

# Inter-partner and Temporal Variations in the Perception of Sexual Risk for HIV

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**Abstract** This study uses longitudinal qualitative methods to examine how gay and bisexual men perceive sexual risk across both a variety of partners and across time. Over ten weeks, participants completed three quantitative personal relationship diaries (PRD) describing sexual encounters during that time period. Participants then completed a timeline-based individual in-depth interview to unpack the PRD data. Participants used multiple factors to determine their own sexual risk (e.g., type of sex, partner concurrency, emotional connections), which often resulted in inconsistencies in defining sexual risk and determining the level of risk both within and across partners and across time. These findings can inform HIV prevention messages and programming.

**Resumen** Este estudio usa métodos longitudinales y cualitativos para examinar como hombres homosexuales y bisexuales perciben los riesgos sexuales a través tanto de la variedad de parejas como a través del tiempo. Por diez semanas, los participantes completaron tres diarios cuantitativos sobre sus relaciones personales describiendo sus encuentros sexuales durante este periodo de tiempo. Después, para explicar los datos del diario, los

participantes completaron una entrevista individual profunda basada en una línea de tiempo. Los participantes usaron factores múltiples para determinar su propio riesgo sexual (por ejemplo, el tipo de sexo, la concurrencia de la pareja y conexiones emocionales), que frecuentemente resultaban en inconsistencias para definir el riesgo sexual y determinar el nivel de riesgo tanto dentro y entre parejas y a través del tiempo. Estos resultados pueden ayudar a crear mensajes y programas para la prevención de VIH.

**Keywords** Longitudinal · Risk perceptions · Sexual risk · HIV · MSM

## Introduction

Gay, bisexual, and other men who have sex with men (MSM) experience a disproportionate burden of HIV incidence in the United States. In 2014, MSM accounted for 67% of new HIV infections [1]. We know that condom use and other interventions (e.g. increased HIV testing, pre-exposure prophylaxis, non-occupational post-exposure prophylaxis), can reduce the acquisition and transmission of HIV among individuals and within the population [2, 3], yet the incidence of HIV is still rising for MSM in the United States [4]. One approach to understanding the disconnect between the utilization of available prevention services and the increasing HIV incidence has been to focus on understanding how perceptions of risk for HIV acquisition shape sexual risk-taking behaviors among MSM, especially condomless anal intercourse (CAI), the primary risk behavior for HIV transmission. However, research on risk perceptions has mostly examined perceptions of risk using cross-sectional data [5, 6], capturing risk linked to a specific episode of sex, or at best, recent

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episodes of sex or has focused on risk perceptions in specific types of relationships [7, 8]. In order to better understand the complexities of how sexual risks are perceived among MSM and to understand how risk varies across partners and among the same partners over time, this paper uses a longitudinal qualitative approach to examine gay and bisexual men's perceptions of sexual risk among a variety of partners.

Perceptions of sexual risk are understood to be an important aspect of sexual decision-making; if MSM perceive little to no risk of acquiring HIV from a sexual partner, they may be more willing to engage in CAI. There are many health behavior theories (e.g. Health Belief Model, Protection Motivation Theory, and Precaution Adoption Process) that suggest that decision-making regarding risky behaviors is directly linked to both perceptions of risk as well as susceptibility of HIV infection [9–12]. Cost-benefit analysis, also based on perceptions of risk, may also apply to sexual decision-making. Studies by Suarez and Kauth [13] and Suarez and Miller [14] suggest that condom negotiation is based on the assessment of the perceived benefits of CAI (e.g. pleasure, intimacy) and how they compare to the perceptions of sexual risk [e.g. HIV, sexually transmitted infections (STIs)]. However, risk perception is sometimes a poor deterrent of sexual risk-taking, with the decision to participate in CAI shaped by more than perceptions of risk of HIV infection or transmission [15]. For example, CAI may depend on the context of a sexual encounter (especially if there are other existing risk factors, such as violence or transactional sex) [16–18].

Risk perceptions are often studied as though they are static, with the understanding that there is a unidirectional and causal relationship between an individual's perceptions of risk and their behavior; however, behaviors and experiences that occur over time can also change an individual's attitudes, including how risk is perceived [5, 6]. This reciprocal relationship between attitudes and behavior can cause perceptions of risk to be inconsistent over time [5]. Therefore, examining an individual's perception of risk in a moment of time may not fully capture the various ways that individuals perceive sexual risk across a variety of partners, in a variety of situations, or across time.

It is also important to recognize that perceptions of risk occur within the context of sexual partnerships (both casual and main partnerships). Most research examining relationship contexts has focused on MSM with main partners, but has not examined how risk is perceived among casual partners. Research on main partnerships has addressed a variety of aspects of relationship dynamics among MSM and how these dynamics influence perceptions of sexual risk and sexual risk-taking behaviors [8].

Some examples of contextual factors that shape risk may include the length of the relationship; the level of formality and/or commitment of the relationship; relationship satisfaction; emotional attachments, including love, intimacy, and trust; the perception of monogamy or concurrency; and establishment and investment in sexual agreements [7, 8, 19–24]. However, missing from this literature is an understanding of how risk perceptions are shaped by relationship characteristics in non-main partnerships (for example, short-term or more casual relationships) and how risk perceptions vary over time as men transition between partners and differing relationship types.

Although there is a paucity of research that has explored perceptions of risk-taking over time, Darbes et al. longitudinally examined the associations between relationship dynamics, perceptions of HIV risk, and engagement in CAI among MSM in main partnerships [7]. This study found that relationship dynamics and relationship satisfaction predicted CAI with outside partners and among sero-discordant couples, with impacts on both preventative and more risky behaviors, and with these findings remaining consistent over time [7]. However, this study was unable to explore whether risk perceptions are static as men transition through different relationship types, as all men had main partners plus, in some cases, concurrent outside partners.

The current study builds on previous findings to examine how risk perceptions vary across time and across partners. In this study, we use data collected via longitudinal qualitative methods to examine sexual patterns that self-identified gay and bisexual men (GBM) engaged in over a ten-week period in order to understand the complexities and nuances of the ways that GBM ascribe risk to their behaviors in a variety of relationships. Having a more complex understanding of how men perceive sexual risk across a variety of sexual partnerships will allow for the development of more informed public health interventions; these interventions can use these nuances to consider the contexts of relationships and circumstances when providing education or other resources about sexual risk reduction to men that may apply across different types of partnerships.

## Methods

The research design included nine personal relationship diaries (PRDs) and a debrief in-depth interview (IDI) from men who were participants in previous research. This study was approved by Emory University's Institutional Review Board. These methods have been reported in Goldenberg et al. [20, 25].

