

# Individual-Level and Event-Level Associations Between Substance Use and Sexual Risk Behavior Among Gay and Bisexual Men

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## Background: Substance Use and Sex

- Rates of HIV infection have continued to increase among gay and bisexual men (and other MSM) since 2008 (CDC, 2014)
- Substance use is also elevated among GBM, and numerous reviews suggest a connection between substance use and HIV risk behaviors such as condomless anal sex (CAS; e.g., Drumright et al., 2006; Vosburgh et al., 2012)
  - This includes evidence for alcohol, marijuana, and club drugs (i.e., cocaine/crack, crystal meth, ecstasy, ketamine, and GHB)

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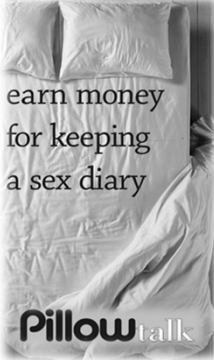
## Background: Levels of Influence

- The influence of substance use on sexual behavior has been examined at multiple levels
  - Global association or dispositional analyses examine levels or frequency of substance use with sexual behavior
  - Event-level analyses examine use or amount of use prior to or during a given event and sexual behavior
  - Results have been inconsistent, and very few studies have examined multiple levels (and fewer have done so simultaneously in the same analysis)


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## *Pillow Talk: Compulsive Behaviors, Mental Health, & HIV Risk*



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## Participants

- Eligible if:
  - Identified as gay, bisexual, or other non-heterosexual identity (e.g., queer)
  - Reported 9 or more partners in past 90 days
  - Excluded if evidence of cognitive impairment (MMSE) or serious, unmanaged psychiatric symptoms (e.g., psychosis)
- 376 participants enrolled
  - 1 did not complete at-home survey (CASI); 4 did not complete daily diaries
  - Analytic sample of 371 men

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## Procedures


<ul style="list-style-type: none"> <li>▪ Online CASI (from home)</li> <li>▪ Baseline visit 1 (\$50):               <ul style="list-style-type: none"> <li>• HIV Test (if negative/unknown)</li> <li>• TLFB (90 days)</li> <li>• Daily diary training</li> </ul> </li> <li>▪ 30-day diary (\$1/day + \$30)</li> <li>▪ Baseline visit 2 (\$50):               <ul style="list-style-type: none"> <li>• Neurocognitive tasks</li> <li>• Computerized Diagnostic Interview Schedule (C-DIS) and Screener for Borderline Personality Disorder</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ 6-month visit (\$55)               <ul style="list-style-type: none"> <li>• Online CASI (from home)</li> <li>• TLFB (90 days)</li> <li>• Qual interview (n = 100)</li> </ul> </li> <li>▪ 12-month visit (\$60):               <ul style="list-style-type: none"> <li>• Online CASI (from home)</li> <li>• HIV test</li> <li>• TLFB (90 days)</li> <li>• Qual interview (n = 100)</li> <li>• Daily Diary Training</li> </ul> </li> <li>▪ 30-day diary (\$1/day + \$30)</li> </ul>
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## Data Analysis

- Aggregated TLFB data to create groups of substance users:
  - Non users; among users, median split to indicate lighter and heavier users
- Utilized multilevel logistic regressions to model:
  - Whether or not they had sex each day and whether or not they had CAS (on sex days)
  - Predicted by whether or not they consumed 5 or more drinks (heavy drinking), used marijuana, or used club drugs (dichotomous)
  - Adjusted for day of cycle (i.e., 1 through 42/1 through 30), HIV-positive status, and relationship status
  - Conducted analyses using a random intercept
- Total of four models: 2 predicting sexual engagement (1 TLFB and 1 Diary) and 2 predicting CAS (1 TLFB and 1 Diary)


