

UCSF

UC San Francisco Previously Published Works

Title

Information, Motivation, and Self-Efficacy Among Men Who Have Sex With Men and Transgender Women in the State of Maharashtra, India

Permalink

<https://escholarship.org/uc/item/4wz8b5s2>

Journal

Health Education & Behavior, 46(2)

ISSN

1090-1981

Authors

Wilkerson, J Michael
Rhoton, Jayson Michael
Li, Dennis
[et al.](#)

Publication Date

2019-04-01

DOI

10.1177/1090198118796880

Peer reviewed



Published in final edited form as:

Health Educ Behav. 2019 April ; 46(2): 304–311. doi:10.1177/1090198118796880.

Information, Motivation, and Self-Efficacy among Men Who Have Sex with Men and Transgender Women in the State of Maharashtra, India

J. Michael Wilkerson, PhD, MPH¹, Jayson M. Rhoton, MA¹, Dennis Li, MPH¹, Shruta Rawat, MSc², Pallav Patankar, MBA², B. R. Simon Rosser, PhD, MPH³, Maria L. Ekstrand, PhD^{4,5}

¹The University of Texas Health Science Center at Houston (UTHealth) School of Public Health, Houston, Texas, USA

²The Humsafar Trust, Mumbai, Maharashtra, India

³University of Minnesota School of Public Health, Minneapolis, Minnesota, USA

⁴University of California San Francisco Center for AIDS Prevention Studies, San Francisco, California, USA

⁵St John's Research Institute of St John's National Academy of Health Sciences, Bengaluru, India

Abstract

Background: India's National AIDS Control Programme calls for, among other things, targeted behavioral interventions that address determinants contributing to new infections among men who have sex with men (MSM) and hijras (transgender women).

Aim: To determine if the information-motivation-behavioral skills (IMB) model was transferable to an Indian context.

Methods: We recruited 442 MSM and 7 hijras into an online cross-sectional study that asked questions about condom use knowledge, motivation, self-efficacy, and sexual behavior. Structural equation modeling was used to test the overall IMB structure.

Results: Overall fit of the model was good: $\chi^2(201, N=447)=445.002, p<0.0001$, RMSEA=0.052, 90%CI [.046, .059], CFI=.989, TLI=.987. Condom use and HIV risk knowledge did not significantly predict condom use self-efficacy or having condomless anal sex with more than one male partner in the past 3 months, and knowledge was not significantly correlated with attitudes toward barebacking. Despite this, the final structural model explained 14.4% of the variance in condom use self-efficacy and 20.0% of the variance in risky sexual behavior

Conclusion: The public health response to India's HIV epidemic is currently different than in the West due to differences in medication access and public health infrastructure. As Indian MSM

CORRESPONDENCE: Please direct all correspondence to J. Michael Wilkerson, PhD, MPH, The University of Texas Health Science Center at Houston (UTHealth) School of Public Health, 7000 Fannin, Suite 2620, Houston, TX 77030. Phone: 713.500.9974. Fax: 713.500.9750. Johnny.M.Wilkerson@uth.tmc.edu.

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

and hijras learn more about the effectiveness of viral suppression and hopefully have greater access to PrEP, researchers should monitor for changing attitudes towards condoms and be prepared to collaborate with the public health infrastructure to develop interventions that reinforce positive attitudes towards condom use.

Keywords

Internet-based survey; Gay men; HIV prevention; Behavior change; Structural equation modeling

Introduction

Since the introduction of TasP (Treatment as Prevention) and pre-exposure prophylaxis (PrEP) much of the western HIV-prevention has focused on early identification, anti-retroviral treatment (ART), retention in care, and PrEP-uptake among persons at greatest risk for HIV (Hankins & Dybul, 2013; Young & McDaid, 2014). U.S. men who have sex with men (MSM) living in urban centers or a large gay male community have greater access to ART, PrEP, and support of behavioral interventions (F., Chen, & McFarland, 2015; Raymond et al., 2013). However, Indian MSM have less access to ART, PrEP, and behavioral risk reduction interventions (National AIDS Control Organisation). Additionally, a weaker healthcare infrastructure makes it difficult for MSM to access prevention services (Li et al., 2016). Consequently, prevention efforts have focused increasing condom use, linkage to care, and retention in care when viral load reaches 350 cells/mm³(National AIDS Control Organisation). To address these gaps, Phase IV (2012–2017) of India's National AIDS Control Programme calls for the strengthening of the healthcare infrastructure, and the implementation of targeted interventions that focus on determinants of HIV transmission (National AIDS Control Organisation).

