total ( $n = 230$ )	Intimates ( $n = 92$ )	Trusters ( $n = 78$ )	Gamblers ( $n = 60$ )
Risk reduction motivations	-0.18**	-0.07	-0.32**	-0.11
Pleasure interference	0.35**	0.33**	0.22	0.36**
Sexual pressure	0.24**	0.35**	0.04	0.11
Intimacy	0.25**	0.14	0.27*	0.26 <sup>†</sup>

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; <sup>†</sup>  $p = 0.05$

underscore the importance of better understanding patterns of sexual behavior with casual partners among distinct groups of MSM, and may shed light on past equivocal findings regarding rates of UAI with casual versus main partners [37].

Second, our data indicate that participants' HIV risk perceptions differ significantly across the three groups. Intimates' perceived risk was half that of Gamblers, while Trusters perceived their risk to be between the other two groups. Although some epidemiological research has found similar rank-order risk estimates [2], per contact risk is more strongly associated with behavior type (e.g., insertive versus receptive sex, with or without ejaculation) than with partner type or perceived partner serostatus [38]. Data from this study suggest that participants' risk perceptions are less consistent with epidemiological data about the likelihood of transmission, and more consistent with psychological beliefs about the protection conferred by trusting one's sexual partners.

Third, in this sample, many of the traditional psychological correlates of risk taking—impulsivity, risk propensity, consideration of future consequences, even depression—applied only to individuals who were classified as Gamblers. These data lend credence to the idea that the psychological experience of risk-taking differs by partner type and perceived serostatus. Impulsivity and failure to consider future consequences may not be factors in the UAI of Intimates or Trusters, because they may not experience their behavior as particularly impulsive or risky.

Finally, while Gamblers reported the highest levels of PrEP risk compensation intentions, the three groups differed in their pattern of association between these intentions and condom use motivations/barriers. These data suggest that the reasons why each cohort might be motivated to engage in UAI on PrEP are very different. Among Gamblers, risk compensation intentions were highest among those with strong beliefs about condoms interfering with sexual pleasure. Among Trusters, risk compensation intentions were highest among those who believe that condoms interfere with intimacy. And among Intimates, risk compensation intentions were highest among those who report that sexual pressure from their partners makes condom use difficult. These distinctions not only highlight the importance of tailoring PrEP-related risk reduction counseling to the specific needs and contexts of individual patients, but may also help us understand the factors that might motivate individuals with different behavior patterns to take PrEP in the first place.

These data are subject to several important limitations. Our participants were recruited for a study about PrEP, and so may not be representative of the community more broadly. While our sample was diverse in terms of race/ethnicity, age and socioeconomic status, the limited number of transgender women in our sample limits our findings for this group. This study relies on self-report data, which may be subject to social desirability biases. Analyses were correlational, and cannot be construed to support causal claims regarding observed relationships. Participants were not asked directly about their levels of trust in specific partners or about their psychological experience of risk. As such, these data can be considered *suggestive* of a psychological perspective on HIV risk, but further research is needed to more fully understand these phenomena.

Despite these limitations, this study has important implications for prevention research, messaging, and program development. In the context of a growing epidemic among MSM and transgender women and emerging epidemiological evidence about the complex dynamics of transmission, it is difficult to identify optimal strategies to reach the highest risk individuals.

These data suggest that attending to psychological differences inherent in patterns of—and motivations for—unprotected intercourse may allow us to better understand and treat our clients. This study also focuses particular attention on perhaps the most difficult HIV prevention message, i.e., the risk associated with *trusting* one's sexual partner(s). Multiple studies demonstrate the critical role of intimacy in motivating UAI with both casual and main partners, and these data suggest that individuals who limit their UAI to contexts of trust in a main or casual partner's HIV-negative status may be fundamentally different from those who engage in UAI with partners of unknown serostatus. Although epidemiological data indicate that these individuals are at significant risk for infection, HIV prevention messages that contain such warnings may actually be perpetuating risk-taking. If MSM and transgender women are consistently told that it is important to use condoms because they can never fully trust their partners, it seems reasonable that the most basic demonstration of trust between two partners (whether they have known each other years, months, or hours) will be to reject condom use. In the development and tailoring of PrEP programs, it is critical that we not recapitulate past rhetoric, but rather use PrEP to help frame HIV prevention within the contexts of these complex behaviors and relationships. One of the most important challenges facing HIV prevention in the coming years will be identifying messages, strategies, and programs that integrate an epidemiological perspective on risk with a recognition of the psychological dynamics of risk perception and sexual decision-making.

