



HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2021 June 10.

Published in final edited form as:

AIDS Behav. 2021 April ; 25(4): 1210–1218. doi:10.1007/s10461-020-03097-5.

Trends in methamphetamine use among men who have sex with men in New York City, 2004–2017.

Alexis V. Rivera¹, Graham Harriman¹, Sidney A. Carrillo¹, Sarah L. Braunstein¹

¹Bureau of HIV, New York City Department of Health and Mental Hygiene, Queens, NY

Abstract

Methamphetamine (meth) use among men who have sex with men (MSM) has been documented to be associated with HIV transmission among those who are HIV-negative and worsening HIV outcomes among those who are HIV-positive. Recent media reports have suggested recent increases in meth use in New York City (NYC), particularly among Hispanic/Latino and Black MSM. Using serial cross-sectional data from 2004–2017, we aim to describe trends in meth use and describe racial/ethnic patterns among MSM in NYC. Overall, we observed a decrease in meth use among MSM from 2004–2011 and an increase from 2011–2017. When stratified by race/ethnicity, use among White MSM decreased. Beginning in 2008, use among both Hispanic/Latino and Black MSM increased over time. These data provide more evidence that meth use may be increasing in Hispanic/Latino and Black MSM. Culturally-tailored and status-neutral interventions should be explored.

Keywords

meth; men who have sex with men; HIV; disparities

INTRODUCTION

Methamphetamine (meth) use has been a documented driver of HIV transmission among men who have sex with men (MSM) throughout the HIV epidemic [1–4]. The role of meth in the HIV epidemic extends beyond HIV transmission, as use has also been linked to poor HIV care and treatment outcomes [5–10]. In contrast to other regions in the United States, meth has not been a dominant drug in the New York metropolitan area [11–14]; but similar to other large urban areas [15–17], use has consistently disproportionately affected MSM [1, 18–20]. Addressing meth use can have benefits for both HIV prevention and care, and thus aligns with New York City’s (NYC) ‘status-neutral’ approach to ending the HIV epidemic [21, 22].

Meth is a stimulant commonly used to enhance sex among MSM. Its consistent association with condomless sex [4, 23–27] and other sexual behaviors that increase HIV transmission risk [4, 5, 28, 29] could be attributed to its biological effects in the context of sex, such as loss of inhibitions and enhancement of libido [1]. In the current age of pre-exposure

prophylaxis (PrEP) and Treatment as Prevention (TasP) as effective biomedical prevention methods, meth use may still be a persistent factor in contributing to a sustained HIV epidemic among MSM. Meth use can negatively impact daily functioning [30–32]; one study found that MSM who use stimulants had concerns that their substance use would impact their ability to adhere to PrEP [33] and meth use was noted in a qualitative study as interfering with PrEP adherence [34]. Yet, quantitative findings on the association between meth use and PrEP adherence are mixed [35–39]. More consistent evidence exists showing that meth use is associated with lower adherence to antiretroviral therapy (ART) among those who are HIV-positive [5, 40–42]. Coupled with data that report direct relationships between meth use and elevated HIV viral load levels [7, 8, 43, 44], these findings suggest that meth use may contribute to transmission of HIV to HIV-negative partners, posing a barrier for TasP efforts. For those who are HIV-positive, meth use can have detrimental health effects. Unsuppressed viral load levels caused by ART non-adherence can lead to disease progression, including mortality. This is compounded by lower engagement in HIV care observed among people who report meth use [45, 46]. Meth use may also worsen HIV disease progression through biological pathways, separate from ART adherence [47–49].

To address the harm of meth use on HIV transmission and across the HIV care continuum, several interventions among MSM have been assessed. Some of these interventions, known as culturally-tailored interventions, are adapted to the context and needs of MSM, specifically. Culturally-tailored interventions have shown promise in reducing meth use [50–52] and frequency of condomless sex [50, 51, 53, 54] and in improving ART adherence [50, 55] among MSM. Some randomized trials have shown greater effectiveness of culturally-tailored interventions aimed at MSM who use meth, compared to their non-tailored counterparts or control arms [50, 52, 53, 55].

In NYC, meth use became an emergent public health issue in the early 2000's when reports indicated high use among MSM in the city [1, 56]. In response, public health efforts and social marketing campaigns aiming to reduce meth use among MSM emerged [57, 58]. These efforts, which began in 2004, may have influenced the decline of meth use among MSM in NYC in the early- to mid-2000s. For example, serial cross-sectional surveys among MSM in NYC found that meth use increased from 8.5% in 2002 to 12.3% in 2003 and then decreased to 3.2% in 2007 [59]. There are few reports measuring prevalence of meth use among MSM in NYC in the past decade. Recent media reports have suggested a new wave of meth use in NYC [60], specifically among Hispanic/Latino and Black MSM [61, 62]. However, there is a paucity of empirical data measuring racial/ethnic differences in meth use. This is concerning considering that 78% of new HIV diagnoses in 2018 among MSM in NYC were among Hispanic/Latino and Black men [63]; furthermore, among people with diagnosed HIV, Hispanic/Latino and Black MSM had poorer care and treatment outcomes, including viral suppression, compared to White MSM [64]. Empirical data on the prevalence of meth use among MSM by race/ethnicity can provide an evidence base for informing the design of efforts to reduce use, reduce risks associated with use, and reduce racial inequities in HIV acquisition and HIV-related outcomes. In this analysis, we aim to describe trends in meth, overall and by race/ethnicity, among MSM in NYC from 2004–2017, using serial cross-sectional data from the National HIV Behavioral Surveillance Study (NHBS) in NYC.