## Study Population and Recruitment

Participants were men who previously participated in other studies at Emory University who reported an interest in taking part in additional research. This previous research included participation in a cross-sectional survey examining intimate partner violence or participation in a cohort study, which included engaging in HIV testing every six months [26–28]. Participants were originally recruited for these studies using venue-based sampling. Venue-based sampling is recruitment that occurs within prescribed blocks of time at pre-identified settings that are frequented by the study populations of interest [29]. For participation in this study, all GBM from these studies who indicated being interested in participating in future research were contacted via email to complete an online eligibility survey. Participants were eligible if they identified as a gay or bisexual man, were aged  $\geq 18$  years, lived in the Atlanta metropolitan area, and self-reported CAI in the past three months. In total, we recruited 25 participants. After data collection from the first twenty participants, data were reviewed to assess saturation and variation in demographics among participations. Recruitment of the last five participants was targeted based on age and race; this resulted in having approximately half of the sample be men of color, with six men under the age of 25, ten between the ages of 25 and 34, and 9 aged 35 and older.

## Study Procedures

This was a 10-week longitudinal qualitative study, using IDIs to unpack quantitative data collected through web-based PRDs. Upon entering the study, participants completed a study visit, which included receiving a full description of study components, providing informed consent to study participation, and completion of a web-based survey. This asked demographic questions (age, race, sexual orientation) in addition to relationship status at the time of entering the study. Participants were asked if they were in a relationship with someone who they “feel committed to above all others.” During this study visit, participants also completed a baseline in-depth individual interview, which was not included in this analysis; these results are described elsewhere [20]. Participants received a \$30 incentive for this first study visit.

### *Personal Relationship Diaries*

The PRDs were answered over a nine-week period, with participants completing three quantitative web-based PRDs at home, one every three weeks. In order to ensure completion of the PRDs, every three weeks, participants were

sent the link to the PRD with a numeric code that was required to complete the diary. If a participant did not complete the PRD within three days of receiving the email, they were sent a reminder email. All PRDs were completed within one week of receiving the initial email. The subsequent PRD was sent to each participant three weeks after the previous one was completed.

The PRDs asked questions about sex partners that participants had during the past three weeks. Participants were first asked how many oral or anal intercourse (AI) partners they had in the past three weeks. If they had more than three partners, they were asked to choose three to discuss in the diary; only three partners were chosen for discussion in order to reduce respondent burden of the PRD and to allow for a more in-depth discussion during the debrief IDIs. For each partner, the participants gave them a nickname and answered a series of questions, including: questions about the relationship context (duration of the relationship, how the partners met); whether or not the partner was a main partner (is this partner someone who they are committed to above all others); questions about their sexual encounters that occurred in the past three weeks (quantity of oral, quantity of penetrative AI, quantity of receptive AI, condom use); and rankings on a one to five scale (least to most) based on how well they knew their partner, perceptions of emotional risk, and perceptions of HIV/STI risk. For example, the question on HIV/STI risk ranking asked participants: “Thinking back to your sexual encounters with [partner’s nickname] over the past three weeks, how would you rank how risky the behaviors were, in terms of STIs and HIV, on a scale from 1 to 5? (1 = least risky, 5 = most risky)?” Further details on these measures are presented in Goldenberg et al. [25]. Participants were expected to self-define both emotional and HIV/STI risk and during a later interview were asked to elaborate on their interpretation of their definition of risk. Participants also chose applicable statements from a list of 26 that demonstrated a variety of emotions/relationship characteristics (e.g., ‘I get jealous when he flirts with other people’, ‘I trust him a lot’). Participants were asked the same question in each diary, but for the second and third diaries, participants were asked if they had previously discussed a partner; if they had, they were not asked questions about how they met their partner and the duration of the relationship, but they were still asked about sexual experiences, risk rankings, and emotional characteristics. Repeating these questions enabled analysts to examine how relationships changed (or did not change) over the study period.

### *Debrief Interview*

All debrief interviews were conducted within one week after the completion of the final PRD. Diary data were

unpacked in a timeline-based IDI examining the dynamics of each partnership over the study period. Information from the diaries were extracted and put onto a timeline using color-coded and discrete stickers (Fig. 1); this included information about the number of sex acts, condom use, indications of commitment, and scores for how well the participant knew the partner, perceptions of emotional risk, and perceptions of HIV/STI risk. The timelines were used to facilitate discussion regarding the previously-reported diary answers. Participants were asked about all of the information included on the timelines from the PRDs and they were also asked additional questions and answered those using stickers with predetermined labels; if none of the labels were applicable, participants made stickers using their own words. Additional questions included: how they label the relationship (e.g. boyfriend, friends with benefits, hookup); how they would describe the sex that they had (e.g. making love, having sex, hooking up); and the feelings that they had during sex (e.g. comfortable, uncomfortable, pleased, unsatisfied). Separate timelines were created for each partner, signifying changes between each relationship diary three-week period. Each debrief interview was tailored to diary responses, with modified interview guides addressing different types of responses (e.g., multiple versus one sexual partner, periods of abstinence). All interviews were audio-recorded and transcribed verbatim. Upon completion of the debrief interview, participants received an additional incentive of \$65; this included an incentive for completing all three PRDs and the IDI.

## Data Analysis

We conducted a multi-step analysis of data. In order to better identify patterns across relationships, we first examined the PRDs quantitatively, summarizing each participant's sexual experiences based on sexual acts, condom use, and perceptions of HIV/STI risks. The quantitative summaries included descriptions of each participant's sexual partners over the three diary periods, including quantitative information about the type of sex, whether or not they used a condom, whether or not the relationship was defined as committed, and the risk scores that were assigned during each diary time period. These summaries were used to identify longitudinal patterns of sexual behavior and perceptions of sexual risk. However, since the purpose of the diary data was to inform qualitative results (i.e., results from the debrief interviews), statistical tests were not performed to examine these quantitative patterns; they purely act as a description of the sexual behaviors experienced by the participants over the 10 weeks, with the emphasis of the analysis on the qualitative data to explain these behaviors. To further

understand each participant's sexual patterns over the study period, we also conducted a case-based qualitative analysis, examining each participant's perceptions of their patterns of sexual behavior and their perceptions of HIV and STI risk; this case-based analysis was informed by quantitative summaries, but was expanded using qualitative interview data. We used verbatim transcripts to qualitatively describe how participants defined their sexual behaviors and to examine how they perceived sexual risk.

Then, we conducted a thematic analysis utilizing MAXQDA, version 11 (Verbi Software, Berlin), a qualitative data analysis software. The thematic analysis used elements of Grounded Theory [30]; though analysis was informed by a specific research question, inductive themes were used to allow for an examination of patterns that emerged organically in the data. This analysis entailed the consistent application of a set of codes to all transcripts to examine how perceptions of risk were discussed across participants. A preliminary codebook was created based on analysts' close readings of several transcripts, incorporating explicit domains from interview guides as well as pervasive, unanticipated themes that were emergent across transcripts. Provisional definitions were given to each code and six analysts applied the codes to a single transcript; analysts were all members of the research team and included project faculty and staff. The coded transcripts were merged for comparison and the six analysts met to review segments of the text that were not coded identically across all six analysts; code definitions were revised based on an examination of coding disagreement. This process was repeated on three additional transcripts until consistent agreement of code definitions and code applications was attained among all coders. Once the finalized codebook was established, the finalized codes were applied to all transcripts by three of the data analysts, with two analysts coding each transcript. Focused readings of coded text produced thick descriptions for each code. For the purpose of data retrieval by code, text was segmented based on the participant's overall sexual and relationship patterns (e.g. multiple partners versus one partner, condom use, committed versus non-committed partners). Themes were developed based on patterns identified in thick descriptions. Quotes from participants are presented in the results and pseudonyms are used in order to protect the privacy of the participants.

