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STABILITY OF BISEXUAL BEHAVIOR AND EXTENT OF VIRAL BRIDGING BEHAVIOR AMONG MEN WHO HAVE SEX WITH MEN AND WOMEN (MSMW)

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Abstract

BACKGROUND—Bisexual men experience significant health disparities likely related to biphobia. Biphobia presents via several preconceptions, including that bisexuality is transitory, and that bisexual men act as viral bridges between MSM and heterosexual populations. We analyzed

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INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study. The Institutional Review Boards at each respective Multicenter AIDS Cohort Study partner institution (University of Pittsburgh, Johns Hopkins University, University of California-Los Angeles, and Northwestern University) approved of the behavioral measures assessed and reported on herein.

ETHICAL STATEMENT

The manuscript has not been submitted to more than one journal for simultaneous consideration. Small portions of this appeared previously in substantially different form in the lead author's doctoral dissertation: Friedman, MR. (2013). HIV among men who have sex with men and women (MSMW): Prevalence estimates, acquisition and transmission risks, and implications for interventions (Doctoral dissertation, University of Pittsburgh). This manuscript significantly expands upon this previous work. We have taken care not to split up these data into several parts to increase submission quantity. No data have been fabricated or manipulated to support conclusions. No data, text, or theories by others are presented as if they were the author's own, and all source data have been properly cited. Consent to submit has been received explicitly from all co-authors, as well as from the responsible authorities - tacitly or explicitly - at the institute/organization where the work has been carried out, before the work was submitted. All authors whose names appear on the submission have contributed sufficiently to the scientific work and therefore share collective responsibility and accountability for the results.

CONFLICTS OF INTEREST STATEMENT

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data from a prospective cohort of gay and bisexual men, the Multicenter AIDS Cohort Study, to test these preconceptions.

METHODS—Men reporting both male and female sexual partners (MSMW) between 2002—2009 (n=111) were classified as behaviorally bisexual. We assessed five hypotheses over two domains (transience of bisexual behavior and viral bridging).

RESULTS

Transience: No evidence was found supporting transitory nature of bisexuality. Trajectories of bisexual behavior were not transient over time.

Bridging: We found little evidence to support substantial viral bridging behavior. Notably, HIV-positive MSMW reported lower proportions of female partners than HIV-negative MSMW.

DISCUSSION—Our results provide no empirical support for bisexual transience and scant support for viral bridging hypotheses. Our results provide key data showing that male bisexual behavior may be stable over long time periods, and that behaviorally bisexual men's risk to female sexual partners may be lower than expected.

Keywords

Male bisexuality; biphobia; HIV/AIDS; longitudinal data

INTRODUCTION

Men who have sex with men and women (MSMW) experience significant health disparities compared with men who have sex with men only (MSMO) and men who have sex with women exclusively (MSWE). These disparities include higher rates of childhood adversities, such as peer bullying and violence victimization (M. S. Friedman et al., 2011; Goodenow, Netherland, & Szalacha, 2002; Pathela & Schillinger, 2010); psychosocial conditions, including depression, suicidality and substance use (Dodge, Sandfort, & Firestein, 2007; M. R. Friedman, Stall, et al., 2014; Marshal et al., 2011; Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014; Nakamura, Semple, Strathdee, & Patterson, 2011; Robin et al., 2002; Shoptaw et al., 2009; D. P. Wheeler, J. L. Lauby, K. L. Liu, L. G. Van Sluytman, & C. Murrill, 2008); and behavioral risks, including transactional sex and concurrent substance use and sex (M. R. Friedman, Kurtz, et al., 2014). In addition, recent research has identified biomedical disparities among MSMW, including higher rates of HIV infection compared with MSWE (M. R. Friedman, Wei, et al., 2014) and, among those who are HIV-positive, lower awareness of HIV status (Flores, Bakeman, Millett, & Peterson, 2009), higher viral load levels, and faster disease progression compared with MSMO (M. R. Friedman, Stall, et al., 2014; Singh, Hu, Wheeler, & Hall, 2014a). These disparities may be propelled by precocious and persistent experiences of "double discrimination," e.g., enduring stigma from both straight and gay communities (Ochs, 1996). Double discrimination (generally termed biphobia) may promote feelings of isolation and alienation from both sexual majority and minority communities, and lower levels of protective factors, including comparatively weaker attachments to families, peers, and schools than both MSMO and MSWE during

formative developmental periods (Flores et al., 2009; Saewyc et al., 2009; Udry & Chantala, 2002).

