



# Elevated Risk for HIV Infection among Men Who Have Low- and Middle-Income Countries 2000–2006: A Sys

Stefan Baral, Frangiscos Sifakis, Farley Cleghorn, Chris Beyrer

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## Abstract

### Background

Recent reports of high HIV infection rates among men who have sex with men (MSM) from Asia, Africa, Latin America, and the Caribbean indicate high levels of HIV transmission among MSM in low- and middle-income countries. To investigate the global epidemic outbreaks to general populations, we conducted a comprehensive review of HIV studies among MSM in low- and middle-income countries and a meta-analysis of reported MSM and reproductive-age adult HIV prevalence data.

### Methods and Findings

A comprehensive review of the literature was conducted using systematic methodology. Data regarding HIV prevalence from each of the studies that met inclusion criteria and aggregate values for each country were calculated. Pooled odds ratios (ORs) including HIV prevalence of the country, Joint United Nations Programme on HIV/AIDS (UNAIDS)-classified level of development, and whether or not injection drug users (IDUs) played a significant role in given epidemic. Pooled ORs were stratified by prevalence level: overall MSM OR of 58.4 (95% CI 56.3–60.6); low-prevalence countries, 14.4 (95% CI 13.8–14.9); and medium- to high-prevalence countries, 9.0–10.2). Significant differences in ORs for HIV infection among MSM in were seen when comparing low- and middle-income countries (OR of 7.8 (95% CI 7.2–8.4), whereas middle-income countries had an OR of 23.4 (95% CI 22.8–24.0). Stratification by IDU spread resulted in an OR of 12.8 (95% CI 12.3–13.4) in countries where IDU transmission was high (OR 23.7–25.2) where it was not. By region, the OR for MSM in the Americas was 33.3 (95% CI 32.3–34.2); 18.7 (95% CI 17.7–19.7) for Africa; and 1.3 (95% CI 1.1–1.6) for the low- and middle-income countries of Europe.

### Conclusions

MSM have a markedly greater risk of being infected with HIV compared with general population samples from low- and middle-income countries in Asia, Africa, and Latin America. ORs for HIV infection in MSM are elevated across prevalence levels by country and decrease as prevalence increases, but remain 9-fold higher in medium–high prevalence settings. MSM from low- and middle-income countries are in urgent need of both understudied and underserved.

### Figures

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**Abbreviations:** CI, confidence interval; FSU, former Soviet Union; IDU, injection drug user; MESH, medical subject headings; OR, odds ratio

## Editors' Summary

### Background.

AIDS (acquired immunodeficiency syndrome) first emerged in the early 1980s among gay men living in New York City. Since then, it has spread around the world, it became clear that AIDS also affected heterosexual men and women. Now, a quarter of the world's population is infected with human immunodeficiency virus (HIV), the organism that causes AIDS. HIV is most often spread by sexual contact with an infected partner and in sub-Saharan Africa, the region most badly hit by HIV/AIDS, heterosexual transmission predominates. In other regions, however, infections are thought to be in men who have sex with men (MSM, a term that encompasses gay, bisexual, and transgender men, and sometimes have sex with men), and in several high-income countries, including the US, male-to-male sexual contact is the most common transmission route.

### Why Was This Study Done?

In the US, the MSM population is visible and there is considerable awareness about the risks of HIV transmission. In other countries, MSM are much less visible. They remain invisible because they fear discrimination, stigmatization, and arrest—sex between men is illegal in 85 countries. Consequently, MSM are often under-represented in HIV surveillance programs. If the AIDS epidemic is going to be halted, much more needs to be known about HIV prevalence (the proportion of people who have the virus) among MSM. In this study, the researchers have done a systematic review (a type of research where the results of published reports of HIV prevalence among MSM in low- and middle-income countries are pooled together to get a better picture of the overall prevalence).

### What Did the Researchers Do and Find?

The researchers found 83 published studies that reported HIV prevalence in 38 low- and middle-income countries. When the results were pooled—in what statisticians call a meta-analysis—MSM were found to have a 19.3 times greater risk of HIV infection than the general population. This is described as a pooled odds ratio (OR) of 19.3. The researchers also asked whether factors such as injection drug use (another risk factor for HIV transmission), per capita income, and the prevalence of HIV in the general population were associated with differential risk (increase in odds) of HIV infection compared to the general population. In countries where the prevalence of HIV in the general population was very low (less than 1 adult in 1,000 infected), the pooled OR for MSM was 58.4; where it was high (more than 1 adult in 20 infected), the pooled OR for MSM was 1.4.