METHODS

Study Design

Data were drawn from the NYC site of the CDC's NHBS study among MSM (NHBS-MSM). Every three years, starting in 2004, MSM were recruited using venue-based sampling. In NYC, the NHBS-MSM rounds were conducted in 2004–2005 (MSM1), 2008 (MSM2), 2011 (MSM3), 2014 (MSM4), and 2017 (MSM5). Detailed methods have been described elsewhere [65]. There were few changes in study methodology over time. In MSM1, individuals were eligible if they identified as male or identified as transgender and had a male sex assigned at birth, were at least 18 years old, and lived in the NYC metropolitan statistical area. Beginning in MSM2, participation was restricted to cisgender males and participants had to report ever having sex with another man. Across all rounds, eligible participants underwent an interviewer-administered survey and were offered HIV testing. The study was approved by the Institutional Review Board of the NYC Department of Health and Mental Hygiene (all rounds), the NY Blood Center (MSM1) and John Jay College of Criminal Justice (MSM2 and MSM3).

Measures

The outcome of interest for this analysis was any meth use in the past 12 months. Only in MSM1, meth use was asked in conjunction with amphetamine use. The main exposure of interest was year of data collection (2004, 2008, 2011, 2014, 2017). Sample characteristics that were measured include race/ethnicity (Hispanic/Latino, Black, White, Other), age at interview (18–24, 25–29, 30–39, 40), education level (less than high school, high school level or equivalent, some college, college graduate), annual household income (<\$10,000, \$10,000–\$29,999, \$30,000–\$49,999, \$50,000), homelessness in the past 12 months, sexual orientation (straight, gay, bisexual) and type of venue where study recruitment took place (Bar/Club vs. Other). The 'other' venue category includes sex environments (places where MSM meet to have sex), community events, street locations, cafes/restaurants, retail businesses, and parks.

Statistical Analysis

The analysis was restricted to participants who identified as male, reported oral or anal sex with another man in the past 12 months, and who resided in NYC. We first examined linear trends in meth use through log-linked Poisson regression with robust standard errors to obtain prevalence ratios (PRs), overall and stratified by race/ethnicity (excluding those who did not report Hispanic/Latino, Black, or White race/ethnicity due to small sample sizes). Models were additionally adjusted for age and venue type (as potential confounders) to obtain adjusted prevalence ratios (aPRs). We also examined non-linear trends by adding a quadratic term for study year. Where the *p*-value for the quadratic term was < 0.05, we tested linear trends between 2004–2011 and 2011–2017 in the overall sample, by race/ethnicity and adjusted for age and venue type. Since there were differences in the measurement of meth use in MSM1, we also examined linear trends excluding the MSM1 sample. All analyses were conducted using SAS 9.4 (Cary, NC, USA) [66].

RESULTS

Table I shows sample characteristics across years. A total of 457, 549, 510, 476, and 483 MSM were included in analyses for each round year, respectively. Hispanic/Latino and Black MSM comprised most of the samples each year, except for the 2014 sample where a little less than half (48%) were Hispanic/Latino or Black. Age varied across time with the 2011 sample having the highest proportion of MSM aged 18–24 (35.1%). In terms of socioeconomic status, education level and annual household income were high across all samples and homelessness never exceeded 15%. Most men were recruited at bars or clubs and this proportion increased from about 65% in the first three rounds to 84.5% in the most recent round.

Overall, prevalence of meth use was 13.9% in 2004, decreased to 6.0% in 2008, further decreased to 4.3% in 2011, and increased and then remained stable at 9.5% in 2014 and 2017. Meth use by race/ethnicity is displayed in Figure 1. Over time, there was variability both within and across groups. In 2004, use was highest among White MSM at 17.0% and lowest among Black MSM at 6.5%. Use decreased among all racial/ethnic groups in 2008, but White MSM continued to have the highest use (8.6%) and Black MSM had the lowest use (3.9%). In 2011, meth use was almost equal across racial/ethnic groups, with 4.2% among White MSM (a decrease), 4.0% among Hispanic/Latino MSM (a decrease), and 4.9% among Black MSM (an increase). Use then increased across all racial/ethnic groups in 2014, with Black MSM having the highest use (13.3%) and White MSM the lowest use (6.7%). In 2017, use decreased somewhat among Black (11.3%) and White MSM (6.2%), and Hispanic/Latino MSM had the highest reported use (12.8%).

Linear trends in meth use overall and by race/ethnicity are shown in Table II. In the overall sample, a linear trend was not found (aPR: 0.97; 95% CI: 0.94–1.0; $\chi^2 = 2.67$). When stratified by race/ethnicity, a significant downward linear trend during the analytic period was found among White MSM (aPR: 0.92; 95% CI: 0.88–0.96; $\chi^2 = 11.6$). In unadjusted analyses, there was a significant increase in meth use over time among Black MSM (PR: 1.08; 95% CI: 1.01–1.16; $\chi^2 = 4.48$), although this trend lost significance after adjustment (aPR: 1.07; 95% CI: 0.99–1.15; $\chi^2 = 2.85$; $p = 0.0912$). No significant linear trends during this period were found among Hispanic/Latino MSM. Overall, we found a significant quadratic association with use over time ($\chi^2 = 21.22$; $p < 0.0001$; Table III), with a significant decreasing linear trend from 2004–2011 (aPR: 0.84; 95% CI: 0.79–0.90; $\chi^2 = 26.17$) and a significant increasing linear trend from 2011–2017 (aPR: 1.12; 95% CI: 1.04–1.20; $\chi^2 = 8.51$) (data not shown). When stratified by race/ethnicity, this trend was found only among Hispanic/Latino MSM; significant quadratic associations were not found among Black or White MSM. When excluding the data from MSM1 (Table II), we found an overall significant increasing linear trend in the sample (aPR: 1.07; 95% CI: 1.02–1.12; $\chi^2 = 6.64$); when stratified by race/ethnicity, a significant trend was found only among Hispanic/Latino and Black MSM, with Black MSM having a greater increase in meth use over time compared with Hispanic/Latino MSM.