This focus creates an opportunity to develop new theoretically based behavioral interventions that address the determinants driving infection, such as stigmatizing attitudes towards homosexuality and persons living with HIV (Chakrapani, Newman, Shunmugam, Kurian, & Dubrow, 2009; Chakrapani, Newman, Shunmugam, McLuckie, & Melwin, 2007; Ekstrand, Bharat, Ramakrishna, & Heylen, 2012; Li et al., 2016). Salient determinants include inconsistent condom use, sexual concurrency, substance use, depression and anxiety disorders, a lack of knowledge about safer sexual practices, and less condom use self-efficacy (Brahmam et al., 2008; Chakrapani et al., 2009; Mimiaga et al., 2010; Newman, Chakrapani, Cook, Shunmugam, & Kakinami, 2006; Phillips et al., 2010; Thomas et al., 2011; Thomas et al., 2009).

The information-motivation-behavioral skills model (IMB; (Fisher & Fisher, 1992)) attempts to address individual-level determinants by increasing knowledge about a risk reduction behavior and increasing motivation and skills to enact the behavior. Behavioral skills can be measured directly via observation or through measures of self-efficacy (confidence in ability) to perform a skill. Developed to inform HIV/STI-prevention interventions targeting MSM, interventions theoretically based in IMB have been used to decrease substance use (Avants, Margolin, Usubiaga, & Doebrick, 2004; Avants, Warburton, Hawkins, & Margolin, 2000; Margolin, Avants, Warburton, Hawkins, & Shi, 2003) and increase condom use

(Bryan, Fisher, Fisher, & Murray, 2000; Crosby et al., 2008; Nostlinger et al., 2011; Scott-Sheldon et al., 2010) in the US and Europe.

The purpose of this analysis was to determine if the IMB was transferable to an Indian context. Therefore, we have operationalized the IMB constructs of information as knowledge about condoms effectiveness at preventing HIV. We defined motivation by assessing attitudes toward barebacking, which assesses the individual's personal motivation to perform a preventive behavior. Finally, we operationalized behavioral skills as condom self-efficacy. Condom-self efficacy assesses the individual's confidence in his ability to perform the behavior. Based on the model, well-informed and highly motivated individuals will engage in preventive behaviors. Therefore, we hypothesized that among an Indian sample of MSM, having information about HIV would positively predict condom use self-efficacy (confidence in condom use skills). While being motivated toward risky sexual behavior would negatively predict condom use self-efficacy. Conversely, HIV information and condom use self-efficacy would negatively predict risky sexual behavior, and motivation would positively predict the outcome. In line with the IMB model, we hypothesized that self-efficacy would be the strongest predictor of risky sexual behavior.

Methods

Study Design

Between September 2013 and May 2014, we recruited 449 MSM and hijras through banner advertisements on gay websites, social media advertisements and posts, and the distribution of print materials at outreach events hosted by LGBT and HIV services organizations in the State of Maharashtra, India. The banner advertisements, social media advertisements and posts, and print materials directed participants to the study website where they could complete the eligibility screen. Eligible participants self-identified as MSM or hijras/transgender women living in the State of Maharashtra, being at least 18 years of age, having regular Internet access, and having at least one male sex partner in the previous 90 days. Once eligibility was determined, participants were provided with an overview of the study. It took approximately 30 minutes to complete the eligibility screener, consent process, and survey in Hindi, Marathi, or English. We translated and back-translated all study materials. For completion of the survey, participants were compensated 300 (approximately \$7 US) in the form of a gift card to an online retailer that supports India's sexual and gender minority community. The institutional review boards of the authors' institutions approved study procedures.

Measures

Participants were asked questions about IMB constructs, online and offline sexual behavior, and demographic characteristics. All data were self-report. Items relevant to this analysis are described below.

Knowledge.—To assess the information construct, participants answered 4 true/false items about condom use and HIV risk (see Table 2 for specific items). We developed knowledge items in collaboration with our community advisory board. We computed a knowledge sum

score of all correct responses, which was treated as an observed variable in subsequent SEM analyses. Higher values indicate more correct knowledge about condom use and HIV risk.

Attitudes toward barebacking.—The attitudes toward barebacking scale (Halkitis, Parsons, & Wilton, 2003) was used as a proxy for the motivation construct. Participants rated their agreement with 9 statements about condomless sex (see Table 2) on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher values indicate more favorable attitudes toward barebacking. Internal consistency was high ($\alpha = 0.94$).