### What Do These Findings Mean?

These findings indicate that MSM living in low- to middle-income countries have a greater risk of HIV infection than the general population. The subgroup analyses indicate that the high HIV prevalence among MSM is not limited to any one region or income level, nor is it related to the prevalence of HIV in the general population or injection drug use level. Although the small number and design of the studies included in the meta-analysis limit the strength of these findings, the clear trend toward a higher HIV prevalence of among MSM suggests that HIV surveillance and prevention programs should include those countries where they are currently ignored. Efforts should also be made to include MSM in HIV prevention programs by investigating the cultural, behavioral, social, and public policy factors that underlie the high HIV prevalence among MSM. If surveillance, research, and prevention among MSM in low- to middle-income countries, it should be possible to reduce the global burden of HIV.

### Additional Information.

Please access these Web sites via the online version of this summary at <http://dx.doi.org/10.1371/journal.pmed.0070101>

The International Lesbian and Gay Association provides a world legal map on legislation affecting lesbians and gay men: <http://www.ilga.org>

The International Gay and Lesbian Human Rights Commission provides a page called Off the Map: How Practicing People in Africa

The American Foundation for AIDS Research (amfAR) has launched their MSM initiative, which is focus groups working on providing services and doing research focused on HIV among MSM in lower income- Information is available from the US National Institute of Allergy and Infectious Diseases on HIV infection HIV InSite has comprehensive information on all aspects of HIV/AIDS, including a list of organizations that Information is available from Avert, an international AIDS charity, on HIV, AIDS, and men who have sex with The US Centers for Disease Control and Prevention provides information on HIV/AIDS and on HIV/AIDS (and Spanish)

## Introduction

Male-to-male sexual contact has been an important route of HIV-1 spread since HIV/AIDS was first identified among diversely identified men who have sex with men (MSM) remains a significant or predominant component of HIV epidemics including the United States, Australia, and much of Western Europe [1]. In the United States and European context, minority MSM have been seen by many as evidence of resurgent HIV spread [2,3]. Recent reports of high HIV prevalence in America, and the states of the former Soviet Union (FSU) indicate that high levels of HIV infection among MSM are common in income countries [4–8]. Reports from Thailand, Cambodia, and Senegal, countries characterized by relatively low HIV populations, but which have greater than 20% prevalence in MSM in recent samples, suggest an unlinked epidemic among those in MSM [6,9–12].

MSM is a term coined in 1994 to reduce stigma against gay, bisexual, transgendered, and self-identified heterosexuals describing behaviors rather than social or cultural identities [13]. While the term is sensitive to defining a common language specificity across the many subsets it contains [14,15]. Multiple reports have described significant differences in HIV prevalence among transgenders and male sex workers, and among MSM practicing receptive versus insertive anal intercourse—nearly all. Nevertheless, MSM is now widely used in the literature, and we have used it here for standardization and comparison.

A review of the epidemiologic literature suggests that MSM are inadequately studied in many countries, and that data on and transmission, MSM continue to be under-represented in national HIV surveillance systems, in targeted prevention programs. We have published a recent estimate of the number of MSM in low- and middle-income countries, and Johnson et al. [16] have published a recent estimate of the number of MSM in low- and middle-income countries, and Johnson et al. [16] have published a recent estimate of the number of MSM in low- and middle-income countries. MSM population in many African, Asian, and FSU countries due to criminalization in many states, stigma (often referred to as homophobia) where consenting adult men is criminalized in 85 countries as of 2007, and in more than half of African states [18]. Where HIV levels have been measured, nearly all reports suggest significantly higher HIV prevalence rates among MSM [16].