Research on biphobia indicates that this stigma derives from several preconceptions. These include that bisexuality is transient (M. R. Friedman, Dodge, et al., 2014; Morrison, Harrington, & McDermott, 2010; Mulick & Wright Jr, 2002, 2011; Yost & Thomas, 2012); and that bisexuals are sexually uninhibited, acting as *viral bridges* by facilitating HIV transmission from gay to straight communities and endangering their female partners (Cunningham, Olthoff, Burnett, Rompalo, & Ellen, 2006; Montgomery, Mokotoff, Gentry, & Blair, 2003; Morse, Simon, Osofsky, Balson, & Gaumer, 1991; O'Leary & Jones, 2006; Prabhu, Owen, Folger, & McFarland, 2004). Researchers have shown that these preconceptions have been combined in Western popular media to argue that bisexual men, particularly those who are Black, are primarily responsible for sexually transmitted HIV infections among women (Malebranche, 2008; Millett, Malebranche, Mason, & Spikes, 2005; Sandfort & Dodge, 2008). Expressed by such phrases as "bi now, gay later," "anything that moves," and "on the down-low," cultural paradigms about bisexuals question their legitimacy, stability, morality, and honesty: these preconceptions suggest male bisexuality is not real and does not last, but when it occurs it is dangerously and secretively performed.

As prevalent and powerful as these preconceptions may be, their scientific validity has been infrequently measured, especially among men. Regarding *transience of bisexual behavior*, research on sexual minority women has demonstrated that they are more likely over time to adopt sexual behavior with both genders, evidencing sexual fluidity over the lifespan even as their relationships trend toward monogamy (Diamond, 2008). However, few studies have assessed transience of *male* bisexual behavior longitudinally and what exists is no longer current. Weinberg et al found that a majority of bisexually-identified men and women reported changes in the ratio of the gender of their sexual partners over five years, with over half reporting increases in same-gender sexual partnering (Weinberg, Williams, & Pryor, 2001). Stokes et al found that, over a follow-up period of one year, almost twice as many bisexual men reported shifts in Kinsey scores (which include dimensions of behavior, orientation, and fantasy) toward a more homosexual rating than a more heterosexual rating (Stokes, McKirnan, & Burzette, 1993). Reporting on a nationally representative sample of adolescents, Savin-Williams and Ream found that the overall prevalence of male bisexual behavior increased, even as only 2.1% of MSMW at the first wave reported bisexual behavior at the third wave (Savin-Williams & Ream, 2007). However, no recent research has been conducted that assesses transience of bisexual behavior among adult men over a wide timeframe. Of particular interest is whether bisexual men continue to report bisexual behavior over time, which can be assessed by longitudinally analyzing changes in the proportion of female sexual partners they report, as has been researched among bisexual women (Diamond, 2008). To provide context to such findings, it is also useful to analyze longitudinal changes in general sexual activity over the life-course among bisexual men, from their initial attraction to and sexual debut with males and females to the assessment of sexual partnerships as these men age, with particular attention to whether changes in sexual expression occur similarly across male and female partnerships.

More information is available related to bisexually-behaving men's *viral bridging* potential. Several studies report that MSMW have higher numbers of sexual partners than their MSMO and MSWE counterparts (Goodenow et al., 2002; W. L. I. V. Jeffries, 2011; Knight et al., 2007; Latkin et al., 2011; Levin, Koopman, Aral, Holmes, & Foxman, 2009; Spikes et al., 2009), though this is not always the case (M. R. Friedman et al., 2013). Such findings must however be interpreted with caution: MSMW are generally classified as such only if they had sex with at least one man and one woman in the timeframes assessed; as such, MSMW may be subject to *de facto* promiscuity bias compared to their peers (Bauer & Brennan, 2013). While several cross-sectional studies report on condomless intercourse rates among MSMW with male and/or female partners, few report on condomless intercourse with partners of serodiscordant/unknown HIV status and none provide trajectory estimates of these risks over time (Agronick et al., 2004; Dodge et al., 2013; W. L. t. Jeffries & Dodge, 2007; Knight et al., 2007; Munoz-Laboy & Dodge, 2007; Nakamura et al., 2011; Spikes et al., 2009; D. P. Wheeler, J. L. Lauby, K.-l. Liu, L. G. Van Sluytman, & C. Murrill, 2008). A recent meta-analysis demonstrated that MSMW were less than half as likely to experience HIV infection than men who have sex with men only (MSMO), estimating that the number of HIV-positive MSMW was equivalent to the number of HIV-positive MSWE in the U.S and concluding that the "bisexual bridge" concept was overstated relative to the data available (M. R. Friedman, Wei, et al., 2014).