Condom use self-efficacy.—Confidence in ability to use condoms was indicated by 11 items measuring the condom use self-efficacy construct. Participants were asked how sure they were that they could use a condom in various situations (see Table 2). Items were scored on a 5-point ordinal scale from 1 (*not at all sure*) to 5 (*completely sure*), and higher values indicate greater self-efficacy. The items were adapted from items from the Men's Internet Study (Marin, Gomez, Tschann, & Gregorich, 1997; Rosser et al., 2010). To assess validity of the self-efficacy measure, we conducted an exploratory factor analysis (EFA) with oblique rotation and a confirmatory factor analysis (CFA) on a 20–80 randomized split of the sample, respectively (Table 1). Although a two-factor solution appeared to have better fit than a one-factor solution, the correlation between the two factors was very high, greater than .95 in the CFA and full samples. Thus, the one-factor solution, which had adequate fit and internal consistency ($\alpha = 0.90$), was selected.

Risky sexual behavior.—Participants were asked about the number of male and hijra partners they met online or offline with whom they had insertive or receptive anal sex without a condom in the past 3 months. The four variables were summed to get a total number of condomless anal sex acts (CAS) with male partners and then dichotomized between having one or fewer versus having two or more male partners with whom they engaged in CAS in the past 3 months.

Data Analysis

A CFA was first conducted on the full sample for the latent variable measurement models (i.e., attitude towards barebacking, condom use self-efficacy) to examine data fit. Then, the measurement model was added to the structural equation model (SEM) to test the overall IMB structure. Several model fit indices are reported, but model fit was chiefly evaluated using the comparative fit index (CFI) (Bentler, 1990) and Tucker Lewis Index (TLI) (Tucker & Lewis, 1973) because χ^2 is affected by sample size and correlations whereas small degrees of freedom inflates the root mean square error of approximation (RMSEA) (Kenny, Kaniskan, & McCoach, 2014). Values of $>.95$ for CFI, $>.90$ for TLI, and $<.06$ for RMSEA are generally considered an indication of adequate fit (Hu & Bentler, 1999). Descriptive analyses were conducted using STATA 13 (StataCorp LP, 2012), and the EFA, CFA and SEM were conducted using Mplus 7 (Muthén & Muthén, 2012).

Results

Sample Description

Participant characteristics are summarized in Table 2. Participants ranged from 18 to 64 years old, with an average age of 29.47 ($SD = 8.28$). Almost 56% were middle or upper class, based on an income of 25,001 or more per month, and 85% indicated they had completed post-secondary education. Approximately 56% reported being open or out about their sexuality to few or half of the people they knew whereas almost 20% were out to most or all the people they knew; a quarter of the men said they were not out to anyone at all.

Measurement Models

Table 3 details the mean scores for each item in each of the IMB variables as well as the standardized factor loadings for the attitudes toward barebacking and the condom use self-efficacy scales. For both latent variables, almost all items loaded highly and significantly onto their respective factors. The initial measurement model for attitudes toward barebacking showed no large residuals or outliers, no item correlations greater than .90, and adequate fit according to the CFI and TLI: $\chi^2(27, N=444) = 496.640, p < 0.0001$, RMSEA=0.198, 90%CI [.183, .213], CFI=.966, TLI=.955. Based on the results of the CFI, TLI and CI fit indices and the hypothesized factor model. We made four modifications to the model to account for theoretical IMB connections between items. These modifications improved the model fit slightly: $\chi^2(23, N=444) = 288.363, p < 0.0001$, RMSEA= 0.161, 90%CI [.145, .178], CFI=.981, TLI=.970.

For condom use self-efficacy, the one-factor solution showed adequate fit: $\chi^2(44, N=438) = 192.338, p < 0.0001$, RMSEA=0.088, 90% CI [.075, .101], CFI=.988, TLI=.984. There were no large residuals or outliers, and only one item correlation was greater than .90. The condom use self-efficacy model showed evidence of good convergent validity (AVE=0.71) and good composite reliability (CR=0.96). The attitudes toward barebacking scale showed evidence of good convergent validity (AVE=0.76) and good composite reliability (CR=0.97).

Structural Model

Figure 1 shows the final structural model for the IMB SEM among a sample of Indian MSM with standardized path coefficients. We chose WLSMV estimator because of our ordinal data. Overall fit of the model was good: $\chi^2(201, N=447)=445.002, p < 0.0001$, RMSEA=0.052, 90%CI [.046, .059], CFI=.989, TLI=.987. No post hoc modifications were made because the data fit the model well. All paths were statistically significant except for those associated with knowledge. Condom use, and HIV risk knowledge did not significantly predict condom use self-efficacy or having more than one CAS male partner in the past 3 months. In addition, contrary to the IMB model, knowledge was also not significantly correlated with attitudes toward barebacking. Despite this, the final structural model explained 14.4% of the variance in condom use self-efficacy and 20.0% of the variance in risky sexual behavior.