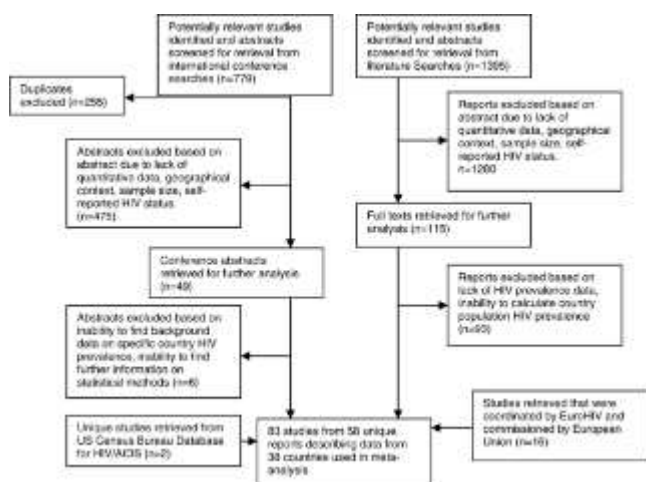
The highest rates of HIV infection overall have been seen in sub-Saharan Africa, where heterosexual transmission is the principal mode of transmission of HIV is through needle sharing among injection drug users (IDUs), with 25 countries having documented an HIV seroprevalence of more than 20% among this group [27]. In these settings, and include men of all sexual orientations. MSMs who are also IDUs, though likely a minority compared with the risk group with the highest burden of HIV, making interpretation of MSM rates in these contexts complex. In IDU settings, rates among MSM and heterosexual populations where many, or most, infections are due to IDU exposure. To address these issues, we conducted analyses of MSM epidemics in countries with substantial IDU epidemics. The Joint United Nations Programme on HIV/AIDS (UNAIDS) report by Aceijas et al., which details those countries where at least one cohort of IDUs has been found with more than 20% HIV prevalence, identifying these countries [27].

To investigate the global epidemic of HIV among MSM and the relationship of outbreaks among MSM to spread in low- and middle-income countries, we conducted a systematic review of HIV studies among MSM in low- and middle-income countries, and performed a meta-analysis among adults of reproductive age in reviewed countries [28].

## Methods

## Search Protocol

We searched both electronic databases and conference proceedings for this review. The databases used included Database of Systematic Reviews on October 3, 2006. All the databases were included to ensure sensitivity, though analysis found in other databases that was not also found on PubMed. Inclusion criteria for studies were determined data among MSM populations (including homosexual, bisexual, male sex workers, transgender, and other country-peer-reviewed journal; an abstract at a conference with peer-reviewed blinded abstract selection process; listed collection started since January 1, 2000; studies in low- and middle-income countries; and studies taking place in a population prevalence for 2006. If the studies were not published in a peer-reviewed journal, though commissioned monitoring agencies such as European Centre for the Epidemiological Monitoring of AIDS (EuroHIV) or the US Centers the studies were also included. The following medical subject heading (MESH) terms were used for PubMed, while other databases: “Homosexual, Men” OR “Homosexual” which were cross-referenced with the key word (AND) “Term “Human Immunodeficiency Virus” (107 articles, four reviews) and limited to reports in the English language, published present date, and pertaining to individuals 15 y of age and older (Figure 1). The exclusion criteria were studies with status rather than serologic testing, and if the sample was a subset of another population used in another study. If not further exclude studies demonstrating 0% prevalence of HIV among MSM. On further review, the 107 articles in subset of the collection retrieved using HIV as a keyword. Based on abstract and title alone, 1,280 articles were retrieved were retrieved for further analysis. Of these 115 full texts, 22 contained data from at least one study that fulfilled the abstract volumes were searched from the International AIDS conference; The Conference on HIV Pathogenesis, Transmission Retroviruses and Opportunistic Infections with similar restrictions using Boolean logic with search terms including “MSM” (265 abstracts), “homosexual” (214 abstracts), “bisexual” (46 abstracts), OR “transgender” (37 abstracts) were unique and 49 met all the inclusion and exclusion criteria, though six were later excluded due to the inability to clarification, or an inability to retrieve background prevalence of HIV in that country. An additional 16 studies were EuroHIV [5]. The 2004 US Census Bureau database of HIV/AIDS is a thorough compilation of global HIV prevalence the methodology used in their collection [29]. This database was used to assess the sensitivity of the literature and unique conference abstracts being retrieved that met inclusion and exclusion criteria (Figure 1). Significant attention HIV among MSM among the same population published in two different reports. Bibliographies of articles were also retrieved by this method. In all, 83 studies from 58 unique reports were used in the meta-analysis describing MSM was done by one of the authors (SB), and abstraction methods and data extraction were independently validated by abstractors were settled by contacting the authors of the study in question for further clarification. This resulted in were unable to be reached. Abstractors were not blinded to the purpose of the study.