We attempted to address these key preconceptions of bisexual men by generating five hypotheses over two domains: bisexual transience and viral bridging. We constructed hypotheses that, if confirmed, would provide empirical support for the preconceptions about bisexual men in each domain. Conversely, if the hypotheses below were rejected, results would be considered evidence that these preconceptions about bisexual men were not supported.

Domain 1

Male bisexuality is transient ("bi now, gay later").

- Hypothesis 1: Among MSMW, the proportion of sexual partners who are female declines significantly over time.
- Hypothesis 2: Among MSMW, total sexual activity with female partners declines significantly over time relative to total sexual activity with male partners.
- Hypothesis 3: MSMW realize attraction to and sexual debut with females at earlier ages than their attraction to and sexual debut with males, respectively.

Domain 2

Bisexual men function as viral bridges, performing sexual activities without regard for their female sexual partners' safety.

- Hypothesis 4: Compared to HIV-negative MSMW, HIV positive MSMW do not differ in rates of sexual activity with female partners.
- Hypothesis 5 (exploratory): Assess the proportion of HIV-positive MSMW with viral load levels above the threshold for heterosexual infectivity who

concomitantly report condomless sex with female partners of serodiscordant/unknown HIV status.

It is essential to understand the extent and nature of transience of bisexual behavior and viral bridging behavior among bisexual men not only to better inform HIV and STI interventions targeting these men, but to also explore areas of divergence between assumptions that underpin biphobic conceptions and the actual lived experiences of bisexuals, so as to better inform interventions intended to reduce biphobia. This study attends to the gap in the literature on bisexual men by testing preconceptions about bisexuality empirically, using data from a longitudinal cohort study.

METHODS

Sample and procedures

We conducted a series of longitudinal and cross-sectional analyses using participant data from a prospective cohort of gay and bisexual men, the Multicenter AIDS Cohort Study (MACS). A prospective cohort study of MSM, the MACS is the longest-running U.S.-based research study of the natural and treated history of HIV/AIDS among gay and bisexual men. The MACS has purposively recruited three successive cohorts, beginning in 1984, in four cities: Chicago, Los Angeles, Baltimore, and Pittsburgh. Men were eligible if they were 18 years of age or older; self-reported as sexually active men who have sex with men; and were HIV-negative or of unknown HIV status or HIV-positive without a pre-existing AIDS-defining illness and: a) either had never taken antiretroviral therapy (ART) or b) if they had taken ART, had laboratory-confirmed CD4 cell and viral load values taken within three months of ART initiation. The second cohort (1987) focused on increased recruitment of MSM of color and MSM who were HIV-positive. The third cohort enrolled HIV-negative and HIV-positive participants between 2001–2003, focusing on those who were racial/ethnic minorities, and relying on targeted recruitment that included HIV care facilities, gay-affiliated venues, and social networks of existing participants; MSM risk behavior was not an exclusion criteria for this cohort. Recruitment strategies varied from 1984–2002, but centered on gay community outreach strategies that were not designed specifically to recruit MSMW (Silvestre et al., 2006). Recruitment techniques and study design have been described in greater detail elsewhere (Dudley et al., 1995; KASLOW et al., 1987; Silvestre et al., 2006). Every six months, participating volunteers return to MACS sites and receive incentives for engaging in a battery of specimen collection, neuropsychological and physical examinations, and behavioral and medical and behavioral surveys. Instruments can be accessed at http://www.statepi.jhsph.edu/macs/forms.html. Participants were surveyed retrospectively in 2008—2009 (Methamphetamine Sub-Study, corresponding with study visits 49–50) on age of attainment of several developmental milestones such as ages of attraction, sexual debut, and identity disclosure. The present analysis was restricted to participants who completed this retrospective survey and reported sexual activity with at least one male and female partner between 2002—2009 (n=111). Supplemental survey design and methods can be found elsewhere (Dyer et al., 2012; M. R. Friedman, Stall, et al., 2014; Herrick et al., 2013).