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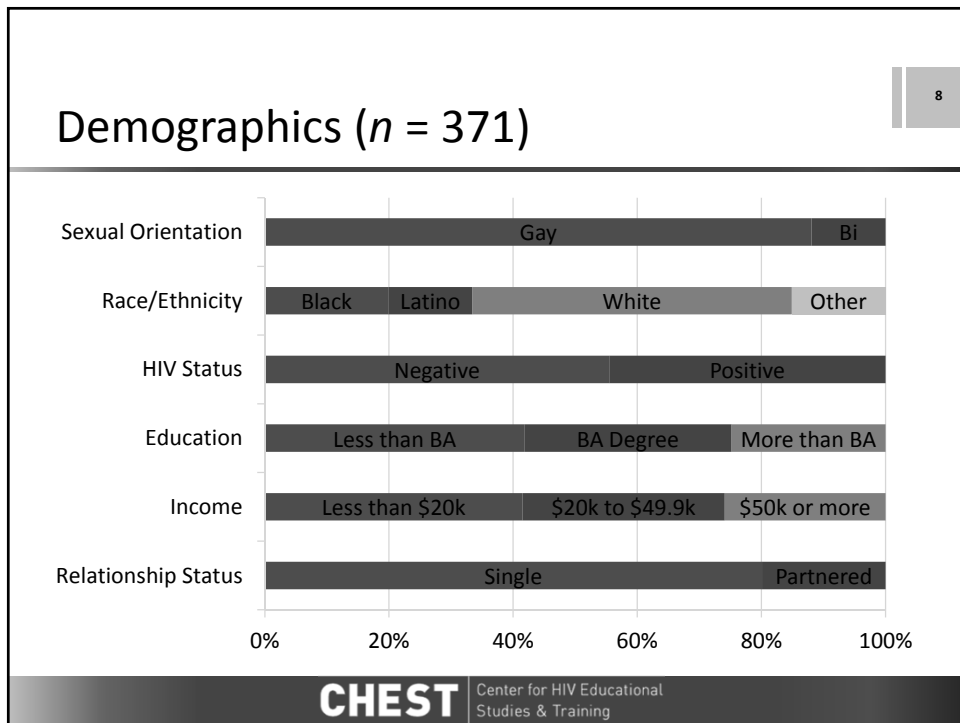


Table 1.  
Demographic characteristics of the sample.

	<i>n</i>	%
Race/Ethnicity		
Black	74	19.9
Latino	50	13.5
White	191	51.5
Multiracial/Other	56	15.1
Sexual Orientation		
Gay, queer, or homosexual	327	88.1
Bisexual	44	11.9
Employment Status		
Full-time	117	31.5
Part-time	94	25.3
Student (unemployed)	31	8.4
Unemployed	127	34.2
Not answered	2	0.5
Highest Educational Attainment		
High school diploma/GED or less	42	11.3
Some college or Associate's degree	113	30.5
Bachelor's or other 4-year degree	124	33.4
Graduate degree	92	24.8
HIV Status		
Positive	166	44.5
Negative	207	55.5
Relationship Status		
Single	297	80.1
Partnered	74	19.9
	<i>M</i>	<i>SD</i>
Age ( <i>Mdn</i> = 35.0)	37.0	11.5
Number of TLFB Heavy Drinking Days ( <i>Mdn</i> = 2.0)	5.4	8.5
Number of TLFB Marijuana Use Days ( <i>Mdn</i> = 1.0)	8.1	13.6
Number of TLFB Club Drug Use Days ( <i>Mdn</i> = 0.0)	2.4	5.8

Table 2.  
Bivariate associations between individual-level frequency of substance use and individual-level CAS.

	Heavy Drinking						$\chi^2(2)$
	No Use ( <i>n</i> = 158)		Lower Frequency ( <i>n</i> = 94)		Higher Frequency ( <i>n</i> = 119)		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Any CAS in TLFB	106	67.1	68	72.3	78	65.5	1.20, <i>p</i> = 0.55
Any CAS in Diary	90	57.0	57	60.6	65	54.6	0.78, <i>p</i> = 0.68
	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>H</i> (2)
# ANC Acts in TLFB	3.0	0, 8	1.0	0, 5	1.0	0, 5	4.92, <i>p</i> = 0.09
	Marijuana						$\chi^2(2)$
	No Use ( <i>n</i> = 185)		Lower Frequency ( <i>n</i> = 91)		Higher Frequency ( <i>n</i> = 95)		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Any CAS in TLFB	118	63.8	69	75.8	65	68.4	4.07, <i>p</i> = 0.13
Any CAS in Diary	106	57.3	58	63.7	48	50.5	3.32, <i>p</i> = 0.19
	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>H</i> (2)
# ANC Acts in TLFB	1.0	0, 5	3.0	0, 7	2.0	0, 5	4.17, <i>p</i> = 0.12
	Club drugs						$\chi^2(2)$
	No Use ( <i>n</i> = 235)		Lower Frequency ( <i>n</i> = 66)		Higher Frequency ( <i>n</i> = 70)		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Any CAS in TLFB	150	63.8	47	71.2	55	78.6	5.78, <i>p</i> = 0.06
Any CAS in Diary	136	57.9	32	48.5	44	62.9	3.01, <i>p</i> = 0.22
	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>Mdn</i>	<i>IQR</i>	<i>H</i> (2)
# ANC Acts in TLFB	1.0	0, 5	2.0	0, 5	4.0	1, 11	11.51, <i>p</i> = 0.003

Note: Number of ANC acts was compared using a Kruskal-Wallis ranksum test (medians presented for interpretability). Number of acts from the diary was not computed due to inability to account for missing diary data when aggregating.

Table 3.