**Figure 1. Search Protocol and Results**  
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## Low- and Middle-Income Country Definition

Economies are divided according to 2005 gross national yearly income per capita, calculated using the World Bank US\$875 or less; lower middle income, US\$876–3,465; upper middle income, US\$3,466–10,725; and high income, countries with a gross national income per capita of less than US\$10,725 [30].

## Statistical Methods

This meta-analysis calculates the measure of association between being MSM, the independent variable, and HIV prevalence, the dependent variable, in the form of an odds ratio (OR). In addition, individual country prevalence estimates were calculated.

Country	Sample Size	MSM Prevalence (95% CI)	Population Prevalence	OR (95% CI)	Prevalence Level	UNAIDS Level	Income Level	IDU	Reference
<b>Country</b>	<b>816</b>	<b>15.7 (12.8–19.4)</b>	<b>0.01</b>	<b>34.4 (10.4–110)</b>	<b>VA</b>	<b>C</b>	<b>HI</b>	<b>N</b>	<b>(45–11)</b>
Burkina Faso	18,843	12.2 (11.7–12.7)	0.01	12.8 (11.6–14.0)	C	C	HI	N	(45,46,50)
Burundi	528	20.2 (19.6–20.7)	0.01	19.8 (18.7–20.9)	VA	C	HI	N	(13,50,80)
Guinea	738	18.0 (16.7–19.3)	0.08	19.2 (16.1–22.4)	VA	C	HI	N	(15,46)
Kenya	5,418	12.1 (10.8–13.4)	0.00	21.8 (19.0–24.7)	L	C	HI	F	(42,44,12,33)
Madagascar	1,174	18.4 (17.3–19.5)	0.00	24.3 (20.1–29.5)	VA	C	HI	N	(34–50)
Mali	707	15.0 (14.0–16.0)	0.02	15.4 (13.8–17.0)	VA	C	HI	N	(14)
Niger	5,438	14.4 (13.6–15.2)	0.00	28.7 (24.8–32.6)	L	C	HI	N	(17–30)
Nigeria	588	13.8 (12.3–15.3)	1.72	16.3 (13.8–18.8)	HI	C	HI	N	(30,81)
Rwanda	135	18.6 (17.4–19.8)	1.33	11.3 (9.6–13.0)	HI	C	HI	N	(52)
Tanzania	1,128	11.9 (10.7–13.1)	1.84	12.4 (10.7–14.1)	VA	C	HI	N	(30,81)
Togo	393	7.9 (6.8–9.0)	1.34	8.1 (6.9–9.3)	L	C	HI	N	(32,81)
Zambia	167	9.1 (8.0–10.2)	0.25	43.8 (28.9–68.5)	VA	C	HI	N	(32,81)
Zimbabwe	4,472	25.8 (24.8–26.8)	0.53	49.2 (46.4–52.0)	VA	C	HI	N	(34–50)
<b>Subtotal and I<sup>2</sup></b>	<b>155</b>	<b>29.4 (19.3–39.5)</b>	<b>4.28</b>	<b>5.3 (4.1–6.5)</b>	<b>HI</b>	<b>C</b>	<b>HI</b>	<b>N</b>	<b>(57)</b>
Algeria	842	37.3 (37.1–37.5)	0.88	37.3 (37.1–37.5)	HI	L	HI	N	(8)
Botswana	789	19.8 (19.4–20.2)	0.44	19.8 (19.4–20.2)	HI	U	L	N	(34)
Senegal	712	8.2 (7.4–9.0)	1.67	8.0 (6.9–9.2)	VA	U	L	N	(36)
Togo	13	0.0 (0.0–0.0)	0.00	190.8 (15.7–226.3)	VA	L	HI	N	(7)
Thailand	5,736	24.8 (23.1–26.5)	1.10	23.7 (21.1–26.4)	HI	U	HI	F	(13,12,11)
Vietnam	1,019	28.1 (27.4–28.8)	0.82	33.3 (30.8–35.8)	VA	C	HI	N	(12,10)
Zimbabwe	104	7.8 (5.9–9.7)	1.81	4.8 (3.5–6.2)	HI	U	L	N	(17,2)
China	6,219	3.8 (3.3–4.3)	0.00	45.1 (30.0–60.4)	VA	C,HI	HI	F	(7,8–10)
Indonesia	779	9.2 (8.8–9.6)	0.14	72.8 (66.8–78.8)	VA	C	HI	F	(36)
India	8,889	14.7 (13.6–15.8)	0.87	17.2 (16.0–18.4)	L	U,HI	L	F	(30–40)
Nepal	238	4.8 (3.8–5.8)	0.04	8.2 (6.4–10.0)	L	C	L	F	(34)
Czech Republic	379	3.5 (3.0–4.0)	0.03	11.0 (8.5–13.5)	VA	C	HI	F	(1)
Poland	474	5.4 (4.7–6.1)	0.13	48.4 (40.5–56.3)	VA	C	HI	N	(1)
Russia	7,727	6.7 (6.1–7.3)	0.08	68.8 (61.8–75.8)	VA	L	HI	N	(1)
Slovenia	18	2.8 (2.2–3.4)	0.00	13.1 (11.1–15.1)	VA	L	HI	N	(1)
Ukraine	108	8.8 (8.0–9.6)	0.10	5.5 (4.8–6.2)	VA	C	HI	N	(1)
Uzbekistan	179	8.8 (8.0–9.6)	0.06	6.8 (5.8–7.8)	VA	C	HI	N	(1)
Belgium	111	8.1 (7.5–8.7)	0.04	23.7 (20.6–26.8)	VA	L	HI	N	(1)
Switzerland	108	8.2 (7.6–8.8)	0.04	18 (16.1–19.9)	VA	L	HI	N	(1)
Spain	100	8.8 (8.0–9.6)	0.14	24 (21.0–27.0)	VA	L	HI	F	(1)
Ukraine	79	8.2 (7.6–8.8)	0.18	14 (12.3–15.7)	VA	L	HI	N	(1)
Holland	118	7.7 (7.0–8.4)	1.13	1.5 (1.4–1.6)	VA	C	HI	N	(1)
Korea	8,867	8.7 (8.0–9.4)	1.21	8.8 (8.0–9.6)	L	L	HI	F	(1)
<b>Pooled estimate</b>	<b>343,338</b>	<b>12.8 (12.0–13.6)</b>	<b>—</b>	<b>14.2 (13.0–15.4)</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>