Discussion

The IMB model did not fully perform as predicted in an Indian sample of MSM and hijras. CAS with two or more partners in the past 3 months was associated with proxies for motivation and self-efficacy as hypothesized. Per the IMB model (Fisher & Fisher, 1992), we also hypothesized a negative correlation between knowledge of safer sex strategies and attitudes towards barebacking and positive associations between knowledge and self-efficacy and CAS. Contrary to our hypothesis, there was not a statistically significant association between knowledge and motivation, self-efficacy, and behavior.

Participants' knowledge of safer sex practices was mixed. The variations in the proportion of correct responses could explain the lack of association between knowledge and the other constructs. While the majority (98%) knew that condoms were the best way to prevent the spreading of HIV is when putting their penis inside someone's anus, only half (53%) could differentiate the risk associated with oral and anal sex. Few knew that more risk was associated with being a receptive anal sex partner than the insertive partner (13%) or that a person living with HIV whose viral load is undetectable is less likely to transmit the virus to someone else (23%). The responses to these items suggest Indian MSM and hijras have varying levels of information about safer sex practices, but that information is not associated with preventive behavior. Our results support prior findings by Fisher and Fisher, (1992, 2000) which found that information does not always translate to motivation. While we cannot fully state that lack of motivation was the predictor of low condom use, we can question the conceptualization the role information has in predicting behavior. More study is required to understand how we can translate a HIV prevention model based on western data into an Indian MSM context.

As India is not able to provide ART to all persons living with the virus regardless of viral load and PrEP to persons at greatest risk, the information Indian MSM will need to make protective sexual health choices will need to expand beyond the items assessed in this survey. To aid the public health infrastructure in preparing for increased access to medications, future research should begin exploring how to educate Indian MSM and hijras about medication adherence and PrEP.

Overall, the men in our sample tended to disagree with the statements that are positively associated with bareback sex (Halkitis et al., 2003), and the men had fairly high condom use self-efficacy, suggesting cognitive barriers to condom use when engaging in anal sex are low. As Indian MSM and hijras learn more about the effectiveness of viral suppression and hopefully have access to PrEP, researchers should monitor for changing attitudes towards condoms and be prepared to collaborate with the public health infrastructure to develop interventions that reinforce positive attitudes towards condom use.

Limitations and Strengths

There are a few limitations to this study. The knowledge scale was not piloted tested or pretested. In future projects, the knowledge scale should be piloted tested and validated. Self-reported data were from a cross-sectional study, and the sampling frame included only MSM and hijras with access to technology. Longitudinal data would strengthen study

findings. The sample included mostly men from Mumbai; many were educated and middle-class. Because the study participants did not differ greatly on personal characteristics, we believe this could be a threat to internal validity. Findings might not be generalizable to all Indian MSM and Hijras. Although access to the Internet and smartphones is growing in India, disparities to access exist by income and proximity to an urban area (Internet Live Stats, 2016). Despite these limitations, study findings can inform public health practitioners working to implement Phase IV and develop and implement Phase V.

Implication for Practice

Phase IV of the National AIDS Control Programme outlines the nation's strategy to prevent HIV transmission in India. Relative to MSM and hijras, the program calls for improved access to treatment for persons living with HIV; the reduction of stigma experienced by persons living with HIV and marginalized communities most affected by the virus, including MSM and hijras; and targeted behavioral interventions that address determinants most contributing to new infections (Government of India Ministry of Health and Family Welfare, 2012). Findings from the current study will inform future development of prevention messages. We believe that our findings suggest that prevention messages should expand beyond increasing knowledge toward safe sex. Consistent with our findings, HIV prevention messages should increase self-efficacy to use condoms under difficult circumstances (e.g., while using drugs or alcohol).

The public health response to India's HIV epidemic is currently different than in the West due to differences in medication access and public health infrastructure. Future phases of the National AIDS Control Programme will likely build upon the achievements experienced in Phase IV. In time, it is likely that India will be able to adapt successful viral suppression and PrEP strategies being implemented in the West, so it is prudent to begin planning for how to adapt strategies found successful in western contexts. While it is also prudent to focus on improving behavioral interventions that increase condom use knowledge, motivation, and self-efficacy, there is a need to identify and understand barriers to condom use not included in the IMB model. It is likely that cultural and structural barriers specific to the Indian context need to be considered. Based on findings from this study, public health practitioners should increase MSM and hijras's knowledge of condom use and reaffirm positive attitudes and self-efficacy to use condoms when engaging in anal sex with more than one partner. Researchers should explore how to adapt the IMB model for the Indian context.