DISCUSSION

In these serial cross-sectional samples of sexually active, venue attending MSM in NYC, examination of meth use from 2004–2017 revealed differences in trends by race/ethnicity. Our empirical data support anecdotal reports that meth use may be surging among MSM communities of color in NYC, as well as elsewhere in the US [67]. In all models, use among White MSM since 2004 either decreased or remained steady, whereas our data demonstrated increase in use in more recent years among Hispanic/Latino and Black MSM, specifically since 2008.

This is the first analysis we are aware of to examine trends in meth use among MSM by race/ethnicity in NYC. An analysis using Washington DC's NHBS-MSM data similarly found a significant increase in meth use among Black MSM and a significant decrease among White MSM from 2008–2014 [68]. Our finding that Black MSM in our sample had the lowest prevalence of meth use during the period of campaigns and public health efforts focused on use in this population in the mid-2000's mirrors findings from other studies [69]. A decline in meth use since this period among White MSM only is not surprising, as these campaigns focused on and featured White men; further, evaluations showed that White men had a more positive reaction towards the campaigns than MSM of color [57]. Stigma and negative views towards meth use within the White MSM community may have propagated over time. Although we found an overall lower prevalence of meth use than has been reported in other major cities across all time points (with the exception of 2017, when Los Angeles and NYC had the same prevalence) [70], these findings are concerning given the persistent inequities in HIV diagnoses, prevalence, and HIV outcomes among Hispanic/Latino and Black MSM compared to White MSM in NYC.

The drivers of this recent rise in use are not known. Hispanic/Latino and Black MSM face the intersectionality of both homophobia and racism. As posited by the Minority Stress Theory [71], homophobia and racism act as lifelong chronic stressors that place individuals who face these stressors at higher risk for negative health outcomes, including substance use. Meth, specifically, may be used as a coping mechanism by Hispanic/Latino and Black MSM [72, 73] Meth use may also serve as a mechanism for bonding among MSM of color. A recent small qualitative study of meth use reported that Hispanic/Latino and Black MSM primarily use meth to enhance sex and intimacy [67]. It is possible that meth has only recently been used for this purpose among Hispanic/Latino and Black MSM, whereas this was more common among White MSM in the past. Although we do not have data on meth use during sex, MSM5 (2017) data show that among those who reported use in the past 12 months, both Hispanic/Latino and Black MSM reported using meth with a significantly greater number of persons than White MSM. Whereas Hispanic/Latino and Black MSM reported a median of one and three persons, respectively, White MSM reported a median of zero persons with whom they used meth in the past 12 months ($p=0.03$; data not shown).

These data highlight the importance of culturally-tailored and appropriate interventions for Hispanic/Latino and Black MSM meth users in NYC and other jurisdictions that observe similar racial/ethnic trends in use over time. We are aware of only one intervention culturally-tailored for Black MSM who use meth [51, 74]. Public health efforts for MSM

who are HIV-negative should include education about and referral to PrEP and post-exposure prophylaxis (PEP), along with services to support PrEP adherence, to reduce risk of HIV acquisition. Among MSM who are HIV-positive, a recent randomized controlled trial reported a decrease in viral load using a contingency management approach to reduce meth use and increase adherence to HIV treatment [75]. Other alternatives may include education regarding Undetectable=Untransmittable (U=U) and training to providers to address meth use among their clients in a non-judgemental manner [67]. In NYC, observation of an increase in meth use based on NHBS data from 2014 led to a community call for action and a commitment of NYC city funding to initiate new programs to address use in mid-2016. These programs incorporate harm-reduction principles to engage both HIV-negative and HIV-positive MSM who use meth through street, venue, and public sex environment outreach, and informal drop-in groups in order to mitigate harms associated with meth use. Once engaged, participants may access clinical care, including PEP, PrEP, HCV testing, STI testing and treatment, HIV primary care, psychiatric services, counseling, and case management. As of December 2019, 372 MSM had engaged in the program, with 25% identifying as Black and 30% identifying as Hispanic/Latino MSM.

This analysis is subject to some limitations. First, since data are self-reported, we do not know if meth use was underreported due to stigma or other factors and if reporting bias differed by race/ethnicity or over time. Although the validity of self-reported methamphetamine use is high compared to biologically confirmed use among dependent adults [76], less is known about the validity among MSM, a subgroup that may experience more stigma towards meth use [77] and so underreporting of use might be more frequent. Second, we do not know the proportion of men who specifically used meth in the MSM1 round since the question was asked in combination with amphetamine use. The literature on the use of amphetamines that are not methamphetamines is scant as research has focused on either general amphetamine use or meth use. Although we do not have an estimate of the proportion of amphetamine users who did not use methamphetamine, we expect the proportion to be minimal. Anecdotal data from a 2001–2002 study on MSM in San Francisco estimated that more than 90% of amphetamine users used meth [78]. In the case where meth use is overestimated in the MSM1 cycle, there may be an actual increasing linear trend in use in Hispanic/Latino and Black MSM, and the decreasing linear trend that was observed among White MSM may be actually more towards the null. This interpretation aligns with our findings when we removed MSM1 data from the analysis. In the quadratic trend analyses, there may be no true decreasing trend between MSM1-MSM3 among Hispanic/Latino MSM. Third, we are unable to ascertain whether increases in meth use contributed to HIV acquisition over time. We conducted a sensitivity analysis in which we examined overall adjusted linear trends, stratified by self-reported HIV status (positive vs. negative or unknown), since 2004. Whereas use declined significantly among those reporting a negative or unknown HIV status, it remained stable among those who self-reported a positive HIV status (data not shown). The reasons for this decline in use among MSM who are HIV-negative are unknown, as is whether there is any association between reduced meth use and protection against HIV infection at the individual level in this population. Lastly, the findings from this analysis are only generalizable to venue attending MSM. Systematic recruitment of MSM using venue-based sampling decreases biases known to be associated

with convenience sampling. Despite these limitations, this analysis is one of the first to contribute to the literature on racial/ethnic inequities in meth use over time among MSM. Finally, the large and racially and ethnically diverse sample we recruited enabled us to make racial/ethnic comparisons, which have been limited in previous research.