Measures

Sociodemographics—Sociodemographic information, including HIV status, was obtained from the MACS study database. Further description of sociodemographic variables can be found elsewhere (M. R. Friedman, Stall, et al., 2014).

Proportion of female sexual partners—The total number of each participant's male and female sexual intercourse partners (defined as any penile insertion orally, anally, or vaginally, with or without ejaculation) was summed for each visit. We computed a variable dividing each subject's number of female partners by their total number of partners, if they reported sexual activity at a given study visit.

Bimodal distribution of gender partners—A dichotomous variable was created to represent at each observation whether sexual partners were either all male or all female (bimodal).

Psychosexual development—We asked participants at study visits 49 and 50 (2008/2009) to recall at what ages they experienced several developmental milestones. These included age of first sexual attraction to males and to females; age when one first wondered whether one was gay or bisexual; age at first oral or anal sex with a male and age at first oral, anal, or vaginal sex with a female; and age at first realization of being gay or bisexual. The questions allowed for continuous age responses, as well as response options for "Never," "Don't know/unsure," and "I don't want to answer this question." Responses were analyzed continuously (for ages given, excluding non-responses, uncertain responses, and "never" responses).

Viral load—Assessed using standard laboratory procedures. Later dichotomized to denote potentially efficient transmissibility using a conservative measure (viral load ≥1500 copies/mL) (Quinn et al., 2000).

Condomless vaginal (CVI) or anal (CAI) intercourse with female partners—Participants were asked whether they engaged in CVI or CAI with a main female partner and, if so, what that partner's HIV status was (negative/positive/unknown). By cross-referencing a participant's HIV serostatus with his partner's perceived serostatus for both CVI and CAI and summing and then dichotomizing these results, we created a dichotomous variable indicating any condomless sexual intercourse with main female partners of serodiscordant/unknown HIV status. In the MACS instrument, this variable was assessed only for main female partners, in study visits 46–50 (2007–2009) only.

Potentially efficient transmission events—We further classified condomless intercourse with women as dichotomous variables indicating potentially efficient transmission events if HIV-positive participants had viral loads ≥1500 at visits when condomless intercourse with women was reported.

Statistical analysis

For variables assessed longitudinally (sexual partnership and risk), we conducted a series of generalized linear mixed models using PROC GLIMMIX in SAS 9.3 (SAS Institute, Cary, NC), utilizing the LSMEANS statement for group comparisons and a repeated measures statement with appropriately specified distributions (binary with logit link for dichotomous variables; Poisson with log link for proportions) and model-derived variance components. Overall least-squares means estimates were generated from observed means. Within-MSMW trajectory effects were estimated by calculating the significance of change over time. Longitudinal models controlled for time (study visit), age, race/ethnicity, income, and HIV status, guided by the literature on MSMW (M. R. Friedman, Stall, et al., 2014). We examined cross-sectional variables (differences in retrospectively reported age of attraction and age of sexual debut with males and females, respectively) via paired t-tests.

RESULTS

Sociodemographics

A total of 1625 men (MSMO n=1514; MSMW n=111; total person-visits=18,320; mean number of visits=11.7 of 13 possible visits) reported sexual activity between 2002—2009 with at least one man. Of these, 111 men reported sexual activity with at least one male and at least one female partner during this span. These men were included in longitudinal analyses. Table 1 shows characteristics of MSMW in this sample. Of these MSMW, 93 (83.8%) completed at least one retrospective psychosexual developmental question in visits 49/50 as part of the Methamphetamine Sub-Study; these men were included in cross-sectional analyses.

Domain 1 (Transience of bisexual behavior)

Hypothesis 1: Within MSMW, the proportion of sexual partners who are female declines significantly over time.

Result: We did not find evidence to support this hypothesis. Table 2 shows that, adjusting for covariates, the proportion of female partners was not associated with time (P=.92), suggesting that bisexual behavior over time remained stable. However, the tendency for MSMW to report sexual activity with either all male *or* all female partners (bimodal distribution of partner gender) at a given observation was associated with time (P<.001). While an estimated 78.0% of MSMW reported all male or all female partners at a given observation, these estimates increased from 69.5% at visit 38 to 87.4% by visit 50 (see Figure 1).