**Table 1.**

Meta-Analyses of Aggregate Country Data Comparing HIV Prevalence among MSM and Adults of Reproductive Age with Data on MSM HIV Prevalence, 2000–2006  
doi:10.1371/journal.pmed.0040339.t001

## HIV Epidemic Categories

HIV epidemics have been characterized by prevalence levels and/or epidemic stages. In defining categories of prevalence, Stover et al., which defines HIV epidemics among adults of reproductive age (those aged 15–49 y) a low prevalence, 0.5%–1.0%; medium prevalence 1.1%–5%; and high prevalence, >5% of adults [31]. The extent to which these national estimates affects both their overall validity and our ability to compare MSM infection rates to general population prevalence.

## Background Population Estimates

General population prevalence was estimated by using reported absolute number of HIV infected adults of reproductive age in 2006 and, using as the denominator the population estimates of people aged 15–49 y in the respective countries from the Division International Database [1,32]. The data were then grouped into two categories: the absolute number of those who were uninfected.

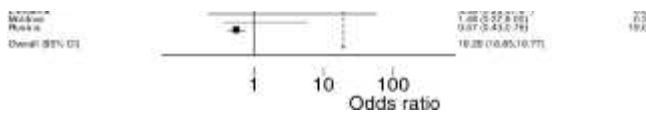
The population estimates calculated by UNAIDS are based on statistical models rather than actual survey data. Since computed individually, based on the specific dynamics of the HIV epidemic in that country, there is potential for bias in these estimates. For very populous and diverse countries such as China and India, different regions of these nations have different epidemic stages (Table 1). Specifically, India has been classified as having low-level, concentrated, and generalized epidemics. For China and India, the data were included in the meta-analysis in each of the strata for these countries.

UNAIDS defines what is a country according to the criteria used by the United Nations; thus, separate analyses for low-income countries, data from Taiwan were coupled with that of mainland China; similarly, data from Puerto Rico would be included as high-income country.