## Results

During the 10-week study period, all 25 participants completed all of the study activities, resulting in data from 75 PRDs and 25 IDIs. Participant demographics and characteristics are described in Table 1. The mean age for

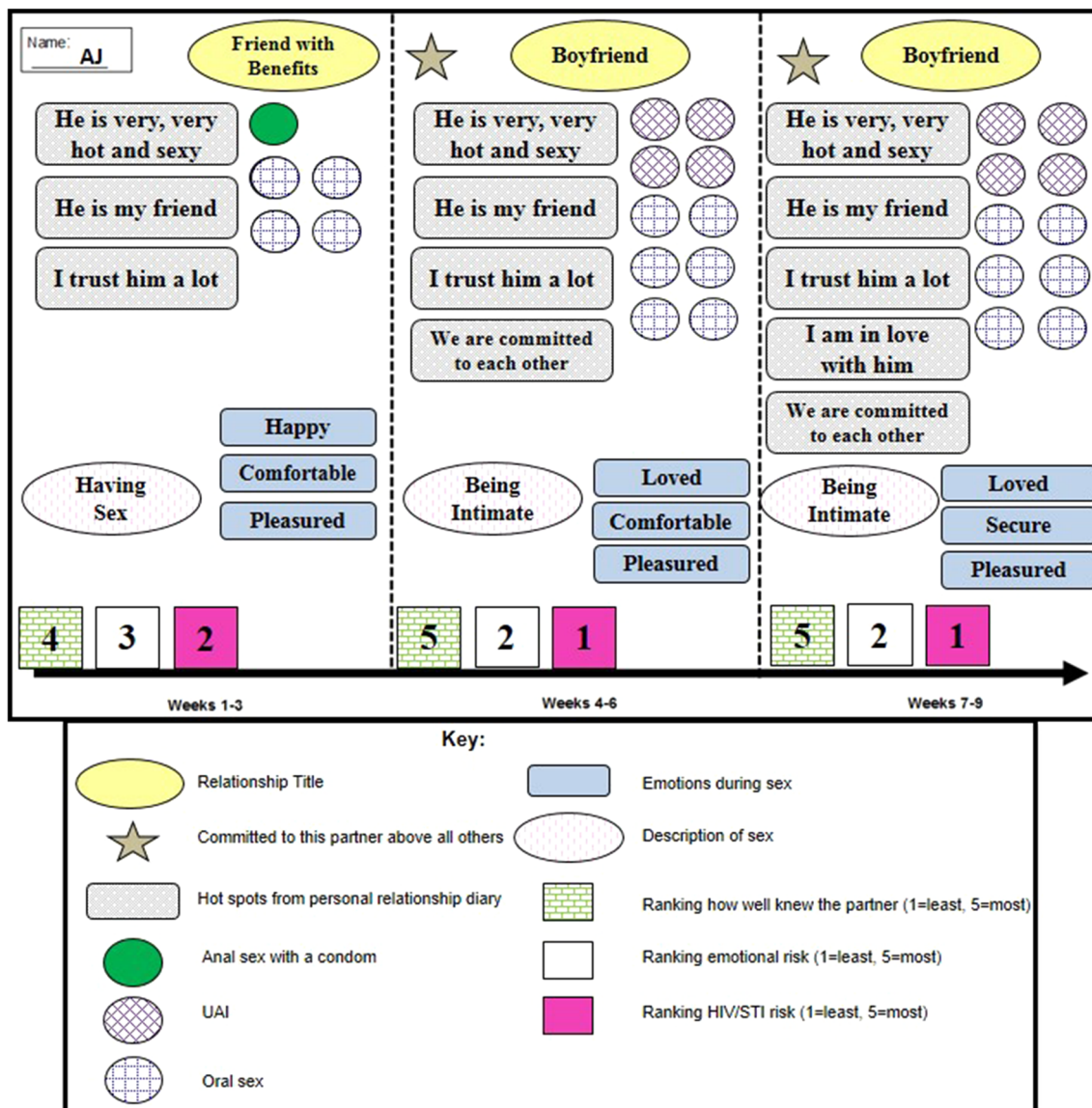


Fig. 1 Debrief Interview Timeline

participants was 32.2 years, ranging from 19 to 50. Approximately half the participants identified as non-Hispanic African American/Black (44%) and half were non-Hispanic Caucasian/White (48%); two participants identified as another race. Almost all participants identified as gay/homosexual (92%), with two identifying as bisexual. Most participants were not in a committed relationship (68%) at the time of enrollment, which we defined as answering no to the question: ‘Are you currently in a relationship with a man you feel committed to above all others? Some people might call this a boyfriend, life partner, husband, or significant other.’ Participants were not directly asked about HIV status, but seven participants (28%) disclosed living with HIV, while fourteen participants (60%) disclosed that they were not living with HIV;

three participants (12%) did not mention their own HIV sero-status and one participant (4%) stated that he had never been tested for HIV.

A description of the sample’s patterns of sexual behaviors is presented in Fig. 2. The number of sexual partners in each diary ranged from 0 to 11, with participants discussing up to three sex partners in more detail (per diary). In total, the 25 participants discussed 74 sex partners in more detail (including both oral sex and AI), with each participant ranging from 1 to 7 sex partners discussed over the study period (Table 1). Fifteen (60.0%) participants described having at least one committed partner over the time period. Some of these committed partners were the only partners that participants had during the study period (n = 6), while others had other sex partners in addition to

**Table 1** Participant characteristics and descriptions of personal relationship diaries (n = 25)

	% (n)	Mean (range)
Participant characteristics		
Age		32.2 (19–50)
Race		
Non-Hispanic White	48 (12)	
Non-Hispanic Black	44 (11)	
Other	8 (2)	
Sexual orientation		
Gay	92 (23)	
Bisexual	8 (2)	
HIV status		
Negative	60 (14)	
Positive	28 (7)	
Never tested	4 (1)	
Not disclosed	12 (3)	
Relationship status at baseline		
Had main partner	32 (8)	
Did not have main partner	68 (17)	
Participant's PRD characteristics		
Total number of partners discussed		3 (1–7)
Had at least one committed relationship	60 (15)	
Had anal sex with at least one partner during the study period	88 (22)	
Had CAI with at least one partner during the study period	68 (17)	