CONCLUSIONS

We found that meth use among MSM in NYC may be re-emerging as a health issue specifically among Hispanic/Latino and Black MSM, which among other concerns poses a challenge to HIV prevention, care, and treatment efforts. More research is needed to understand the drivers of these racial/ethnic trends. Our findings suggest the need for more geographically-distributed, culturally-competent services for HIV-positive and -negative Hispanic/Latino and Black MSM, including those that screen for meth use and refer for services, and for more research on meth use-related interventions for Hispanic/Latino and Black MSM.

ACKNOWLEDGMENTS

This study was funded by CDC grant 1U62PS005086-01. The authors would like to acknowledge Alan Neiaigus, PhD, former NYC NHBS Principal Investigator, and former NHBS-MSM data collection staff. We would like to acknowledge Jelani Cheek, MPH, Matthew Feldman, PhD, and Frances Silva, MPH for providing data and their work on NYC DOHMH's Recharge program. We would also like to thank Willi McFarland, Henry Fisher Raymond, and Glenn-Milo Santos on their insight on meth use in San Francisco.

REFERENCES

1. Halkitis PN, Parsons JT, Stirratt MJ. A double epidemic: crystal methamphetamine drug use in relation to HIV transmission among gay men. *J Homosex*. 2001;41(2):17–35. [PubMed: 11482426]
2. Buchacz K, McFarland W, Kellogg TA, et al. Amphetamine use is associated with increased HIV incidence among men who have sex with men in San Francisco. *AIDS*. 2005;19(13):1423–4. [PubMed: 16103774]
3. Thu Vu NT, Maher L, Zablotska I. Amphetamine-type stimulants and HIV infection among men who have sex with men: implications on HIV research and prevention from a systematic review and meta-analysis. *J Int AIDS Soc*. 2015;18(1):193273.
4. Colfax G, Shoptaw S. The methamphetamine epidemic: Implications for HIV prevention and treatment. *Curr HIV/AIDS Rep*. 2005;2(4):194–9. [PubMed: 16343378]
5. Rajasingham R, Mimiaga MJ, White JM, et al. A systematic review of behavioral and treatment outcome studies among HIV-infected men who have sex with men who abuse crystal methamphetamine. *AIDS Patient Care STDS*. 2011;26(1):36–52. [PubMed: 22070609]
6. Mayer KH, Skeer MR, O'Cleirigh C, Goshe BM, Safren SA. Factors associated with amplified HIV transmission behavior among American men who have sex with men engaged in care: Implications for clinical providers. *Ann Behav Med*. 2013;47(2):165–71.
7. Feldman MB, Thomas JA, Alexy ER, Irvine MK. Crystal methamphetamine use and HIV medical outcomes among HIV-infected men who have sex with men accessing support services in New York. *Drug Alcohol Depend*. 2014;147:266–71. [PubMed: 25482501]
8. Carrico AW, Hunt PW, Neilands TB, et al. Stimulant Use and Viral Suppression in the Era of Universal Antiretroviral Therapy. *J Acquir Immune Defic Syndr*. 2018;80(1):89–93.
9. Carrico AW. Substance use and HIV disease progression in the HAART era: Implications for the primary prevention of HIV. *Life Sci*. 2010;88(21–22):940–7. [PubMed: 20934437]
10. Carrico AW, Shoptaw S, Cox C, et al. Stimulant use and progression to AIDS or mortality after the initiation of highly active antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2014;67(5):508–13. [PubMed: 25271387]