## MSM Prevalence Estimates

Data regarding prevalence and total sample size were obtained from each of the studies that met inclusion criteria.





**Figure 2. Forest Plot Showing Meta-Analysis of Risk of HIV Infection among MSM Compared with Adult Income Countries, 2000–2006**  
doi:10.1371/journal.pmed.0040339.g002

Category	Subcategory	Number of Countries	OR (95% CI)
Level of epidemic	Low level	11	24.5 (20.8–28.8)
	Generalized	21	11.5 (9.3–13.8)
Region	Central Asia	9	10.8 (8.3–14.0)
	Eastern Europe	15	15.5 (12.2–19.7)
	Sub-Saharan Africa	7	10.7 (7.7–14.7)
Prevalence	High	14	1.8 (1.06–3.0)
	Very low prevalence countries	23	10.4 (8.5–12.6)
IDU Country	Low prevalence countries	6	14.4 (11.8–16.8)
	Medium to high prevalence countries	7	10.6 (8.0–13.9)
Income level	Low income	16	11.8 (9.2–15.0)
	High income	11	14.4 (11.3–18.2)
Overall	Low-income countries	7	7.8 (7.3–8.4)
	Multi-income countries	31	10.28 (7.85–13.77)

**Table 2.** Stratification of Pooled OR for HIV Infection among MSM by Epidemic Level, Region, Prevalence, and IDU Country  
doi:10.1371/journal.pmed.0040339.t002

## Discussion

This is to our knowledge the first meta-analysis of HIV survey data collected from MSM participants in low- to mid HIV infection are markedly and consistently higher among MSM than among the general population of adults of reference and the FSU.

There are a number of limitations to this study. MSM in many developing countries are often difficult to access and behavior, the social stigma associated with their behaviors and identities, participant safety concerns in some settings. These barriers likely limited both the number and quality of studies in the literature—only a few lower-income countries have systematically surveyed MSM. The majority of studies cited in this analysis are convenience samples not representative of MSM. To determine a corollary of risk for HIV infection among MSM in low- and middle-income countries, prevalence estimates for each country as the unexposed population to compute ORs. Because of the lack of control groups formally controlled for in our study. MSM tend to congregate in urban areas, at least partially explaining why the magnitude may limit generalizability. In very populous countries such as China and India, there may be even more marked differences in prevalence and in reporting of MSM behaviors. Publication bias tends to affect the results of meta-analyses, both overestimation and could be partly responsible for the magnitude of associations seen in this study [35]. To minimize the effect of publication bias, the Cochrane database and the EuroHIV surveillance report were searched to validate the sensitivity of the journal and conference abstracts. A limitation of this study was that it was limited to English-language publications, which could serve as a source of language bias in the literature. To address this, non-English databases, the authors found no sources of primary data that had not also been reported in English journals. Other factors for HIV infection are assessed in this study, and these may be subject to ecologic fallacy, meaning that the associations at the individual level. Although individual drivers of HIV acquisition and transmission among MSM have been well characterized, it cannot be said for the majority of countries included in this study [36,37]. Only with prospective observational studies can risk factors for HIV acquisition and transmission apply to MSM in low- and middle-income settings. Finally, a portion of the elevated risk may be explained by a ceiling effect. That is, a bias where the magnitude of a relative association, such as an OR

of 10, may be inflated because MSM were likely included in some samples of men in the general reproductive-age population. This is likely the case in low-income countries. We conducted a sensitivity analysis to assess the importance of this misclassification of MSM. Such an analysis would require assumptions made for statistical calculations in meta-analyses [38]. Using the prevalence of MSM behavior in each country, a sensitivity analysis was conducted by removing the total (estimated) population of MSM from the population estimations.

countries. We then recalculated the odds of HIV infection among MSM for a hypothetical population where MSM prevalence. This modified the overall magnitude of the OR modestly, from 1.5% to 7.5%, depending on the country in the meta-analyses. Data and methodological quality of these studies was deemed sufficient for the purposes of this analysis. Studies that underwent peer review or were published as government reports, with high methodological standards such as that

Despite these limitations, this meta-analysis draws its precision strength from the combined estimates of the OR (95% CI 63,538). By calculating a measure of association, such as an OR, one can see that two regions with identical absolute prevalence of MSM, may be in very different stages of the HIV epidemic affecting the overall risk status of MSM in that region. The range of the ORs of HIV infection among MSM from differing countries, one pooled OR describing the HIV risk of MSM (OR 10.8) of risk. Rather, the value of these analyses is in the overall trends of the results. These trends of high HIV prevalence in concentrated HIV epidemics speak to the urgent need for increased targeted prevention strategies to this at-risk population.