Multilevel models utilizing day-level and individual-level substance use to predict daily sexual engagement and CAS with casual partners.

	Timeline Follow-Back Combined Models					
	No Sex vs. Sex <sup>a</sup>			No CAS vs. CAS <sup>b</sup>		
	b	AOR	95% CI	b	AOR	95% CI
Intercept	-0.77	0.47***	0.38, 0.57	-1.96	0.14***	0.10, 0.20
<u>Level 1: Event-Level Effects</u>						
Day-level heavy drinking	0.97	2.63***	2.28, 3.03	0.13	1.14	0.87, 1.50
Day-level marijuana use	1.30	3.66***	3.06, 4.38	0.46	1.58**	1.17, 2.13
Day-level club drugs use	2.39	10.88***	8.77, 13.50	0.81	2.25***	1.63, 3.09
<u>Level 2: Dispositional Effects</u>						
Frequency of heavy drinking: Lower	-0.35	0.70**	0.55, 0.90	-0.01	0.99	0.63, 1.57
Frequency of heavy drinking: Higher	-0.37	0.69**	0.54, 0.88	-0.57	0.57*	0.35, 0.91
Frequency of marijuana use: Lower	-0.18	0.84	0.65, 1.07	-0.04	0.96	0.61, 1.52
Frequency of marijuana use: Higher	-0.78	0.46***	0.35, 0.61	-0.64	0.53*	0.31, 0.89
Frequency of club drug use: Lower	-0.43	0.65**	0.50, 0.85	-0.05	0.96	0.58, 1.59
Frequency of club drug use: Higher	-0.86	0.42***	0.32, 0.56	-0.10	0.91	0.54, 1.53
<u>Daily Diary Combined Models</u>						
	No Sex vs. Sex <sup>a</sup>			No CAS vs. CAS <sup>b</sup>		
	b	AOR	95% CI	b	AOR	95% CI
Intercept	-0.79	0.46***	0.36, 0.58	-1.69	0.19***	0.13, 0.27
<u>Level 1: Event-Level Effects</u>						
Day-level heavy drinking	0.75	2.12***	1.77, 2.54	0.47	1.60**	1.19, 2.14
Day-level marijuana use	0.85	2.34***	1.93, 2.85	0.31	1.36 <sup>†</sup>	0.98, 1.89
Day-level club drugs use	1.60	4.94***	3.72, 6.56	0.94	2.56***	1.69, 3.86
<u>Level 2: Dispositional Effects</u>						
Frequency of heavy drinking: Lower	-0.09	0.91	0.68, 1.22	0.10	1.10	0.71, 1.72
Frequency of heavy drinking: Higher	-0.10	0.90	0.67, 1.21	-0.20	0.82	0.52, 1.28
Frequency of marijuana use: Lower	-0.19	0.83	0.62, 1.11	0.12	1.13	0.72, 1.77
Frequency of marijuana use: Higher	-0.43	0.65**	0.47, 0.90	-0.63	0.53*	0.32, 0.89
Frequency of club drug use: Lower	-0.43	0.65**	0.47, 0.91	-0.48	0.62 <sup>†</sup>	0.37, 1.04
Frequency of club drug use: Higher	-0.50	0.61**	0.43, 0.86	-0.59	0.55*	0.32, 0.95

Note: <sup>†</sup> $p \leq 0.08$ ; \* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ . <sup>a</sup>Binary logistic regression; <sup>b</sup>Multinomial logistic regression (only one of two comparisons shown). All models were adjusted for HIV-positive status and relationship status as well as day of data collection (i.e., day of TLFB cycle or day of diary cycle). Comparison group for dispositional substance use is the non-use group for each substance.