11. Hedegaard H, Bastian BA, Trinidad JP, Spencer MR, Warner M. Regional differences in the drugs most frequently involved in drug overdose deaths: United States, 2017. *Natl Vital Stat Rep.* 2019;68(12):1–16.
12. Jones CM, Olsen EO, O'Donnell J, Mustaquim D. Resurgent methamphetamine use at treatment admission in the United States, 2008–2017. *Am J Public Health.* 2020;110(4):509–16. [PubMed: 32078347]
13. Jones CM, Compton WM, Mustaquim D. Patterns and characteristics of methamphetamine use among adults - United States, 2015–2018. *MMWR Morb Mortal Wkly Rep.* 2020;69(12):317–23. [PubMed: 32214077]
14. Gonzales R, Mooney L, Rawson R. The methamphetamine problem in the United States. *Ann Rev Public Health.* 2010;31:385–98. [PubMed: 20070191]
15. Jin H, Hurliaux E, Loughran E, Packer T, Raymond HF. Differences in HIV risk behaviors among people who inject drugs by gender and sexual orientation, San Francisco, 2012. *Drug Alcohol Depend.* 2014;145:180–4. [PubMed: 25456328]
16. Forrest DW, Metsch LR, LaLota M, et al. Crystal methamphetamine use and sexual risk behaviors among HIV-positive and HIV-negative men who have sex with men in South Florida. *J Urban Health.* 2010;87(3):480–5. [PubMed: 20101468]
17. Wohl AR, Frye DM, Johnson DR. Demographic characteristics and sexual behaviors associated with methamphetamine use among MSM and non-MSM diagnosed with AIDS in Los Angeles County. *AIDS Behav.* 2008;12(5):705–12. [PubMed: 17968649]
18. Griffin M,DC, Duncan DT, Palamar JJ. Differential risk for drug use by sexual minority status among electronic dance music attendees in New York City. *Subst Use Misuse.* 2020;55(2):230–40. [PubMed: 31530057]
19. Reilly KH, Neaigus A, Wendel T, Marshall DM 4th, Hagan H. Bisexual behavior among male injection drug users in New York City. *AIDS Behav.* 2016;20(2):405–16. [PubMed: 26607927]
20. Wendel T, Khan B, Dombrowski K, et al. Dynamics of methamphetamine markets in New York City: Final technical report to the National Institute of Justice. John Jay College of Criminal Justice; 2011. Contract No.: 236122.
21. Myers JE, Braunstein SL, Xia Q, et al. Redefining prevention and care: A status-neutral approach to HIV. *Open Forum Infect Dis.* 2018;5(6):ofy097. [PubMed: 29977957]
22. Harriman G, Silva F, Cheek J, et al. A status neutral public health approach to men who have sex with men (MSM) using crystal methamphetamine. *Fast Track Cities 2019*; London, England 2019.
23. Halkitis PN, Mukherjee PP, Palamar JJ. Longitudinal modeling of methamphetamine use and sexual risk behaviors in gay and bisexual men. *AIDS Behav.* 2009;13(4):783–91. [PubMed: 18661225]
24. Hirshfield S, Remien RH, Humberstone M, Walavalkar I, Chiasson MA. Substance use and high-risk sex among men who have sex with men: A national online study in the USA. *AIDS Care.* 2004;16(8):1036–47. [PubMed: 15511735]
25. Vosburgh HW, Mansergh G, Sullivan PS, Purcell DW. A review of the literature on event-level substance use and sexual risk behavior among men who have sex with men. *AIDS Behav.* 2012;16(6):1394–410. [PubMed: 22323004]
26. Halkitis PN, Levy MD, Moreira AD, Ferrusi CN. Crystal methamphetamine use and HIV transmission among gay and bisexual men. *Curr Addict Rep.* 2014;1(3):206–13.
27. Brown RE, Turner C, Hern J, Santos G. Partner-level substance use associated with increased sexual risk behaviors among men who have sex with men in San Francisco, CA. *Drug Alcohol Depend.* 2017;2017:176–80.
28. Nerlander LMC, Hoots BE, Bradley H, et al. HIV infection among MSM who inject methamphetamine in 8 US cities. *Drug Alcohol Depend.* 2018;190:216–23. [PubMed: 30055426]
29. Benotsch EG, Lance SP, Nettles CD, Koester S. Attitudes toward methamphetamine use and HIV risk behavior in men who have sex with men. *Am J Addict.* 2012;21:S35–42. [PubMed: 23786508]
30. Henry BL, Minassian A, Perry W. Effect of methamphetamine dependence on everyday functional ability. *Addict Behav.* 2010;35(6):593–8. [PubMed: 20167435]

31. Minassian A, Henry BL, Iudicello JE, et al. Everyday functional ability in HIV and methamphetamine dependence. *Drug Alcohol Depend.* 2017;175:60–6. [PubMed: 28399475]
32. Halkitis PN, Solomon TM. New data reveals shifting NYC meth demographic. *amNY.* 2010 November 3, 2010. Available from: <https://www.amny.com/news/new-data-reveals-shifting-nyc-meth-demographic/>
33. Oldenburg CE, Mitty JA, Biello KB, et al. Differences in attitudes about HIV pre-exposure prophylaxis use among stimulant versus alcohol using men who have sex with men. *AIDS Behav.* 2016;20(7):1451–60. [PubMed: 26462669]
34. Storholm ED, Volk JE, Marcus JL, Silverberg MJ, Satre DD. Risk perception, sexual behaviors, and PrEP adherence among substance-using men who have sex with men: A qualitative study. *Prev Sci.* 2017;18(6):737–47. [PubMed: 28578516]
35. Okafor CN, Hucks-Ortiz C, Hightow-Weidman LB, et al. Brief report: Associations between self-reported substance use behaviors and PrEP acceptance and adherence among black MSM in the HPTN 073 study. *J Acquir Immune Defic Syndr* 2020;85(1):23–9. [PubMed: 32452970]
36. O'Halloran C, Rice B, White E, et al. Chemsex is not a barrier to self-reported daily PrEP adherence among PROUD study participants. *Int J Drug Policy.* 2019;74:246–54. [PubMed: 31739177]
37. Grov C, Rendina HJ, John SA, Parsons JT. Determining the roles that club drugs, marijuana, and heavy drinking play in PrEP medication adherence among gay and bisexual men: Implications for treatment and research *AIDS Behav.* 2019;23(5):1277–86. [PubMed: 30306433]
38. Hojilla JC, Vlahov D, Glidden DV, et al. Skating on thin ice: stimulant use and sub-optimal adherence to HIV pre-exposure prophylaxis. *J Int AIDS Soc.* 2018;21(3):e25103. [PubMed: 29577616]
39. Grant RM, Anderson PL, McMahan V, et al. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: A cohort study. *Lancet Infect Dis.* 2014;14(9):S1473–3099.
40. Perera S, Bourne AH, Thomas S. P198 Chemsex and antiretroviral therapy non-adherence in HIV-positive men who have sex with men: A systematic review. *Sex Transm Infect.* 2017;93:A81.
41. Moore DJ, Blackstone K, Woods SP, et al. Methamphetamine use and neuropsychiatric factors are associated with antiretroviral non-adherence. *AIDS Care.* 2012;24(12):1504–13. [PubMed: 22530794]
42. Marquez C, Mitchell SJ, Hare CB, John M, Klausner JD. Methamphetamine use, sexual activity, patient-provider communication, and medication adherence among HIV-infected patients in care, San Francisco 2004–2006. *AIDS Care.* 2009;21(5):575–82. [PubMed: 19444665]
43. Blumenthal J, Haubrich R, Jain S, et al. Factors associated with high transmission risk and detectable plasma HIV RNA in HIV-infected MSM on ART. *Int J STD AIDS.* 2014;25(10):734–41. [PubMed: 24452730]
44. Nance RM, Trejo MEP, Whitney BM, et al. Impact of abstinence and of reducing illicit drug use without abstinence on Human Immunodeficiency Virus viral load. *Clin Infect Dis.* 2019;70(5):867–74.
45. Hightow-Weidman L, LeGrand S, Choi SK, et al. Exploring the HIV continuum of care among young black MSM. *Plos One.* 2017;12(6):e0179688. [PubMed: 28662170]
46. Jin H, Ogunbajo A, Mimiaga MJ, et al. Over the influence: The HIV care continuum among methamphetamine-using men who have sex with men. *Drug Alcohol Depend.* 2018;192:125–8. [PubMed: 30248558]
47. Carrico AW, Flentje A, Kober K, et al. Recent stimulant use and leukocyte gene expression in methamphetamine users with treated HIV infection. *Brain Behav Immun.* 2018;71:108–15. [PubMed: 29679637]
48. Carrico AW, Cherenack EM, Roach ME, et al. Substance-associated elevations in monocyte activation among methamphetamine users with treated HIV infection. *AIDS.* 2018;32(6):767–71. [PubMed: 29369159]
49. Miller M, Lee JY, Fulcher JA, et al. Getting to the point: Methamphetamine injection is associated with biomarkers relevant to HIV pathogenesis. *Drug Alcohol Depend.* 2020;213:108133. [PubMed: 32580112]