To determine if there is a differential risk status of MSM depending on the level of the HIV epidemic in given countries, we stratified pooled estimates by level of the epidemic (very low, low, and medium–high; Table 2). There was a trend of decreasing OR with increasing prevalence of the epidemic: 58.4 in very low-prevalence countries, 14.4 in low-prevalence countries, and 9.6 in medium- to high-prevalence countries. OR by income level showed an OR for HIV infection of 23.4 for middle-income countries and 7.8 for low-income countries. As this study had generally higher general population prevalence rates, these results may represent a consistent increase in risk given the potential of a ceiling effect. As more data become available, it will be important to determine to what extent the risk of HIV among MSM. The marked differences in OR by prevalence or income level may be a function of epidemic stage. In countries with adults of reproductive age, HIV transmission may be linked through sexual networks between high-prevalence general populations and low prevalence in general populations, HIV transmission among MSM may be isolated and propagated within this population.

To control for the assumption that prevalence level categories are more relevant than epidemic levels in assessing risk, pooled estimates were stratified using both criteria. Stratification by UNAIDS-defined epidemic level showed that the risk of HIV among MSM in countries with generalized epidemics (OR 10.8), and was even higher in countries with low-level epidemics (OR 23.5) (Table 2). The UNAIDS classification of HIV epidemics was designed, in part, to provide guidance on the appropriate level of response in a country. However, the absence of a difference in the odds of HIV infection among MSM between concentrated and generalized epidemics in this classification system is currently not ideal for measuring the increased risk of specific subsets of the population. This limitation may be improved as more comprehensive prevalence data of specific vulnerable populations such as MSM become available.

The direction of the measure of association among MSM appears to be quite consistent between individual countries, supporting the external validity of the individual studies. Eastern Europe appears to be an exception: MSM data are primarily driven by IDU exposure. No peer-reviewed published report or abstract meeting our inclusion criteria was available for this region. The EuroHIV surveillance report served as the primary source for these data. Since an unknown but potentially significant proportion of IDUs, estimating the attributable risk fraction for these differing behaviors is difficult. What is clear is the need for improved surveillance in this region.

The stratification of the pooled OR estimate revealed some general differences in risk status between MSM globally. The highest risk was in the Americas, at 33.3. It was lower, but still extremely high, in Asia at 18.7, lower still in Africa at 3.8, and lowest in Eastern Europe. The result from Eastern Europe is likely due, as we have argued, to comparing MSM with populations where IDUs are common. The Americas and Asia were by far the best evidenced, suggesting that these epidemics among MSM are real, and that the risk is higher than heterosexuals in these settings. Data regarding MSM in Africa were the sparsest, but are beginning to emerge. MSM were found from Uganda, Zambia, Sudan, and Nigeria, though not all met inclusion criteria for this analysis [39]. This is in part, by marked stigma and homophobia in these settings and by a lack of specific prevention strategies. Although these regions are in desperate need of targeted prevention campaigns, social intolerance currently limits prevention efforts. UNAIDS estimates that globally MSM had access to appropriate HIV prevention services [1].

These results constitute a clear call to action on three fronts: surveillance, research, and prevention [39]. The variation in risk may not necessarily explain complex differences in global HIV epidemic dynamics, but they do demonstrate that high risk is not limited to any one epidemic level, prevalence category, region, or income level. HIV surveillance efforts should take account of these findings and expand surveillance to include them in countries where they are not now included. Social science, epidemiological, and behavioral research, population-based sampling methods and standardized data collection tools to assess prevalence of HIV risk behaviors, and studies of network interactions, and the roles individual and partner circumcision status may play in male-to-male HIV transmission are needed. Assessments could further describe the cultural and behavioral nuances of MSM globally and refine data collection methods. The cessation of discrimination against MSM could afford greater access to HIV prevention and education services and reduce stigma. Male-to-male sexual contact is not inherently dangerous; only in the context of an advanced stage of the epidemic does it become high-risk behavior for HIV infection. Notably, there exists a risk that demonstrating high HIV prevalence rates among MSM in these regions without adequate prevention expenditures are generally allocated based on need; thus, the risk of increasing stigma must be balanced against the need for prevention.