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## References

- Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med*. 2011;365(6):493–505.
- Jin F, Crawford J, Prestage GP, Zablotska I, Imrie J, Kippax SC, et al. Unprotected anal intercourse, risk reduction behaviours, and subsequent HIV infection in a cohort of homosexual men. *AIDS*. 2009;23(2):243–52.
- Jin F, Prestage GP, Templeton DJ, Poynten IM, Donovan B, Zablotska I, et al. The impact of HIV seroadaptive behaviors on sexually transmissible infections in HIV-negative homosexual men in Sydney, Australia. *Sex Transm Dis*. 2012;39(3):191–4.
- Philip SS, Yu X, Donnell D, Vittinghoff E, Buchbinder S. Seroconversion is associated with a decreased risk of HIV seroconversion in the EXPLORE Study Cohort. *PLoS One*. 2010;5(9). doi:10.1371/journal.pone.0012662.
- Truong HM, Kellogg T, Klausner JD, Katz MH, Dilley J, Knapper K, et al. Increases in sexually transmitted infections and sexual risk behaviour without a concurrent increase in HIV incidence among men who have sex with men in San Francisco: a suggestion of HIV serosorting? *Sex Transm Infect*. 2006;82(6):461–6.
- Centers for Disease Control and Prevention. HIV surveillance—United States, 1981–2008. *MMWR Morb Mortal Wkly Rep*. 2011;60(21):689–93.
- Centers for Disease Control and Prevention. Prevalence and awareness of HIV infection among men who have sex with men—21 cities, United States, 2008. *MMWR Morb Mortal Wkly Rep*. 2010;59:1201–7.
- Hoff CC, Chakravarty D, Beougher SC, Neilands TB, Darbes LA. Relationship characteristics associated with sexual risk behavior among MSM in committed relationships. *AIDS Patient Care STDS*. 2012;26(12):738–45.
- Goodreau SM, Carnegie NB, Vittinghoff E, Lama JR, Sanchez J, Grinsztejn B, et al. What drives the US and Peruvian HIV epidemics in men who have sex with men (MSM)? *PLoS One*. 2012;7(11):e50522.
- Sullivan PS, Salazar L, Buchbinder S, Sanchez TH. Estimating the proportion of HIV transmissions from main sex partners among men who have sex with men in five US cities. *AIDS*. 2009;23(9):1153–62.
- Rouwenhorst E, Mallitt KA, Prestage G. Gay men's use of condoms with casual partners depends on the extent of their prior acquaintance. *AIDS Behav*. 2012;16(6):1589–96.
- Zablotska IB, Grulich AE, De Wit J, Prestage G. Casual sexual encounters among gay men: familiarity, trust and unprotected anal intercourse. *AIDS Behav*. 2011;15(3):607–12.
- Gomez AM, Beougher SC, Chakravarty D, Neilands TB, Mandic CG, Darbes LA, et al. Relationship dynamics as predictors of broken agreements about outside sexual partners: implications for HIV prevention among gay couples. *AIDS Behav*. 2012;16(6):1584–8.
- Chen YH, Raymond HF, Grasso M, Nguyen B, Robertson T, McFarland W. Prevalence and predictors of conscious risk behavior among San Franciscan men who have sex with men. *AIDS Behav*. 2013;17(4):1338–43.
- Tucker JS, Hu J, Golinelli D, Kennedy DP, Green HD Jr, Wenzel SL. Social network and individual correlates of sexual risk behavior among homeless young men who have sex with men. *J Adolesc Health*. 2012;51(4):386–92.
- Kelly JA, DiFranceisco WJ, St Lawrence JS, Amirkhanian YA, Anderson-Lamb M. Situational, partner, and contextual factors associated with level of risk at most recent intercourse among black men who have sex with men. *AIDS Behav*. 2013. doi:10.1007/s10461-009-9524-3.
- Wilson PA, Diaz RM, Yoshikawa H, Shrout PE. Drug use, interpersonal attraction, and communication: situational factors as predictors of episodes of unprotected anal intercourse among Latino gay men. *AIDS Behav*. 2009;13(4):691–9.
- Rosser BR, Oakes JM, Horvath KJ, Konstan JA, Danilenko GP, Peterson JL. HIV sexual risk behavior by men who use the Internet to seek sex with men: results of the Men's INternet Sex Study-II (MINTS-II). *AIDS Behav*. 2009;13(3):488–98.
- Fisher MP, Ramchand R, Bana S, Iguchi MY. Risk behaviors among HIV-positive gay and bisexual men at party-oriented vacations. *J Stud Alcohol Drugs*. 2013;74(1):158–67.
- Kelly JA, St Lawrence JS, Amirkhanian YA, DiFranceisco WJ, Anderson-Lamb M, Garcia LI, et al. Levels and predictors of HIV risk behavior among Black men who have sex with men. *AIDS Educ Prev*. 2013;25(1):49–61.