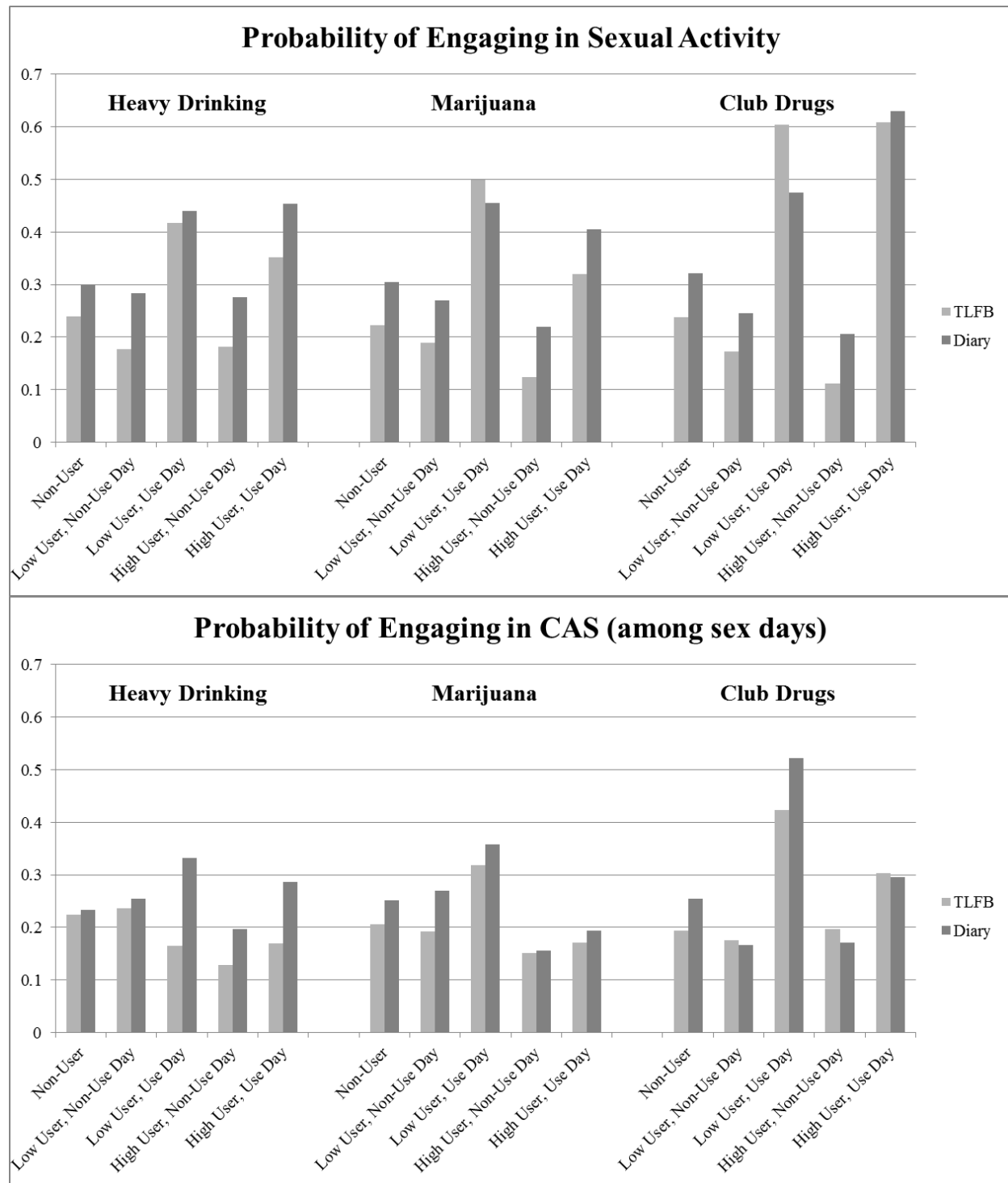


Figure 1. Marginal probabilities of engaging in sexual activity and CAS based on individual-level frequency of use and day-level use of substances from two logistic regressions utilizing TLFB and daily diary data.



## Discussion

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- Event-level substance use increases the odds of sexual engagement and sexual risk (i.e., CAS)
  - This effect is strongest for club drugs
  - This effect is consistent across both TLFB and diary
- Dispositional tendencies towards using substances was inconsistently associated with sexual behavior
  - Higher frequency users of marijuana and lower/higher frequency users of club drugs had lower odds of sexual engagement and risk

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## Discussion (cont'd)

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- There is an interaction between dispositional and event-level use
  - Users have lower odds of sex and sex risk on sober days than do non-users
  - Event-level use substantially increases the odds of sex and sex risk for users – this effect is typically stronger for lower frequency users than higher frequency users

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## Limitations

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- Sample was highly sexually active GBM
  - However, consistency of findings across substances and data collection methods suggests broader applicability
- Substance use and sexual behavior were measured with self-report and are subject to biases
  - Nonetheless, these are two of the most rigorous data collection methods for event-level behavioral data
- Dispositional substance use was looked at as a categorical variable rather than a frequency
  - Important to consider whether more nuance would be found in a sample with higher levels of substance use or more substance users

## Conclusions

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- Important to consider the level of influence when looking at substance use and sexual behavior
  - Aggregating these data to the individual level produced opposite results as those found when different levels (and their interaction) were considered simultaneously
- Targeting interventions toward lower versus higher frequency users may not be needed
- Interventions may seek to target event-level correlates of sexual risk and substance use (e.g., stress, arousal, impaired cognition)
  - Those that target individual-level dispositional traits (e.g., self-efficacy) may ultimately act on the event-level, but it may be more effective to target day-level mechanisms themselves

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## Thank you!

For further questions or a copy of these slides, please email me:

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(Handouts also available on APHA website)