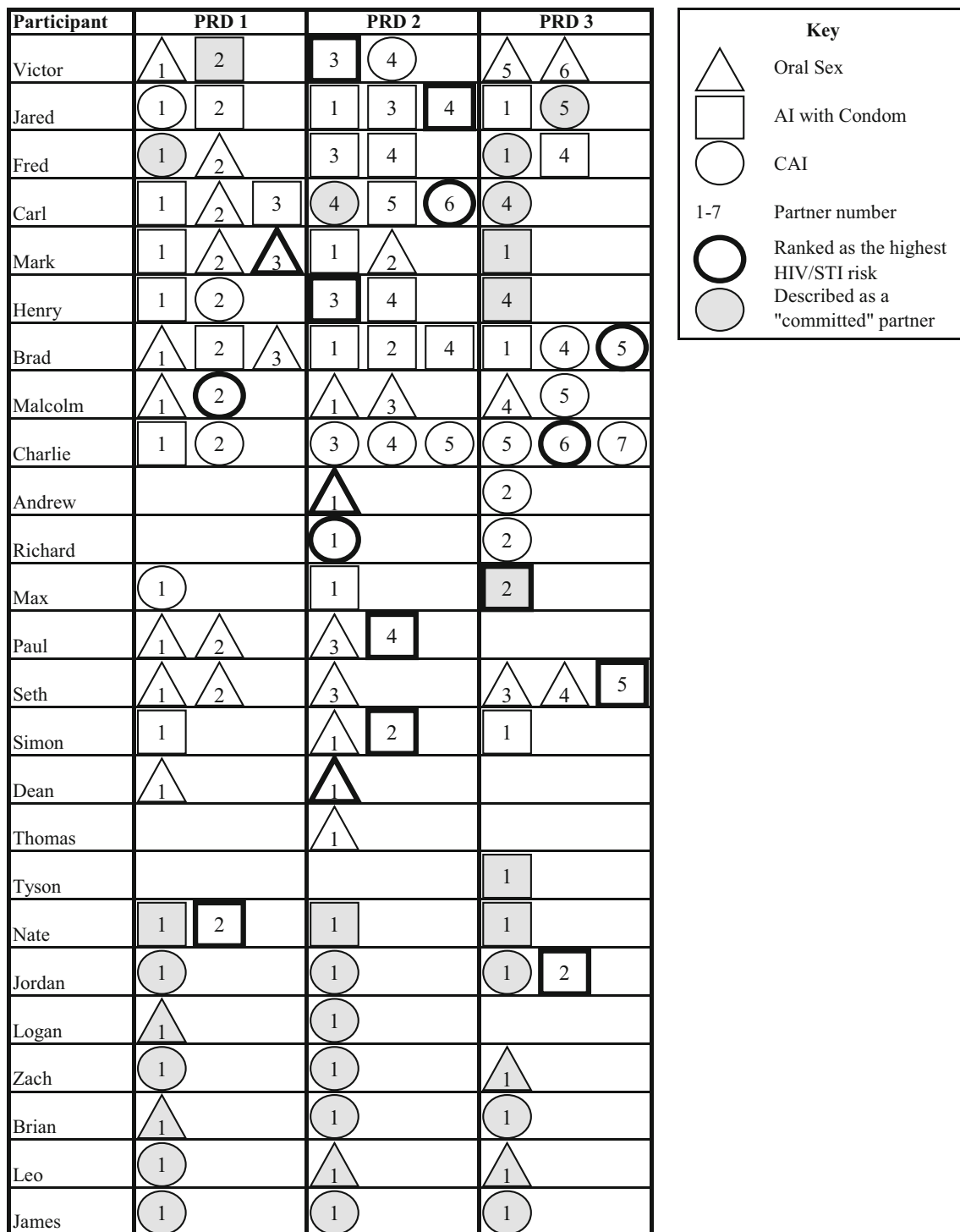
the committed partner (n = 9). The total number of CAI partners was 28, ranging from 0 to 5 per participant over the 10-week study period, with six participants engaging in CAI with at least two partners.

Descriptions of perceptions of HIV/STI risk were also nuanced and varied for individual participants across sexual partners, but also for individual participants with the same sexual partners over time. These variations occurred in both the number ranking ascribed to partners, but also in qualitative descriptions of perceptions of risk. Participants' operationalization of risk also varied based on the relationship development and sexual encounters that occurred with other partners during the same time period, indicating that perceptions of risk are not static or based solely on the development of a relationship with one sexual partner. In order to highlight these varied ways in which participants described risk, we describe the overall themes and factors that contributed to how the participants perceived HIV/STI risk. Key themes emerging from the data were: (1) variations in the operationalization of risk (2) the specific relationship factors that were described as playing a role in shaping risk perceptions (specifically, partner concurrency and emotions), and (3) the nuances in sexual risk perceptions (variation in risk perceptions across partners, variation in risk perceptions with one partner based on behaviors that occurred with other partners, and changes in risk perceptions with one partner over time).

### Variations in the Operationalization of Risk

A dominant pattern among participants was to use multiple factors simultaneously to operationalize HIV/STI risk, which often led to a participant reporting contradictions and variations in risk definitions between partners and for the same partner over time. Many participants based their perception of risk on the sex act itself (e.g. oral versus anal sex, condom use, sexual positioning) when determining HIV/STI risk; however, other contextual factors (e.g., physical appearance, where they met the partner, perceptions of concurrency with outside partners) were also used to determine risk. In general, participants described oral sex, AI with a condom, and insertive sex to be lower risk, but many participants also ranked partners with whom they only had oral sex as having a higher perceived HIV/STI risk than partners with whom they had CAI. For example, Jordan described two partners during the time period. The partner with whom Jordan had multiple acts of CAI (partner 1) was ascribed a lower ranking of HIV/STI risk than the one-time partner with whom Jordan had AI with a condom (partner 2). This was because his operationalization of risk was not specifically based on condom use, but instead was based on HIV status of his partners:

“Simply, so I know he [partner 2] is HIV-positive. So, you know, that's, I guess that's the main reason



**Fig. 2** Description of sex patterns

[that I consider him to have higher risk]. With [partner 1], I know, at least based on his last test, he's negative" (Jordan, 44 years, white, negative HIV sero-status).

However, in many cases, participants ranked CAI as having a lower perceived risk than oral sex because the

participants made decisions about condom use or decisions about the sex act based on perceptions of risk, deciding not to use a condom during AI because they perceived that partner or the specific circumstances as a lower HIV/STI risk or deciding to only have oral sex because they perceived that partner as a higher HIV/STI risk. For example,

Victor stated that he used condoms specifically because he perceived someone as being more likely to have a positive HIV sero-status based on other factors:

“With him we’re going to always use a condom because, yeah, we, I just, I just, I just, my red, my, my, my HIV/STI red flag goes off with him more than any, than any other. With him, the alarms go off because he’s from DC. Now I’m thinking about it. OK. DC. Atlanta. Baltimore. San Francisco. You know. I’m thinking of high risk cities” (Victor, 30 years, black, HIV negative sero-status).