FUNDING

The study Internet-Based HIV Prevention for Indian MSM (ISHKconnect) was funded by the Indian Council of Medical Research, Division of Epidemiology and Communicable Diseases, grant number INDO-US/84/2010-ECD-II and the National Institutes of Health, National Institute of Allergy and Infectious Diseases, grant number 1R21AI094676-01. Research protocols were approved by The University of Texas Health Science Center at Houston (UTHealth) Committee for the Protection of Human Subjects and The Humsafar Trust, the University of Minnesota, and the University of California San Francisco Institutional Review Boards.

References

Avants SK, Margolin A, Usubiaga MH, & Doebrick C (2004). Targeting HIV-related outcomes with intravenous drug users maintained on methadone: A randomized clinical trial of a harm reduction

- group therapy. *Journal of Substance Abuse Treatment*, 26(2), 67–78. doi:10.1016/S0740-5472(03)00159-4 [PubMed: 15050083]
- Avants SK, Warburton LA, Hawkins KA, & Margolin A (2000). Continuation of high-risk behavior by HIV-positive drug users. Treatment implications. *Journal of Substance Abuse Treatment*, 19(1), 15–22. [PubMed: 10867296]
- Bentler PM (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238–246. [PubMed: 2320703]
- Brahmam GN, Kodavalla V, Rajkumar H, Rachakulla HK, Kallam S, Myakala SP, ... Ramesh BM (2008). Sexual practices, HIV and sexually transmitted infections among self-identified men who have sex with men in four high HIV prevalence states of India. *AIDS*, 22 Suppl 5, S45–57. doi: 10.1097/01.aids.0000343763.54831.15 00002030–200812005–00004 [pii]
- Bryan AD, Fisher JD, Fisher WA, & Murray DM (2000). Understanding condom use among heroin addicts in methadone maintenance using the information-motivation-behavioral skills model. *Substance Use and Misuse*, 35(4), 451–471. [PubMed: 10741537]
- Chakrapani V, Newman PA, Shunmugam M, Kurian AK, & Dubrow R (2009). Barriers to free antiretroviral treatment access for female sex workers in Chennai, India. *AIDS Patient Care STDS*, 23(11), 973–980. doi:10.1089/apc.2009.0035 [PubMed: 19821725]
- Chakrapani V, Newman PA, Shunmugam M, McLuckie A, & Melwin F (2007). Structural violence against Kothi-identified men who have sex with men in Chennai, India: a qualitative investigation. *AIDS Education and Prevention*, 19(4), 346–364. doi:10.1521/aeap.2007.19.4.346 [PubMed: 17685847]
- Crosby RA, Salazar LF, Yarber WL, Sanders SA, Graham CA, Head S, & Arno JN (2008). A theory-based approach to understanding condom errors and problems reported by men attending an STI clinic. *AIDS and Behavior*, 12(3), 412–418. doi:10.1007/s10461-007-9264-1 [PubMed: 17588147]
- Ekstrand ML, Bharat S, Ramakrishna J, & Heylen E (2012). Blame, symbolic stigma and HIV misconceptions are associated with support for coercive measures in urban India. *AIDS Behav*, 16(3), 700–710. doi:10.1007/s10461-011-9888-z [PubMed: 21290175]
- F. RH, Chen YH, & McFarland W (2015). Estimating incidence of HIV infection among men who have sex with men, San Francisco, 2004–2014. *AIDS & Behavior*, Epub ahead of print.
- Fisher JD, & Fisher WA (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, 111(3), 455–474. doi:10.1037/0033-2909.111.3.455 [PubMed: 1594721]
- Government of India Ministry of Health and Family Welfare, D. o. A. C. (2012, 2012). National AIDS Control Programme Phase-IV (2012–2017). Retrieved from http://www.nacoonline.org/National_AIDS_Control_Program/
- Halkitis PN, Parsons JT, & Wilton L (2003). Barebacking among gay and bisexual men in New York City: Explanations for the emergence of intentional unsafe behavior. *Archives of Sexual Behavior*, 32(4), 351–357. [PubMed: 12856896]
- Hankins CA, & Dybul MR (2013). The promise of pre-exposure prophylaxis with antiretroviral drugs to prevent HIV transmission: a review. *Curr Opin HIV AIDS*, 8(1), 50–58. doi:10.1097/COH.0b013e32835b809d [PubMed: 23201856]
- Hu L, & Bentler PM (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55.
- Internet Live Stats. (2016). India internet users. Retrieved from <http://www.internetlivestats.com/internet-users/india/>
- Kenny DA, Kaniskan B, & McCoach DB (2014). the performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, 44(3), 486–507. doi: 10.1177/0049124114543236
- Li DH, Rawat S, Rhoton J, Patankar P, Ekstrand ML, Rosser BR, & Wilkerson JM (2016). Harassment and violence among men who have sex with men (MSM) and Hijras after reinstatement of India's "Sodomy Law". *Sexuality Reserach and Social Policy*, 14(3), 324–330. doi:10.1007/s13178-016-0270-9
- Margolin A, Avants SK, Warburton LA, Hawkins KA, & Shi J (2003). A randomized clinical trial of a manual-guided risk reduction intervention for HIV-positive injection drug users. *Health Psychology*, 22(2), 223–228. [PubMed: 12683743]