21. Flores SA, Mansergh G, Marks G, Guzman R, Colfax G. Gay identity-related factors and sexual risk among men who have sex with men in San Francisco. *AIDS Educ Prev*. 2009;21(2):91–103.
22. Hampton MC, Halkitis PN, Storholm ED, Kupprat SA, Siconolfi DE, Jones D, et al. Sexual risk taking in relation to sexual identification, age, and education in a diverse sample of African American men who have sex with men (MSM) in New York City. *AIDS Behav*. 2013;17(3):931–8.
23. White JM, Mimiaga MJ, Reisner SL, Mayer KH. HIV sexual risk behavior among black men who meet other men on the internet for sex. *J Urban Health*. 2013;90(3):464–81.
24. Grosskopf NA, Harris JK, Wallace BC, Nanin JE. Online sex-seeking behaviors of men who have sex with men in New York City. *Am J Mens Health*. 2011;5(5):378–85.
25. Noar SM, Palmgreen P, Chabot M, Dobransky N, Zimmerman RS. A 10-year systematic review of HIV/AIDS mass communication campaigns: have we made progress? *J Health Commun*. 2009;14(1):15–42.
26. Sobell MB, Sobell LC. *Problem drinkers: guided self-change treatment*. New York: Guilford; 1993.
27. Carey MP, Carey KB, Maisto SA, Gordon CM, Weinhardt LS. Assessing sexual risk behaviour with the Timeline Followback (TLFB) approach: continued development and psychometric evaluation with psychiatric outpatients. *Int J STD AIDS*. 2001;12:365–75.
28. Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt impulsiveness scale. *J Clin Psychol*. 1995;51(6):768–74.
29. Moeller F, Barratt E, Fischer C, Dougherty D, Reilly E, Mathias C, et al. P300 event-related potential amplitude and impulsivity in cocaine-dependent subjects. *Neuropsychobiology*. 2004;50(2):167–73.
30. Blais A, Weber EU. A domain-specific risk-taking (DOSPERT) scale for adult populations. *Judgm Decis Mak*. 2006;1(1):33–47.
31. Strathman A, Gleicher F, Boninger DS, Edwards CS. The consideration of future consequences: weighing immediate and distant outcomes of behavior. *J Pers Soc Psychol*. 1994;66(4):742–52.
32. Kalichman SC, Rompa D. The sexual compulsivity scale: further development and use with HIV-positive persons. *J Pers Assess*. 2001;76(3):379–95.
33. Derogatis LR, Melisaratos N. The Brief Symptom Inventory: an introductory report. *Psychol Med*. 1983;13(3):595–605.
34. Golub SA, Starks TJ, Payton G, Parsons JT. The critical role of intimacy in the sexual risk behaviors of gay and bisexual men. *AIDS Behav*. 2012;16(3):626–32.
35. McFarland W, Chen YH, Raymond HF, Nguyen B, Colfax G, Mehrstens J, et al. HIV seroadaptation among individuals, within sexual dyads, and by sexual episodes, men who have sex with men, San Francisco, 2008. *AIDS Care*. 2011;23(3):261–8.
36. Eaton LA, Kalichman SC, O'Connell DA, Karchner WD. A strategy for selecting sexual partners believed to pose little/no risks for HIV: serosorting and its implications for HIV transmission. *AIDS Care*. 2009;21(10):1279–88.
37. Prestage G, Brown G, Down IA, Jin F, Hurley M. “It’s hard to know what is a risky or not a risky decision”: gay men’s beliefs about risk during sex. *AIDS Behav*. 2013;17(4):1352–61.
38. Jin F, Jansson J, Law M, Prestage GP, Zablotska I, Imrie JC, et al. Per-contact probability of HIV transmission in homosexual men in Sydney in the era of HAART. *AIDS*. 2010;24(6):907–13.