Despite these subtleties for operationalizing sexual risk, men still varied in how they perceived risk across partners regardless of the sex act and condom use, ranking some partners and/or encounters based on the sex act or condom use and other partners and/or encounters based on other contextual factors, such as concurrency, how well the participant knew a partner, emotional connections, etc.

Specifically, participants used these other contextual factors to make assumptions about their partner’s HIV sero-status. For example, the location where the participant met a sexual partner mattered when participants determined HIV/STI risk. Meeting men on the Internet was sometimes perceived as higher risk, while meeting men at sex clubs was always perceived as higher risk than meeting partners at other venues:

“Partner five [has the greatest HIV/STI risk]. I had anal sex with him. These guys were pretty risky, too, though... I only received blow jobs from these guys but I mean at the same time it was at a sex club” (Seth, 35 years, white, negative HIV sero-status).

“Even though a condom was used [for anal sex], you know, there was oral sex. I have no idea, again, anything about him. So, you know, even with the oral sex, there’s the possibility of transmitting sexual diseases. Even with a condom, there’s the possibility. So anytime I ever had sex with someone at a sex club, I consider that very high risk” (Jordan, 44 years, white, negative HIV sero-status).

As Jordan describes, some contexts result in an increase in perceived risk because they involve sex with more anonymous partners, who the participant does not know very well. However, even though men described these contexts as higher risk, they also described an increase in their feeling of control and self-efficacy with sexual decision-making, with more adamant and clear decisions to either limit sexual behavior or to always use a condom. Therefore, even though these contexts were considered high risk because participants perceived the partners who were met in these contexts as being more likely to have a

positive HIV sero-status, the sexual activity that occurred was described as having a lower HIV/STI risk.

Some participants also made assumptions about a partner based on certain characteristics that their partner had, including their physical appearance. Often men used these characteristics to determine if a partner “*seemed*” like they were “*sleeping around*” or to determine if a partner had an HIV sero-positive status. Partners who were described as muscular or who “*take care of themselves*” were described as being less likely to be living with HIV:

“[I ranked him as a 1 for HIV/STI risk because] being muscular, being built, you know, you wouldn’t see that. There’s no signs of it. You know, if he’s healthy and takes care of his body and works out, you know, he’s not going to be positive for anything because he has got that mindset that he’s got to stay healthy” (Richard, 40 years, white, positive HIV sero-status). “[I ranked him as a 2 out of 5 for HIV/STI risk] just kind of because I didn’t know him at all. He said he was clean. He seemed like a clean person. We didn’t do anything that I thought was really risky...Like, you know, when you just like look at somebody and you think, blugh, I don’t want to touch that. Like he wasn’t. It seemed like he showered regularly” (Paul, 22 years, white, negative HIV sero-status).

### How Concurrency Perceptions Shape Risk Perceptions

When considering HIV/STI risk rankings for each partner, participants who were not in monogamous relationships commonly discussed their partners’ sexual activities with other men, considering previous partners and concurrent partners. Generally, partners with little to no previous sexual experience and partners who were not concurrently having sex with other men were considered to have a lower HIV/STI risk. Partners who were concurrently having sex with other men or who were perceived as “*too easy*” were perceived as having a higher HIV/STI risk.

Perceptions of whether or not a partner used a condom when engaging in sex with concurrent partners was also important when defining perceived risk. Participants often considered partners willing to use condoms as being lower risk, while partners who were perceived as not liking condoms were considered to be higher risk because there was an assumption that these partners were not using condoms when having sex with other men:

“Well if he doesn’t want to have, he doesn’t like condoms period, it’s like how many other guys have you been with? You know and been a bottom...and



how long apart?” (Richard, 40, white, positive HIV sero-status).

“It felt good to feel safe [with partner 3] because... he didn’t want to do the condom. I wanted to do the condom. You know, I’m not going to say that I, I didn’t trust partner 3 but I, you know, I felt with the way me and him I talked and go through things that he probably would have been unsafe with other dudes as well, you know... He would have chanced it because he was chancing it with me. I’m like no. That’s pretty high risk.” (Carl, 42 years, black, positive HIV sero-status).

The partners who were perceived as not liking condoms were considered to be especially high risk when the participant engaged in CAI with them; however, sex (either insertive or receptive) with partners who offered to use condoms was perceived as a lower risk regardless of the sexual behavior that occurred with this partner. In these cases, it was the offer to use a condom that reduced a perception of risk, rather than the actual use of a condom. When operationalizing risk based on a partner’s willingness to use condoms, participants often translated this willingness to use condoms as an assumption that the partner was not living with HIV. For example, Henry had anal sex with and without a condom with one partner, which he perceived as lower risk activities because the first time they had sex, that partner offered to use a condom:

“The fact that he even has condoms [means that it is lower risk] because some people would be like we don’t have any... if I have to pull them out and you don’t have any... especially if I have to bring it up and I have it, you don’t have any and you didn’t bring it up? Chances are you’re going to be sick... I feel like they [men who don’t bring up condoms] just don’t use condoms regardless” (Henry, 24 years, black, undisclosed HIV sero-status).

Participants also based perceptions of risk on how well they knew their partner. This was strongly linked with perceptions of behavior with outside partners because, usually, when participants discussed how well they knew a partner, they were referring to the knowledge that they had (or did not have) about their partner’s sexual histories or concurrent partners. Knowing a partner decreased risk perceptions and not knowing a partner increased risk perceptions. Perceptions of risk based on how well a participant knew a partner often took precedence over the risk factors associated with the type of sex. For example, even though Andrew (32 years, white) recognized that oral sex was a lower risk activity, he considered a partner who he had oral sex with to be greater risk for STIs than a CAI partner because he did not know the oral sex partner well:

“Partner 1 [would be the most risky in terms of STIs] because I didn’t really take any time to get to know him. We got together, ate dinner and then gave him a blow job. So I could have contracted some oral something or another. So yes, that was definitely the most risky out of all of them. But then again, not so risky because, you know, like the blow job level of risk” (Andrew, 32 years, white, positive HIV sero-status).

Open communication between partners enabled participants to feel as though they knew their partners better, which reduced perceptions of HIV/STI risk: “I just kind of felt like he’s told me everything and I guess I wouldn’t be at risk” (Mark, 24 years, black/Latino, undisclosed HIV sero-status). This communication often included sharing information about each other’s HIV and STI statuses, having conversations about HIV and STI testing, having conversations about sexual histories and outside partners, and if one or both partners are living with HIV, having conversations about HIV treatment. Furthermore, when participants engaged in CAI, but discussed HIV/STI risk first, that was also perceived as reducing HIV/STI risk: “I don’t think he was a big risk because, I mean, we had talked about it beforehand. But I was like I knew there was some risk because hey, no condom” (Charlie, 33 years, white, negative HIV sero-status). On the other hand, a lack of open and honest communication around sexual health was often perceived as increasing perceptions of HIV/STI risk because it led to uncertainties about the partner. For some participants, not discussing sexual histories and sexual health resulted in the participant making assumptions about that partner’s HIV status; this was especially true if the participant attempted to have conversations about sexual health and the partner refused.