We found significant variation in female partner proportion by sociodemographics. Table 3 shows that, adjusting for covariates, the mean proportion of female partners among White MSMW at a given observation was lower than among Black MSMW (11.2% vs. 36.6%; P<.0001) and Hispanic MSMW (11.2% vs. 22.2%; P<.001); Black MSMW reported higher proportions of female sexual partners relative to Hispanics (36.6% vs. 22.2%; P<.001). Higher female partner proportions were also found among low-income MSMW (30.2% vs. 17.8%; P<.0001) and MSMW age 40 and older (27.8% vs. 16.8%; P<.0001). The overall

trend toward bimodal distribution of gender partners at a given observation was not associated with sociodemographic covariates.

Hypothesis 2: Within MSMW, sexual activity with female partners declines significantly over time relative to sexual activity with male partners.

Result: We did not find evidence supporting this hypothesis. Table 2 shows that, within MSMW, significant time effects occurred for reporting any sexual activity with men (p<.001) as well as with women (P<.05). Figure 1 illustrates the general decline over time in reported sexual activity with both and female partners. Table 3 shows that Black MSMW were more likely than White MSMW to report any sex with women (43.8% vs. 28.4%; P<.0001) and less likely to report any sex with men at a given observation (61.0% vs. 86.7%; P<.0001). While no more likely than White MSMW to report any sex with women, Hispanic MSMW were less likely to report any sex with men at a given observation (73.3% vs. 86.7%; P<.01). Hispanic MSMW were more likely (P<.01) than Black MSMW to report any sex with men, but no more likely to report any sex with women.

Hypothesis 3: MSMW realize attraction to and sexual debut with females at earlier ages than their attraction to and sexual debut with males, respectively.

Results: We found evidence *contradicting* this hypothesis. Table 4 shows that MSMW reported later ages of attraction to females than to males (12.6 vs. 10.4; t=2.8, P<.01) and later ages of sexual debut with females than with males (18.2 vs. 14.6; t=3.0, P<.01).

Domain 2 (Viral bridging behavior)

Hypothesis 4: Compared to HIV-negative MSMW, HIV positive MSMW do not differ in rates of sexual activity with female partners.

Results: We found evidence to contradict this. Table 3 shows that, relative to HIV-negative MSMW, HIV-positive MSMW reported lower female partner proportions (16.9% vs. 34.1%; p<.0001) and lower rates of any female sexual partnerships at a given observation (29.4% vs. 45.6%; p<.0001). HIV-positive MSMW were more likely than HIV-negative MSMW to report any *male* sexual partnerships at a given observation (77.1% vs. 65.2%; p<.001).

Hypothesis 5 (exploratory): Assess the proportion of HIV-positive MSMW with viral load levels above the threshold for heterosexual infectivity who concomitantly report condomless intercourse with female partners of serodiscordant/unknown HIV status.

Results: Table 3 shows that overall, just 8.5% of HIV-positive MSMW reported condomless intercourse with female partners at a given observation. Additionally, only 3.5% of HIV-positive MSMW reported potentially efficient transmission sexual events with main female partners at a given observation. These estimates did not vary significantly by age, income, or race/ethnicity.

DISCUSSION

Our report marks one of the first longitudinal analyses of male bisexual behavior, including HIV risk behavior, to be conducted quantitatively over a wide timeframe in the United States. By constructing and attempting to confirm hypotheses that closely parallel popular preconceptions about bisexual men, we assessed whether empirical support exists for these preconceptions. Our findings do not support the preconception that male bisexuality, among this sample, is a transitory state. MSMW experience attractions for and sexual behavior with both males and females in adolescence, and in fact reported attraction and sexual debut with females at earlier ages than with males. In adulthood, they continue to express sexuality with both male and female partners at similarly diminishing rates. Taken together with Diamond's reports on the fluidity of bisexual behavior among adult sexual minority women and their trend toward bimodality of partner-gender partly due to monogamous relationships (Diamond, 2008), our results belie a dominant cultural assumption that bisexuality among men or women is a phase or experiment. Though this may occur during adolescence – when sexuality exploration is experimental in different regards – it is incongruent with reports from adult populations.

Our findings that Black and Hispanic MSMW have higher proportions of female partners than their White counterparts is consistent with other U.S. research (Binson et al., 1995; Millett et al., 2005; Montgomery et al., 2003; Torian, Makki, Menzies, Murrill, & Weisfuse, 2002). Different cultural constructions of masculinity and acceptability of same-sex behavior may inflect sexual expression. Black and Hispanic MSM may be more likely to have sex with female partners in order to "pass" as straight or buffer feelings of internalized homophobia (Agronick et al., 2004; Millett et al., 2005; Munoz-Laboy & Dodge, 2007; Shoptaw et al., 2009).