- Marin BV, Gomez CA, Tschann JM, & Gregorich SE (1997). Condom use in unmarried Latino men: A test of cultural constructs. *Health Psychology; Health Psychology*, 16(5), 458–467. doi: 10.1037/0278-6133.16.5.458
- Mimiaga MJ, Biello KB, Sivasubramanian M, Mayer KH, Anand VR, & Safren SA (2010). Psychosocial risk factors for HIV sexual risk among Indian men who have sex with men. *AIDS Care*, 25(9), 1109–1105. doi:10.1080/09540121.2012.749340
- Muthén B, & Muthén LK (2012). *Mplus (Version 7)*. Los Angeles: Muthén & Muthén.
- National AIDS Control Organisation. (2007). National AIDS Control Programme Phase-III (2007–2012). Retrieved from http://www.nacoonline.org/National_AIDS_Control_Program/
- Newman PA, Chakrapani V, Cook C, Shunmugam M, & Kakinami L (2006). Determinants of sexual risk behavior among men who have sex with men accessing public sex environments in Chennai, India. *Journal of LGBT health research*, 4(2–3), 81–87.
- Nostlinger C, Niderost S, Platteau T, Muller MC, Stanekova D, Gredig D, ... The Eurosupport Study, G. (2011). Sexual protection behavior in HIV-positive gay men: Testing a modified information-motivation-behavioral skills model. *Archives of Sexual Behavior*, 40(4), 817–827. doi:10.1007/s10508-010-9682-4 [PubMed: 20878223]
- Phillips AE, Lowndes CM, Boily MC, Garnett GP, Gurav K, Ramesh BM, ... Alary M (2010). Men who have sex with men and women in Bangalore, South India, and potential impact on the HIV epidemic. *Sexually Transmitted Infections*, 86(3), 187–192. doi:10.1136/sti.2009.038216 [PubMed: 20522632]
- Raymond HF, Chen YH, Ick T, Scheer S, Bernstein K, Liska S, ... McFarland W (2013). A new trend in the HIV epidemic among men who have sex with men, San Francisco, 2004–2011. *Journal of Acquired Immune Deficiency Syndromes*, 62(5), 584–589. doi:10.1097/QAI.0b013e318285febf [PubMed: 23334505]
- Rosser BRS, Oakes JM, Konstan JA, Hooper S, Horvath KJ, Danilenko GP, & Nygaard KE (2010). Reducing HIV risk behavior of MSM through persuasive computing: Results of the Men's INternet Study (MINTS-II). *AIDS*, 24(13), 2099–2107. [PubMed: 20601853]
- Scott-Sheldon LA, Carey MP, Vanable PA, Senn TE, Coury-Doniger P, & Urban MA (2010). Predicting condom use among STD clinic patients using the information-motivation-behavioral skills (IMB) model. *Journal of health psychology*, 15(7), 1093–1102. doi: 10.1177/1359105310364174 [PubMed: 20453055]
- StataCorp LP. (2012). *STATA-IC (Version 12.1)*. College Station, TX: StataCorp LP.
- Thomas B, Mimiaga MJ, Kumar S, Swaminathan S, Safren SA, & Mayer KH (2011). HIV in Indian MSM: reasons for a concentrated epidemic & strategies for prevention. *The Indian journal of medical research*, 134(6), 920–929. doi:10.4103/0971-5916.92637 [PubMed: 22310824]
- Thomas B, Mimiaga MJ, Menon S, Chandrasekaran V, Murugesan P, Swaminathan S, ... Safren SA (2009). Unseen and unheard: predictors of sexual risk behavior and HIV infection among men who have sex with men in Chennai, India. *AIDS Education and Prevention*, 21(4), 372–383. doi: 10.1521/aeap.2009.21.4.372 10.1521/aeap.2009.21.4.372[pii]
- Tucker LR, & Lewis C (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 1, 1–10.
- Young I, & McDaid L (2014). How acceptable are antiretrovirals for the prevention of sexually transmitted HIV?: A review of research on the acceptability of oral pre-exposure prophylaxis and treatment as prevention. *AIDS Behav*, 18(2), 195–216. doi:10.1007/s10461-013-0560-7 [PubMed: 23897125]