Participants who were in long-term, monogamous, committed relationships discussed some similar concepts to men who had multiple casual partners when describing risk. Participants in monogamous relationships also addressed the communication that they had with their partners about sexual health, perceiving these relationships as low risk because discussions of previous sexual histories and HIV and/or STI testing often occurred. This was considered to be an especially low risk when the partner tested negative for STIs and the participant and their partner had concordant HIV sero-statuses.

### Complex Influence of Emotional Connections

Many participants also discussed how emotions influenced their perception of HIV/STI risk, describing emotional connections as protective for HIV/STI risk. In many cases, experiences of intimacy or love helped to maintain a

perception of “safety” when engaging with sexual partners, reducing the perception of HIV/STI risk. However, some participants also recognized that experiences of intimacy or love could actually increase HIV/STI risk because these emotions could result in a decision to “let your guard down” and not use condoms. In general, partners with whom participants had long-established emotional connections were considered to be lower risk; however, partners with whom participants were still developing emotional connections were considered to have a higher HIV/STI risk because this could contribute to the decision to engage in CAI.

Among men in long-term committed relationships, trust was also considered to be important in determining perceptions of HIV/STI risk. Usually, trust was discussed in terms of having sexual agreements (monogamous or non-monogamous) and trusting a partner to not break a sexual agreement, highlighting how various factors (e.g., perceptions of concurrency/monogamy and emotions) can simultaneously influence how a participant perceived risk. In trusting committed relationships, participants did not perceive any HIV/STI risk:

[HIV/STI risk is] not on my radar screen, really...I have no reason to worry about him. I mean, let alone that he wouldn't have the time, I don't feel like he'd even have the inclination. We were honest and open about, yeah, of course we're attracted to other people we see here and there, but it's just not on the radar screen for me (Leo, 50 years, white, never tested for HIV).

However, participants described different degrees of trust in their relationships and with their partners. Some participants perceived no HIV/STI risk at all because of the level of trust while others still expressed trust in their partner, but ranked risk in a less consistent way based on their interactions with their partner over the time period:

This [HIV/STI risk ranking] was all based on if he's, if there's anyone else in the mix and so I don't rank him as risky when it's just us because we're getting tested and he's around me every day, all day. And so the first column [the first PRD time-period] though, it wasn't like that [so the risk was ranked higher]. I think he was around but he still may have a couple days at his grandma's house on the weekends or something like that. So there could have been more room than normal, you know [for cheating], yeah (Brian, 28 years, black, negative HIV sero-status).

These different conceptualizations of trust highlight that even within monogamous relationships, perceptions of risk were also determined based on the possibility of concurrency with outside partners.

## Variation in Risk Perceptions Across Partners

Perceptions of risk and the way that risk was operationalized varied across partners. Multiple participants described partners who had similar types of relationships (e.g., casual ongoing relationships, one-time sexual encounters) with whom they engaged in similar sexual activities, but the perceptions of risk across these relationships still varied. In addition, in some cases when participants described very different types of sexual partners (e.g., ongoing committed relationship and one-time sexual encounter) with different types of sexual activities, they ascribed the same risk ranking to those relationships (though the rationale for the perceptions of risk still varied). Jared's experiences and perceptions of risk across partners provide a good example of how risk was operationalized differently, even across partners with similar types of relationships. Jared is a 42 year-old black man living with HIV who described five sexual partners during the course of the study period. During the first PRD time-period, Jared discussed a transitioning relationship with William. Jared described this relationship as abusive, identifying William's controlling and violent behavior. When Jared and William first began dating, Jared had assumed that they had a monogamous sexual agreement and would not have sex with outside partners, but Jared discovered that William had an outside sex partner. Jared and William engaged in oral sex and AI with a condom and Jared ranked William as 5 (out of 5) for HIV/STI risk. Even though they used a condom when they had sex, Jared perceived William to be a higher risk because:

I didn't see us every time we had sex using a condom. I think that probably if had we stayed together that would have tapered off. And I don't know that he was being honest about his status. I know what he said but he said a lot of things (Jared, 42 years, black, positive HIV sero-status).

In this case, it was not just the current experience of condom use that influenced the perception of risk, but also the potential for non-condom use in the future.

On the other hand, Chris was a partner who Jared described in all three PRDS. Chris is a 25 year-old man who does not identify as gay and who was good friends with William. Chris was described as a friend and the sexual relationship was described as uncommitted and ongoing. Jared and Chris had their first sexual encounter as a foursome with William and another partner and, after Jared and William ended their relationship, Jared and Chris continued a casual sexual relationship. During the foursome, Chris had taken a sleeping pill and did not use a condom; however, Chris and Jared used condoms in all subsequent encounters. Jared ranked Chris as a 5 for HIV/

STI risk in the first PRD and as a 4 in the second and third PRDs. Specifically, in the first PRD, Jared perceived the foursome without condom use as the highest risk experience, but he still considered his encounters with Chris to be higher risk for STIs in the subsequent two PRDs because they were both living with HIV:

I think when we had a conversation about it [our HIV statuses] but, I mean, and like I said but I think I left him at a 4 because by both of us being positive and not knowing are you in treatment, are you, I mean, I found that out later because I dropped him off. Are you taking your meds? Are you, so, that, that adds a whole element to it (Jared, 42 years, black, positive HIV sero-status).

In addition to Chris, in the second PRD, Jared also discussed two additional partners: Jack and Brandon. Jared described both of these partners as uncommitted and ongoing. Jared described his relationship with Jack as purely sexual and stated that he acts like a “trick.” Jared and Jack had one sexual encounter where they engaged in AI with a condom and Jared ranked Jack as a 1 for HIV/STI risk. Jared perceived the HIV risk to be low because of the type of sexual activity that occurred:

The HIV risk because, I mean, we didn’t do any, I mean, he doesn’t kiss, he doesn’t do anything. It’s just like, OK, give me a condom, let me do whatever I do and, quite frankly, he didn’t do, I mean, his thingy didn’t stay hard so it was just like OK, let’s just jack off. ‘OK. That works for me. Then you get out.’ So (Jared, 42 years, black, positive HIV sero-status).

Even though Brandon was also described as an uncommitted relationship with whom Jared engaged in oral sex and AI with a condom, Jared ranked Brandon as a 5 for HIV/STI risk. Jared perceived his encounters with Brandon to have a higher HIV/STI risk because Brandon expressed not liking condoms:

(Sighs) You know (Participant laughing), I’m gonna say this... Sometimes African American men or [Caribbean] men or men of color feel like because they have a large penis that they don’t have to wear condoms or they don’t have condoms that fit. So they don’t want to wear condoms. So, that’s why I gave him a high risk because I had to show him that they come in all shapes, colors and sizes and here’s one for you. And if not, I can go get some saran wrap (chuckling) (Jared, 42 years, black, positive HIV sero-status).