Though significant media attention has been paid to the HIV risk experienced by female sexual partners of bisexual men, our findings suggest that, in reporting lower ratios of female partnerships compared to HIV-negative MSMW, it is possible that HIV-positive MSMW may be *deliberately inhibiting* their heterosexual HIV transmission risks. The small proportion of HIV-positive MSMW, especially during periods of high viremia, who report condomless intercourse with at-risk main female partners, provides additional evidence that MSMW may be engaging in behaviors at a ceiling of safety. If so, that they are doing so in the absence of nationally deployed behavioral interventions targeting bisexual men is surprising, and suggests that continuing efforts to design, implement, and evaluate interventions for this population may yield further rewards (Martinez-Donate et al., 2010; Operario, Smith, Arnold, & Kegeles, 2010). While previous research has indicated that greater attention must be paid to treatment and care among HIV positive MSMW for their own health (M. R. Friedman, Stall, et al., 2014; Singh, Hu, Wheeler, & Hall, 2014b), their HIV transmission risk threats (at least to main female partners) may be overblown relative to the substantial amplification of these threats in American media (Malebranche, 2008; Saleh & Operario, 2009).

This study has several important limitations. Though these findings derive from a groundbreaking cohort study of HIV/AIDS among MSM, the MACS has recruited via

convenience sampling of primarily gay communities in four cities, and thus may not be generalizable to bisexual men in the U.S. Perhaps as a result of recruitment strategies not targeted to bisexual men, this sample contained an unusually small proportion of MSMW, limiting our power to conduct robust analyses across cultures. Though the cohort has been repeatedly refreshed, older MSM are disproportionately represented, potentially inflecting our findings, including those related to sexual behavior patterns. Retrospective psychosexual measures – and, to a lesser extent, sexual behavior measures from visit to visit – may be subject to significant recall bias. The psychosexual development questions asked during the Methamphetamine Sub-Study, conducted during waves 49 and 50, necessitated our use of an end bookmark for these analyses, excluding those men unable to attend those visits. Certain measures were not ideal for our analyses: perceived HIV status of female partners was only collected for "main" female partners, and only for a limited time. Because the main MACS survey instrument only allowed participants to choose one "main" partner, this limited the salience of response options for men who were polyamorous, including those who might otherwise report having both main male and main female partners. Though it measures sexual behavior, the MACS has not measured sexual identity; because MSMW may not identify as bisexual – and because men who identify as bisexual may not necessarily have sex with both men and women – our results should not be considered to apply specifically to bisexually-identified men. While the present study has a relatively wide timeframe (7 years), MACS participants who died or dropped out of (or were censored from) the study before 2002, or those who reported sex with men and women before 2002 or after 2009 were excluded from analyses, so results may not be representative of the full MACS cohort from 1983 to present. In addition, the MACS instrument only allows participants to select "male" or "female" in assigning gender to their sexual partners; men who had transgender partners could not categorize them as such in reporting their sexual behaviors. Instead of assessing the total number of partners with whom a participant engaged in condomless sex, which perhaps would be a more precise risk assessment, the measures used to gauge sexual risk in the MACS *separately* tabulate the number of male partners with whom a participant reported engaging in insertive condomless anal sex; number of male partners with whom a participant reported engaging in receptive condomless anal sex; the number of female partners with whom a participant reported engaging in insertive condomless vaginal sex; and the number of female partners with whom a participant reported engaging in insertive condomless anal sex.

This study provides empirical evidence that transience and viral bridging notions may be, respectively, misconceived and overstated. We found no evidence for the three hypotheses related to bisexual transience, and little evidence for substantial viral bridging. Further research is needed to assess whether these and other findings can effectively contribute to interventions designed to decrease biphobia and its distal negative health effects. We foresee the potential for these findings to influence interventions intended to increase bisexual acceptance in gay and straight communities; decrease experiences of stigma, marginalization, and internalized biphobia among bisexual men; and amplify opportunities for identity disclosure and social support for bisexual men. Only by creating conditions wherein bisexual men are understood, accepted, and valued by society can we begin to ameliorate the debilitating health disparities that these men face.