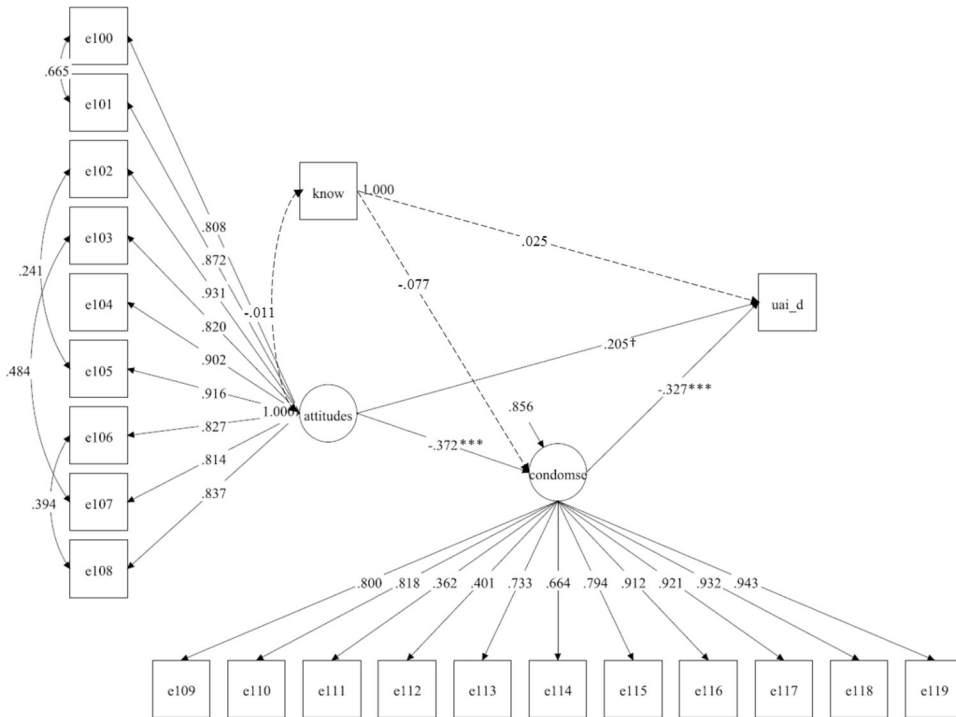


Figure 1. Final structural model for IMB in a sample of Indian MSM ($N=449$) with standardized path coefficients. Dotted lines indicate non-significant paths. All measurement model paths and covariance were statistically significant. † $p < .05$, * $p < .01$, ** $p < .001$, *** $p < .0001$. Abbreviations for the IBM constructs represented in the model are as follows: know is the knowledge construct, attitudes is the attitudes construct, and condomse is the self-efficacy construct. The indicator names for each latent variable are presented in Table 3.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1. Model fit statistics of selected exploratory and confirmatory factor analyses for condom use self-efficacy

Model	χ^2 , df	p-value	RMSEA	90% CI	CFI	TLI	SRMR/WRMR	Factor correlation
EFA sample n=95	80.769, 44	0.0006	0.096	[.062, .128]	0.990	0.987	0.072	--
1-factor, 11-item		0.0004	0.144	[.074, .154]	0.991	0.988	0.062	--
1-factor, 9-item ^a	58.244, 27							
2-factor, 11-item	49.275, 34	0.0437	0.070	[.012, .111]	0.996	0.993	0.052	0.791
2-factor, 9-item ^a	19.439, 19	0.4290	0.016	[.000, .095]	1.000	1.000	0.025	0.799
CFA sample n=354	171.045, 44	<0.0001	0.091	[.077, .106]	0.986	0.983	0.928	--
1-factor, 11-item		<0.0001	0.088	[.073, .102]	0.987	0.984	0.884	0.957
2-factor, 11-item	157.467, 43							
2-factor, 9-item ^a	160.140, 26	<0.0001	0.122	[.104, .140]	0.985	0.979	0.984	0.956