For both Jack and Brandon, Jared operationalized risk around the type of sex and condom use, discussing not only

whether or not they used condoms when they engaged in sex, but also, with Brandon, considering his partner’s general attitudes towards condoms. However, the actual rankings of risk for these partners were very different.

### Perceptions of Risk Varied by Behaviors with Other Partners

Perceptions of risk did not only vary across partners; in some cases, perceptions of risk were determined with one partner specifically as a result of sexual behaviors with another partner. This occurred when participants considered their own HIV and/or STI status in determining perceptions of HIV/STI risk. For example, Brad (29 years, white) had multiple partners over the course of the study, discussing five in more depth. Across his partners, Brad often defined risk based on the type of sex, HIV status, and concurrent outside partners. When Brad engaged in sexual behavior that was out of the ordinary for him, he considered it to be higher risk. Brad described his typical sexual behavior as engaging in oral sex only or AI with a condom; however, he had two partners during the study period with whom he engaged in CAI. In order to reduce the potential HIV/STI risk of CAI with both of these partners, Brad practiced withdrawal. However, he still described the experiences with these two partners as having more sexual risk than his other experiences with other partners and the encounter that occurred with one partner influenced how he perceived risk with the other. During the same time period, Brad engaged in CAI with partner 4 (with the pseudonym, David) and partner 5 (with the pseudonym, Tyler). Brad engaged in receptive CAI with Tyler, a partner who he knew was living with HIV and he engaged in insertive CAI with David, who he believed was not living with HIV. Brad ranked the sexual encounter with Tyler as a 5 (out of 5) for HIV/STI risk because of the sexual act and sero-status of his sexual partner. However, when considering the HIV/STI risk with David, his definition of risk was more nuanced. Brad considered his own risk for acquiring HIV to be low; however, because Brad engaged in other behavior with Tyler that he considered to be higher risk, Brad was concerned that he could transmit HIV to David:

Well, this guy, here, [Tyler] the guy who’s HIV positive [is the highest risk, for HIV/STIs] and this is also a risk because, [David], because I feel bad that I may have something and I would give it to him (Brad, 29 years, white, negative HIV sero-status).

### Changes in Risk Perceptions over Time

Perceptions of risk also varied for the same partner and across time. This occurred among multiple participants,

especially those in relationships that were transitioning in some way. This includes relationships that had previously been more committed and were transitioning into less committed or non-monogamous relationships as well as relationships that were transitioning into more committed or monogamous relationships. For example, one participant (Simon, 24 years, white) had two sexual partners during the study period. Partner 1 (with the pseudonym, Joe) was a partner with whom Simon had previously had a more formal relationship, but more recently transitioned into a casual relationship. Simon described his sexual encounters with Joe during all three diaries and stated that they engaged in both oral sex and AI with a condom. Prior to the study period, Simon stated that Joe would have been described as a “partner” or a “husband” but in the first three-week diary-period, Simon described Joe as a “lover” and in the subsequent two periods, Simon used the term “hook up” to define the relationship. Over all three diaries, Simon ranked Joe as a 4 (out of 5) to describe how well he knew him. In the first diary, Simon ranked Joe as a 3 (out of 5) to describe the level of HIV/STI risk in the relationship and a 4 during the second and third diaries. Simon described this increasing HIV/STI risk as a consequence of the transition in their relationship and the lack of a monogamous agreement:

Well, I mean, it [Joe dating online] caused a lot of distrust to be quite honest because when I would have sexual encounters with him... I would always have this thought in the back of my mind like am I going to contract something? What am I getting into bed with, you know? Whereas before, it purposely wasn't like that, when there was more an exclusivity. And now that it's been downgraded, I would say quite substantially, from a partner/husband level down to a lover (Simon, 24 years, white, undisclosed HIV status).

As part of this transition in the relationship, Simon also recognized that his perception of risk varied based on feeling more or less “in touch with him.” By this, Simon explained that he meant that his perception of risk varied based on the emotional connection and communication between him and Joe:

Interviewer: So you said over here that it was a 3 because you're more in touch with him. Can you tell me what that means exactly?

Simon: OK, we're, as far as being in touch with him, there's feelings of intimacy. There's feelings of, I think there's an element of communication, that's an obvious aspect, I think, that comes into play there. You know, you're still communicating, I think, more in depth as far as like daily feelings and whatnot.

Whereas with hookups, it's more so when are you available? (Participant laughing)

Simon's story provides an example of inconsistency in how HIV/STI risk is perceived even within the same sexual partner, while also highlighting how multiple factors (e.g., emotions, concurrent partners, how well he knew his partners) can simultaneously contribute to a perception of HIV/STI risk.

In some cases, it was not necessarily the transition of a relationship that altered a participant's perceptions of risk with a partner, but a specific event that occurred. For example, one participant perceived HIV/STI risk increased after his partner had an argument his brother:

There was a fight somewhere in this period...the HIV and STI risk increased. So this, he had just more of a negative connotation after that. Not much of one, it's just like a one number shift... But, yes, I just, I guess probably because I was feeling a certain kind of way about him because of him and my brother fighting, I think that's probably why he got lower scores [for risk ranking]. Not because they're necessarily the most conscious things but just because I was feeling a certain way about him, you know. Because, you know, I mean, I don't think between three weeks and six weeks he increased drastically in his HIV and STI risk or anything. Just it's more of a mental thing because, I mean, between those three weeks, I mean, how much sex does a person have in between those weeks?... So, I mean, there wasn't any real conscious difference, just maybe that I was feeling a certain way (Dean, 19 years, white, negative HIV sero-status).

The change in risk perception that Dean describes was recognized as not necessarily the result of an actual increase in biological HIV/STI risk, but rather a response to an emotional experience.

## Discussion

These longitudinal data illustrate that the ways in which GBM perceive sexual risk is complex, with changes in risk perceptions both within and across different sexual partners. This variation highlights that risk perceptions are not static, but rather the operationalization of risk is a dynamic process that may vary depending on perceptions of concurrency, emotional connections, the development or decline of a relationship, or even specific events that occur during a time period. For men who had multiple partners, perceptions of risk with one partner were not shaped solely by that one relationship, but rather by the various

relationships/encounters in which that participant was engaging during the time period. Even though participants considered the type of sex (e.g. oral versus anal, receptive versus insertive, condom use) when determining sexual risk, many other factors (e.g., a partner's appearance, where they met the partner, how well they knew the partner, perceptions of concurrency, emotional connections) were also used to determine sexual risk. Using a combination of these various factors to determine sexual risk often led to inconsistencies in how risk was perceived. Specifically, these various factors that were used to determine sexual risk often created exceptions to what participants knew to be biologically risky or non-risky behavior. In other words, men described risk largely in two ways: (1) "This behavior is risky *but* [I know him, I love him, he does not have other partners, etc.]" or (2) "This behavior is less risky *unless* [I do not know him, I have no emotional attachment, he has other partners, etc.]" There were also exceptions to this, addressing the nuances of how some of these additional factors were perceived. For example, while some participants perceived an emotional connection as reducing risk, other participants perceived it as increasing risk because it could change the sexual behaviors within the relationship.