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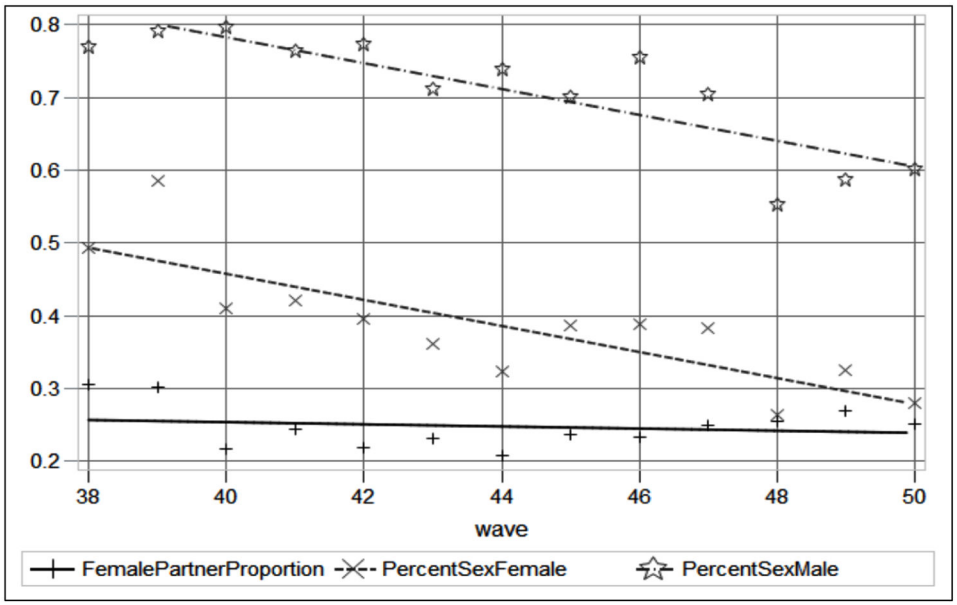

Figure 1.

Proportions of MSMW in the MACS reporting any sex with men, any sex with women, and reported proportion of all sexual partners who are female at each study wave (visits 38–50: 2002—2009): data points and regression lines from least-squares means estimates. FemalePartnerProportion=proportion of total sexual partners reported by participants as female, per wave. PercentSexFemale=proportion of participants reporting any female sexual partners per wave. PercentSexMale=proportion of participants reporting any male sexual partners per wave.

Table 1

Sociodemographics of MSMW in the MACS, study visit 50 (n=111).

Sociodemographics	MSMW N (%)
Race/ethnicity	
White (non-Hispanic)	34 (30.6)
White (Hispanic)	10 (9.0)
Black (non-Hispanic)	55 (49.5)
Black (Hispanic)	4 (3.6)
American Indian/Alaskan	0
Asian/Pacific Islander	0
Other	1 (0.9)
Other Hispanic	7 (6.3)
MACS site	
Baltimore	15 (13.5)
Chicago	45 (40.6)
Pittsburgh	17 (15.3)
Los Angeles	34 (30.6)
Cohort	
1984	28 (25.2)
1987	2 (1.8)
2002	81 (73.0)
HIV Status	
Negative	63 (56.8)
Positive	48 (43.2)
Age	
20–29	12 (10.8)
30–39	16 (14.4)
40–49	47 (42.4)
50–59	22 (19.8)
60+	14 (12.6)
Income	
< $10,000	43 (38.7)
$10,000 – $19,999	18 (16.2)
$20,000 – $29,999	11 (9.9)
$30,000 – $39,999	9 (8.1)
$40,000 – $49,999	2 (1.8)
$50,000 – $59,999	3 (2.7)
≥ $60,000	16 (14.5)
No response	9 (8.1)
Education	
≤ 8th grade	2 (1.8)
9th – 11th grade	15 (13.5)

Sociodemographics	MSMW N (%)
12th grade/HS degree	22 (19.8)
Some college (no degree)	31 (27.9)
College degree	14 (12.6)
Some graduate work	11 (9.9)
Graduate degree	13 (11.7)
No response	3 (2.7)

Table 2

Effects of time (study visit) and sociodemographics on sexual partnerships, sexually active MSMW, 2002—2009 (n=111).