50. Parsons JT, John SA, Millar BM, Starks TJ. Testing the efficacy of combined motivational interviewing and cognitive behavioral skills training to reduce methamphetamine use and improve HIV medication adherence among HIV-positive gay and bisexual men. *AIDS Behav.* 2018;22(8):2674–86. [PubMed: 29536284]
51. Wu E, El-Bassel N, McVinney LD, et al. Feasibility and promise of a couple-based HIV/STI preventive intervention for methamphetamine-using, black men who have sex with men. *AIDS Behav.* 2011;15(8):1745–54. [PubMed: 21766193]
52. Shoptaw S, Reback CJ, Larkins S, et al. Outcomes using two tailored behavioral treatments for substance abuse in urban gay and bisexual men. *J Subst Abuse Treat.* 2008;35(3):285–93. [PubMed: 18329226]
53. Shoptaw S, Reback CJ, Peck JA, et al. Behavioral treatment approaches for methamphetamine dependence and HIV-related sexual risk behaviors among urban gay and bisexual men. *Drug Alcohol Depend.* 2005;78(2):125–34. [PubMed: 15845315]
54. Mausbach BT, Semple SJ, Strathdee SA, Zians J, Patterson TL. Efficacy of a behavioral intervention for increasing safer sex behaviors in HIV-positive MSM methamphetamine users: results from the EDGE study. *Drug Alcohol Depend.* 2007;87(2–3):249–57. [PubMed: 17182196]
55. Jaffe A, Shoptaw S, Stein J, Reback CJ, Rotheram-Fuller E. Depression ratings, reported sexual risk behaviors, and methamphetamine use: Latent growth curve models of positive change among gay and bisexual men in an outpatient treatment program. *Exp Clin Psychopharmacol.* 2007;15(3):301–7. [PubMed: 17563217]
56. Nanín JE, Parsons JT. Club drug use and risky sex among gay and bisexual men in New York City. *J Gay Lesbian Psych.* 2006;10(3–4):111–22.
57. Nanín JE, Parsons JT, Bimbi DS, Grov C, Brown JT. Community reactions to campaigns addressing crystal methamphetamine use among gay and bisexual men in New York City. *J Drug Educ.* 2007;36(4):297–315.
58. Braine N, Acker CJ, van Sluytman N, Friedman S, Des Jarlais DC. Drug use, community action, and public health: Gay men and crystal meth in NYC. *Subst Use Misuse.* 2011;46(4):368–80. [PubMed: 20394522]
59. Pantalone DW, Bimbi DS, Holder CA, Golub SA, Parsons JT. Consistency and change in club drug use by sexual minority men in New York City, 2002 to 2007. *Am J Public Health.* 2010;100(10):1892–5. [PubMed: 20724693]
60. Osborne D. Meth kills — and evidence points to its upswing in NYC. *Gay City News.* Feb 4, 2016. Available from: <https://www.gaycitynews.nyc/stories/2016/3/w23496-meth-kills-evidence-points-upswing-nyc-2016-02-04.html>
61. Secret M. Meth finds a new market in New York. *The New York Times.* June 5, 2015. Available from: <https://www.nytimes.com/2015/06/07/nyregion/meth-finds-a-new-market-in-new-york.html>
62. Rice M. parTy boi, black diamonds in ice castles (Documentary). 2017.
63. New York City Department of Health and Mental Hygiene. New York City HIV/AIDS Annual Surveillance Statistics 2018. 2019. Available from: <https://www1.nyc.gov/assets/doh/downloads/pdf/ah/surveillance2018-table-all.pdf>
64. New York City Department of Health and Mental Hygiene. HIV among men who have sex with men (MSM) in New York City, 2018. 2019. Available from: <https://www1.nyc.gov/assets/doh/downloads/pdf/dires/hiv-aids-in-msm.pdf>
65. Centers for Disease Control and Prevention. HIV Infection risk, prevention and testing behaviors among men who have sex with men - National HIV Behavioral Surveillance, 23 US cities, 2017. 2019. Available from: <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-special-report-number-22.pdf>
66. SAS Institute. SAS 9.4. Cary, N.C
67. Melgarejo T, Hawthorne C, Frost T, et al. A blueprint guide to supporting Black and Latino MSM who use crystal meth. Harm Reduction Coalition, BEAM (Black Emotional & Mental Health Collective), and Counter Narrative Project. October 2018. Available from: <https://harmreduction.org/hrc2/wp-content/uploads/2020/08/Resource-SaferDruguse-ABlueprintGuidetoSupportingBlackandLatinoMSMWhoUseCrystalMeth.pdf>