This understanding of dynamic sexual risk perception adds to the already-existing literature examining the importance of relationship characteristics. Previous studies have quantitatively examined concurrency [31, 32], have longitudinally examined the influence of relationship characteristics on sexual behaviors among main and outside partnerships [7], and have quantitatively and qualitatively studied how MSM perceive risk [33–35]. However, the current study is unique because it applies innovative longitudinal qualitative methods to examine the complexities of how sexual risk is perceived in individual men across a variety of types of relationships and partners. In addition, the findings from the current study also highlight how perceived susceptibility is complex and nuanced, with GBM often simultaneously using multiple and sometimes contradicting factors to assess HIV risk.

Previous studies that have examined perceptions of HIV risk using cross-sectional designs have often focused on the importance of a partner's HIV sero-status in determining risk perceptions [36–38]. In the current study, knowledge of a partner's HIV sero-status was important in some cases, especially for participants who were living with HIV or when a participant had knowledge of a partner's sero-discordant status. However, often, participants used other factors (e.g., a partner's appearance, how well they knew the partner, perceptions of concurrency, a partner's condom use preference) to make assumptions about a partner's HIV sero-status. This highlights that perceptions of risk are more complicated than simply knowing a partner's status,

but rather are developed within the context of a specific partnership or specific situation.

While knowledge of a partner's HIV sero-status was not as central to these findings, sexual concurrency and perceptions of concurrency were main factors in determining sexual risk among both casual and main partners. Sexual concurrency is often studied as a risk factor for HIV [39, 40], but the current study finds that the ways in which these behaviors shape perceptions of risk and increase the perception of HIV susceptibility may actually increase HIV risk-reduction behaviors, such as condom use. This supports previous literature on sexual concurrency, which finds that concurrency is more complicated than simply understanding that having multiple overlapping partners increases one's HIV risk. On the one hand, having concurrent sexual partners may increase the likelihood of HIV transmission through indirect exposure to additional concurrent partners and increased likelihood of HIV transmission during a stage of acute infection [32, 39–41]. However, in addition, research has found that while men perceive monogamy and main partnerships as protective for HIV, this reduced perceived susceptibility may decrease HIV risk-reduction behaviors, such as condom use and/or HIV testing [35, 42].

Another complex theme that the participants discussed was the impact of emotions. These findings demonstrate that emotions have a complicated influence on sexual risk perceptions; in some cases, emotional connections reduced perceptions of risk, while in other cases, they increased risk perceptions. The discussion of emotions also highlights the importance of using longitudinal qualitative methods to understand perceptions of risk. Like perceptions of risk, emotions are not static, and can vary over time, especially as relationships transition. In addition, emotions are not easily captured through quantitative data alone. Therefore, in order to fully understand the complexities of how these emotional states influence perceptions of sexual risk, it is important to use longitudinal qualitative methods.

It is important to note that all of these themes used to describe sexual risk-taking and perceptions of risk imply that an individual has agency in making decisions about sexual risk-taking. However, in a context of increased structural vulnerability (e.g., homelessness, poverty, unemployment) or in relationships with the presence of intimate partner violence, an individual may not have the same agency to make decisions about condom use, regardless of perceived sexual risk [16, 18, 43]. For example, agency may be reduced if an individual is engaging in transactional sex in order to have a place to live or if an individual is being forced to have condomless sex (or has reduced efficacy to negotiate condoms) in a violent relationship [16, 18, 43]. Therefore, in addition to considering the nuances of a sexual relationship and

emotional states, these structural and contextual factors should also be considered when developing public health interventions to reduce sexual risk-taking behaviors.

There were some limitations in this study. Participants were limited to more in-depth discussions of only three partners per relationship diary, even though in some cases participants identified having more than three partners during the three-week time period between diaries. Furthermore, due to study parameters, the follow up period was only ten weeks. A longer follow-up would have allowed for even greater nuance and understanding of the influence of relationship transitions on perceptions of HIV risk. Since these findings are qualitative, they are not generalizable to a larger population. All participants identified as gay and bisexual, but examining the experiences of MSM more broadly would also be useful in order to have a greater understanding of how MSM more generally perceive HIV risk. Additionally, though many participants disclosed their HIV sero-status, participants were not explicitly asked about their sero-status. Additional information on sero-status might be useful in the interpretation of the findings. It is possible that there was some selection bias since participants had previously participated in other research; however, original recruitment methods of these participants used well-established recruitment methods for hard-to-reach populations [29]. It is also possible that there was some recall bias in participants' reporting of sexual behavior, especially when reporting the number of times that participants engaged in a specific act; however, since data are qualitative, the exact number of acts was only examined to describe the sample, with findings focusing on the perceptions of sexual risk. In addition, this study addresses the sensitive topic of sexual behavior; however, in order to reduce social desirability bias, timelines were used during the IDIs to increase participant comfort with disclosing sensitive information (citation blinded for peer-review). Finally, participants self-defined HIV/STI risk in the study; this is both a strength and a limitation. On the one hand, self-definitions enabled the unpacking of the definition of risk and risk perceptions for each participant during the IDI. However, at the same time, when examining variation in perceptions of risk between participants, the definition of sexual risk is not consistent. Still, the fact that risk definitions changed even for the same participant discussing a relationship over time or for a single participant discussing multiple partners highlights the complexities and subtleties of sexual risk perceptions.

Despite these limitations, these findings provide useful insight into how GBM perceive HIV risk with different partner types and how those perceptions can vary not only over time, but within and across partners as well. In addition, specific risk perception factors (such as concurrency/monogamy and emotions) appear to not be static, but

rather to wax and wane depending on characteristics of partners, other interpersonal factors (e.g., how well one knows a partner at that particular time), and the ongoing development of a relationship. Understanding the complexities of how sexual risk is perceived among GBM is important for HIV prevention messaging and programing. This information could inform HIV testing and counseling interventions, or other programs that assess sexual risk. Our findings suggest that it is important to not assume behavior is static, even when coming from one individual, as is typical during risk assessments. For those working with GBM in practice or research settings, it may be necessary to probe to elucidate not only the number of partners but also the different types of partners and how behaviors may differ between them. While prior research and programs have focused on the potential differences in behavior between primary and casual partners, our findings suggest that additional variation exists within these categories as well—and even vary with the same person over time. Therefore, public health messages and programming that consider how sexual risk perceptions are nuanced, dynamic, and context-dependent may be more effective in reducing sexual risk-taking behaviors.

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