	% of sexual partners who are female		% with bimodally distributed gender of sexual partners		% reporting sex with females		% reporting sex with males	
Predictor variables	**Parameter estimate**	***P***	**Parameter estimate**	***P***	**Parameter estimate**	***P***	**Parameter estimate**	***P***
Time (study visit)	-	0.9200	-	0.0002	-	0.0215	-	0.0051
Race	-	<.0001	-	0.6939	−0.3280	0.0020	-	<.0001
Black, non-Hispanic	−1.0066	-	1.2513	-	−0.2503	-	0.4469	-
Hispanic	−1.5036	-	1.3155	-	−0.6292	-	1.0081	-
White, non-Hispanic	−2.1857	-	1.2249	-	−0.9253	-	1.8770	-
Income < $20,000	−1.1875	<.0001	1.2331	0.7576	−0.4356	0.1962	0.4722	<.0001
Age < 40	−1.8051	<.0001	1.0660	0.0756	−0.6736	0.1780	1.7133	<.0001
HIV negative	−1.0814	<.0001	0.1053	0.5175	−0.1769	<.0001	0.6281	0.0001

Models controlled for study visit, race/ethnicity, income, age under 40, and HIV status.

Table 3

Least-squares means estimates (LSME) at a given observation: sexual partnership, social support, and risk, MACS waves 38–50, 2002—2009 (n=111 for MSMW; n=48 for HIV-positive MSMW)

Sociodemographics	% of sex partners who are female	% bimodal partner gender	# of total sexual partners	% reporting any sex with females	% reporting any sex with males	UVI/UAI with main female partner of serodiscordant/ unknown HIV status *(HIV +only)*	Potentially efficient transmission events with main female partners *(HIV+ only)*
Race							
White, non-Hispanic	11.2%	77.3%	15.0	28.4%	86.7%	15.0%	9.9%
Hispanic†	22.2%***	78.8%	4.9****	34.8%	73.3%**	11.2%	2.4%
Black, non-Hispanic†	36.6%****	77.8%	4.8****	43.8%***	61.0%****	12.6%	6.4%
Income < $20,000	30.2%	77.6%	5.7	39.3%	61.6%	9.5%	9.1%
Income ≥ $20,000	17.8%****	78.6%	7.9*	34.9%	82.6%****	6.2%	1.3%
Age < 40	16.8%	73.7%	7.0	33.8%	84.7%	7.9%	5.6%
Age ≥ 40	27.8%****	79.4%	6.3	38.8%	65.1%****	8.8%	0.9%
HIV-negative	34.1%	77.2%	5.8	45.6%	65.2%	-	-
HIV-positive	16.9%****	78.9%	7.3	29.4%****	77.1%***	8.5%	3.5%
Overall LSME	24.4%	78.0%	-	37.5%	71.2%	8.5%	3.5%

†Compared with White, non-Hispanic.

Models controlled for study visit, race/ethnicity, income, age under 40, and HIV status.

Table 4

Psychosexual milestone attainment among MSMW, 2008/2009 (n=91)

Psychosexual milestones	N (%)	Mean years (± s.d.)	t	P-value
Age at sexual attraction to male	71 (78.0%)	10.4 (± 3.9)	-	-
Never	6 (6.6%)	-	-	-
Not sure/refuse/missing	14 (15.4%)	-	-	-
Age at first sexual attraction to female	67 (73.6%)	12.6 (± 4.3)	-	-
Never	13 (14.3%)	-	-	-
Not sure/refuse/missing	11 (12.1%)	-	-	-
Age first wonder whether gay or bisexual	67 (73.6%)	14.2 (± 4.4)	-	-
Never	8 (8.8%)	-	-	-
Not sure/refuse/missing	16 (17.6%)	-	-	-
Age at first sex with a male	84 (92.3%)	14.6 (± 5.7)	-	-
Never	3 (3.3%)	-	-	-
Not sure/refuse/missing	4 (4.4%)	-	-	-
Age at first sex with a female	84 (92.3%)	18.2 (± 8.7)	-	-
Never	3 (3.3%)	-	-	-
Not sure/refuse/missing	4 (4.4%)	-	-	-
Age first realized gay or bisexual	69 (75.8%)	16.3 (± 4.7)	-	-
Never	6 (6.6%)	-	-	-
Not sure/refuse/missing	16 (17.6%)	-	-	-
Difference in first age of attraction to males from first age of attraction to females	54 (59.3%)	2.1 (± 0.7)	2.8	.007
Difference in age of sexual debut with males from age of sexual debut with females	78 (85.7%)	3.7 (± 1.3)	3.0	.004