68. Kuo I, Patrick R, Opoku J, et al. Changing pattern of crystal meth use in black & white MSM, Washington, DC, 2008–2014. Conference on Retroviruses and Opportunistic Infections; 2017; Seattle.
69. Halkitis PN, Jerome RC. A comparative analysis of methamphetamine use: Black gay and bisexual men in relation to men of other races. *Addict Behav.* 2008;33(1):83–93. [PubMed: 17825996]
70. Staley P. Meth use by gay men remains stable after 2014 uptick. *POZ.* June 19, 2019. Available from: <https://www.poz.com/blog/meth-use-gay-men-remains-stable-2014-uptick>
71. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychol Bull.* 2003;129(5):674–97. [PubMed: 12956539]
72. Halkitis PN, Levy MD, Solomon TM. Temporal relations between methamphetamine use and HIV seroconversion in gay, bisexual, and other men who have sex with men. *J Health Psychol.* 2014;21(1):93–9. [PubMed: 24578373]
73. Halkitis PN, Fischgrund BN, Parsons JT. Explanations for methamphetamine use among gay and bisexual men in New York City. *Subst Use Misuse.* 2005;40(9–10):1331–45. [PubMed: 16048820]
74. Wu E, El-Bassel N, Donald McVinney L, Fontaine YM, Hess L. Adaptation of a couple-based HIV intervention for methamphetamine-involved African American men who have sex with men. *Open AIDS J.* 2010;4:123–31. [PubMed: 20657720]
75. Carrico AW, Neilands TB, Dilworth SE, et al. Randomized controlled trial of a positive affect intervention to reduce HIV viral load among sexual minority men who use methamphetamine. *J Int AIDS Soc.* 2019;22(12):e25436. [PubMed: 31860172]
76. Rowe C, Vittinghoff E, Colfax G, Coffin PO, Santos GM. Correlates of validity of self-reported methamphetamine use among a sample of dependent adults. *Subst Use Misuse.* 2018;53(10):1742–55. [PubMed: 29461134]
77. Semple SJ, Strathdee SA, Zians J, Patterson TL. Factors associated with experiences of stigma in a sample of HIV-positive, methamphetamine-using men who have sex with men. *Drug Alcohol Depend.* 2012;125(1–2):154–9. [PubMed: 22572209]
78. Buchacz K, McFarland W, Kellogg TA, et al. Amphetamine use is associated with increased HIV incidence among men who have sex with men in San Francisco. *AIDS.* 2005;19(13):1423–4. [PubMed: 16103774]

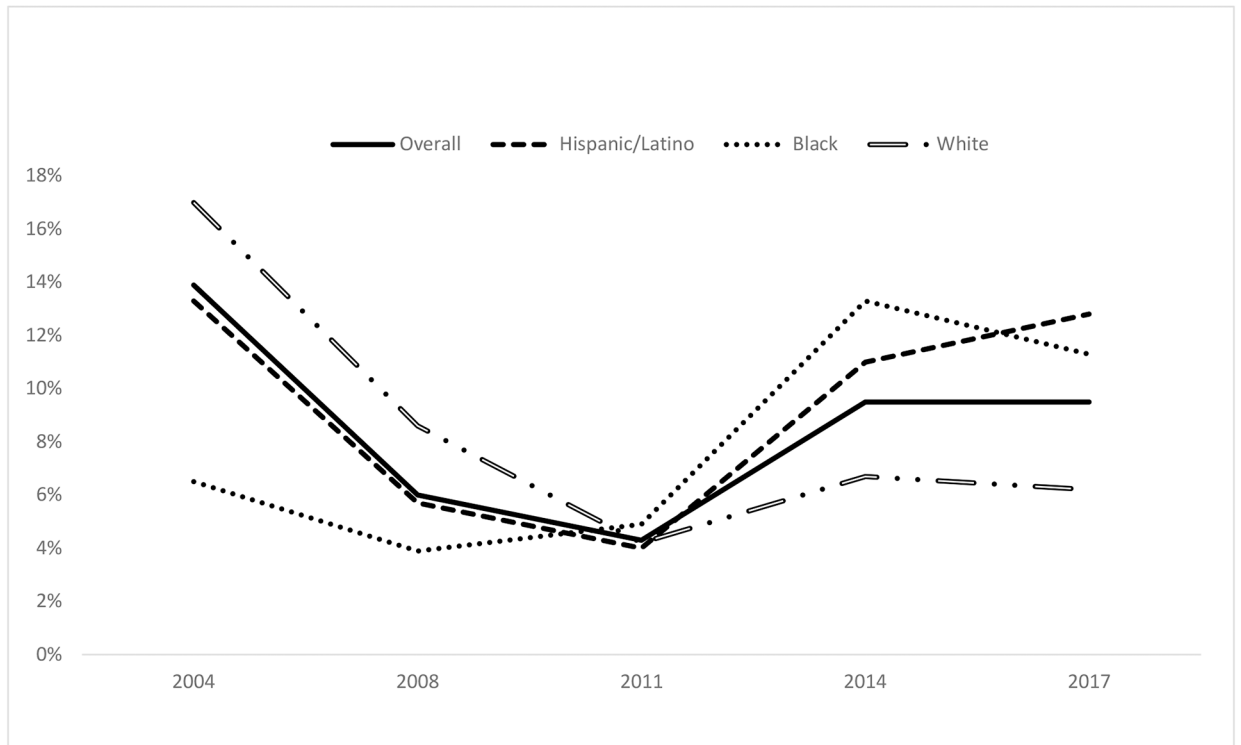


Figure 1. Prevalence of methamphetamine use over time among men who have sex with men in New York City, overall and by race/ethnicity; National HIV Behavioral Surveillance Study, 2004–2017.