^aDropped items e111 and e112 because of lower factor loadings

Table 2.ISHKconnect participant characteristics ($N = 449$)

Demographics	n (%) ^a
Age ($M[SD]$)	29.46 (8.28)
Hijra/transgender	7 (1.59)
Lives in Greater Mumbai/Thane	
Yes	335 (74.61)
No	114 (25.39)
Earn Rs. 25,001 or more	
Yes	185 (44.26)
No	233 (55.74)
Completed college	
Yes	384 (87.07)
No	57 (12.93)
Employment status	
Not employed	47 (10.66)
Employed full-time	267 (60.54)
Employed part-time	31 (7.03)
Student - not employed	63 (14.29)
Student - employed full or part time	33 (7.48)
In a long-term relationship	
With a male	175 (39.77)
With a female	83 (18.99)
HIV	
Positive	10 (2.25)
Negative	336 (75.68)
Status unknown	98 (22.07)
Outness	
Not open at all	110 (24.72)
Open to a few to about half of people they know	249 (55.96)
Open to all or most people they know	86 (19.33)
Location meeting partners in past 3 months	
Online only	212 (61.27)
Mixed online and offline	105 (30.35)
Offline only	29 (8.38)
Victimization	
Ever	252 (56.50)
Within the past 12 months	165 (37.08)
Over 12 months ago/never	280 (62.92)

^aPercentages calculated with missing data removed.

Table 3.

Measurement models and items for the IMB variables (N=449)

Variable	Label	n	% Correct	Standardized factor loading in CFA
UAI-HIV knowledge (sum score mean and standard deviation)	know	437	2.670 (0.827)	
When putting your penis inside someone's anus, condoms are the best way to prevent spreading HIV (True)		445	0.984	
Putting your penis inside someone's anus without a condom is just as risky as letting someone put their penis in your anus without a condom (False)		445	0.133	
Oral sex without a condom is just as risky as anal sex without a condom (False)		440	0.534	
An HIV-positive person with an undetectable viral load is less likely to give someone HIV (True)		414	0.227	
			<i>M (SD)</i>	
Attitudes toward barebacking (latent)	attitudes			
Increases intimacy between men ^a	e100	444	3.342 (2.289)	.808
Makes sex more romantic ^a	e101	443	3.302 (2.347)	.872
Is sexier than sex with condoms ^b	e102	441	3.349 (2.361)	.931
Is more "butch" and manly ^c	e103	443	2.524 (2.068)	.820
Affirms love between men	e104	443	2.648 (2.165)	.902
Is hotter than sex with condoms ^b	e105	440	3.311 (2.434)	.916
Has psychological benefits ^d	e106	442	2.600 (2.090)	.827
Affirms masculinity ^c	e107	440	2.148 (1.864)	.814
Has emotional benefits ^d	e108	437	2.751 (2.233)	.837
			<i>M (SD)</i>	
Condom use self-efficacy (latent)	condom SE			
Avoid situations that can lead to unsafe sex	e109	425	4.012 (1.134)	.800
Use a condom without "breaking the mood"	e110	421	4.050 (1.175)	.818
Avoid getting drunk or high when you're going to have sex	e111	392	3.691 (1.419)	.362
Stop to use a condom even if you are very sexually aroused (horny)	e112	392	3.383 (1.620)	.401
Always keep a supply of condoms available	e113	417	3.890 (1.331)	.733
Pull out while still erect after ejaculating (cumming) when having sex with a condom	e114	380	3.384 (1.482)	.664
Use a condom without having it slip or break	e115	408	3.895 (1.252)	.794
Get any partner to use a condom even if they don't want to	e116	407	4.012 (1.264)	.912
Say no to sex if there is not a condom available, no matter how sexually aroused (horny) you are	e117	420	3.943 (1.353)	.921

Variable	Label	n	% Correct	Standardized factor loading in CFA
Use a condom even when you have been drinking or using drugs	e118	328	4,012 (1,304)	.932
Talk to any partner bout using condoms no matter how aroused (horny) you are	e119	415	4,173 (1,199)	.943
UAI with 2 or more male partners	uai_d	358	12.57%	

Note. Superscripts denote observed variables with correlated residuals. UAI = unprotected anal intercourse. CFA = confirmatory factor analysis.