Table 1.

Sample characteristics by study round, New York City National HIV Behavioral Surveillance Study among Men who Have Sex with Men, 2004–2017.

	MSM1 2004 (n=457)	MSM2 2008 (n=549)	MSM3 2011 (n=510)	MSM4 2014 (n=476)	MSM5 2017 (n=483)
	n (%)				
Race/ethnicity					
Hispanic/Latino	123 (26.9)	193 (35.2)	200 (39.2)	145 (30.5)	148 (30.6)
Black	108 (23.6)	156 (28.4)	122 (23.9)	83 (17.4)	106 (22.0)
White	182 (39.8)	162 (29.5)	144 (28.2)	210 (44.1)	194 (40.2)
Other	44 (9.6)	38 (6.9)	44 (8.6)	38 (8.0)	35 (7.3)
Age					
18–24	136 (29.8)	133 (24.2)	179 (35.1)	78 (16.4)	57 (11.8)
25–29	95 (20.8)	94 (17.1)	88 (17.3)	133 (27.9)	128 (26.5)
30–39	150 (32.8)	150 (27.3)	112 (22.0)	141 (29.6)	172 (35.6)
40	76 (16.6)	172 (31.3)	131 (25.7)	124 (26.1)	126 (26.1)
Education level					
Less than high school	37 (8.1)	51 (9.3)	47 (9.2)	5 (1.1)	8 (1.7)
High school level or equivalent	77 (16.9)	137 (25.0)	144 (28.2)	70 (14.7)	64 (13.3)
Some college	118 (25.8)	140 (25.5)	186 (36.5)	96 (20.2)	90 (18.6)
College graduate	225 (49.2)	221 (40.3)	133 (26.1)	305 (64.1)	321 (66.5)
Annual household income^a					
< \$10,000	n/a	103 (19.5)	95 (18.7)	32 (6.9)	43 (8.9)
\$10,000–\$29,999	n/a	110 (20.8)	169 (33.3)	113 (24.4)	112 (23.3)
\$30,000–\$49,999	n/a	102 (19.3)	104 (20.5)	98 (21.2)	79 (16.4)
\$50,000	n/a	214 (40.5)	139 (27.4)	220 (47.5)	247 (51.4)
Homeless, past 12 months^a					
Yes	n/a	50 (9.1)	70 (13.7)	24 (5.0)	41 (8.5)
No	n/a	499 (90.9)	440 (86.3)	452 (95.0)	442 (91.5)
Sexual orientation					
Straight	4 (0.9)	6 (1.1)	11 (2.2)	3 (0.6)	4 (0.8)
Gay	358 (79.9)	438 (79.8)	399 (78.4)	414 (87.3)	407 (85.2)
Bisexual	86 (19.2)	105 (19.1)	99 (19.5)	57 (12.0)	67 (14.0)
Type of venue recruited at					
Bar/Club	299 (65.4)	365 (66.3)	335 (65.7)	376 (79.0)	408 (84.5)
Other	158 (34.6)	185 (33.7)	175 (34.3)	100 (21.0)	75 (16.0)
Methamphetamine use, past 12 months^b					
Yes	63 (13.9)	33 (6.0)	22 (4.3)	45 (9.5)	46 (9.5)
No	391 (86.1)	516 (94.0)	488 (95.7)	431 (90.6)	437 (90.5)

^aHousehold income and homelessness in past 12 months were not collected in MSM1.

^bMethamphetamine use was asked in conjunction with amphetamine use in MSM1.

Table II.

Linear trends in methamphetamine use among men who have sex with men, overall and by race/ethnicity; New York City National HIV Behavioral Surveillance Study, 2004–2017.

	Overall			Hispanic/Latino			Black			White		
	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value
Unadjusted (including MSM1)	0.98 (0.95– 1.01)	1.58	0.2093	1.02 (0.96– 1.09)	0.42	0.5187	1.08 (1.01– 1.16)	4.48	0.0343	0.92 (0.87– 0.96)	12.0	0.0005
Adjusted ^a (including MSM1)	0.97 (0.94– 1.00)	2.67	0.1026	1.01 (0.95– 1.07)	0.05	0.8234	1.07 (0.99– 1.15)	2.85	0.0912	0.92 (0.88– 0.96)	11.6	0.0007
Unadjusted (excluding MSM1)	1.07 (1.02– 1.13)	8.60	0.0034	1.12 (1.04– 1.22)	8.24	0.0041	1.14 (1.04– 1.25)	8.40	0.0037	0.98 (0.89– 1.06)	0.31	0.5780
Adjusted ^a (excluding MSM1)	1.07 (1.02– 1.12)	6.64	0.0100	1.12 (1.03– 1.21)	7.56	0.0060	1.13 (1.02– 1.24)	5.77	0.0163	0.97 (0.89– 1.06)	0.49	0.4820

^a Adjusted for age and venue type.

Table III.

Quadratic trends in methamphetamine use among men who have sex with men, overall and by race/ethnicity; New York City National HIV Behavioral Surveillance Study, 2004–2017.

	Overall			Hispanic/Latino			Black			White		
	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value	PR (95% CI)	χ^2	<i>p</i> -value
Unadjusted	1.02 (1.01–1.02)	25.14	<0.0001	1.02 (1.01–1.03)	12.3	0.0005	1.01 (0.99–1.03)	1.21	0.2721	1.01 (1.00–1.03)	4.33	0.0374
Adjusted ^a	1.02 (1.01–1.02)	21.22	<0.0001	1.02 (1.01–1.03)	10.35	0.0013	1.01 (0.99–1.03)	0.92	0.3383	1.01 (1.00–1.02)	3.31	0.0687

^aAdjusted for age and venue type.

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