advocating for dedicated funding resources for MSM. In Asia, prevention expenditures targeting MSM range from Thailand [43]. This lack of governmental expenditures is notable given that two recent meta-analyses have demonstrated strategies targeting MSM are successful in decreasing high-risk behaviors [17,44]. MSM have been largely ignored in many countries for too long, given their highly disproportionate burden of HIV. Surveillance, research, and preventing HIV transmission in this marginalized population.

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## Author Contributions

SB designed the initial search strategies and was one of the authors responsible for abstraction and data analysis of the draft of the manuscript. CB is SB's supervisor and was the source of the original ideas for this research study. CB played a significant role in the writing of this manuscript. FS contributed critical thought, aided in data analysis, and also wrote the manuscript. FC helped direct the research, provided extensive critical review of the writing and data analysis methods.

## References

1. UNAIDS (2006) 2006 Report on the global AIDS epidemic. Geneva (Switzerland): Available: <http://www.unaids.org/globalReport/default.asp>. Accessed 10 August 2007.
2. [No authors listed] (2005) HIV prevalence, unrecognized infection, and HIV testing among men who have sex with men—United States, 2005. *MMWR Morb Mortal Wkly Rep* 54: 597–601.  
View Article • PubMed/NCBI • Google Scholar
3. Dougan S, Elford J, Rice B, Brown AE, Sinka K, et al. (2005) Epidemiology of HIV among black and minority ethnic men in London and Wales. *Sex Transm Infect* 81: 345–350.  
View Article • PubMed/NCBI • Google Scholar
4. Bautista CT, Sanchez JL, Montano SM, Laguna-Torres VA, Lama JR, et al. (2004) Seroprevalence of HIV-1 among American men who have sex with men. *Sex Transm Infect* 80: 498–504.  
View Article • PubMed/NCBI • Google Scholar
5. EuroHIV (2006) HIV/AIDS Surveillance in Europe: Mid-year report 2005. European Commission. Saint-Martin: Available: [http://www.eurohiv.org/reports/index\\_reports\\_eng.htm](http://www.eurohiv.org/reports/index_reports_eng.htm). Accessed 10 August 2007.
6. Wade AS, Kane CT, Diallo PA, Diop AK, et al. (2005) HIV infection and sexually transmitted infections among men in Senegal. *AIDS* 19: 2133–2140.  
View Article • PubMed/NCBI • Google Scholar
7. van Griensven F (2007) Men who have sex with men and their HIV epidemics in Africa. *AIDS* 21: 1361–1370.  
View Article • PubMed/NCBI • Google Scholar
8. World Bank (2006) Socioeconomic Impact of HIV/AIDS in Ukraine. Washington (D. C.): Available: <http://ukraine.worldbank.org/>. Accessed 10 August 2007.

9. Beyrer C (2007) HIV epidemiology update and transmission factors: risks and risk contexts—16th Internat Infect Dis 44: 981–987.  
View Article • PubMed/NCBI • Google Scholar
10. [No authors listed] (2006) HIV prevalence among populations of men who have sex with men—Thailand, 2005. *AIDS* 20: 844–848.  
View Article • PubMed/NCBI • Google Scholar
11. Girault P, Saidel T, Song N, de Lind Van Wijngaarden JW, Dallabetta G, et al. (2004) HIV, STIs, and sexual behavior among men who have sex with men in Phnom Penh, Cambodia. *AIDS Educ Prev* 16: 31–44.  
View Article • PubMed/NCBI • Google Scholar
12. Beyrer C, Sripaipan T, Tovanabutra S, Jittiwutikarn J, Suriyanon V, et al. (2005) High HIV, hepatitis C and syphilis prevalence among men who have sex with men in northern Thailand. *AIDS* 19: 1535–1540.  
View Article • PubMed/NCBI • Google Scholar
13. Young RM, Meyer IH (2005) The trouble with “MSM” and “WSW”: Erasure of the sexual-minority person in public health discourse. *Am J Public Health* 95: 1144–1149.  
View Article • PubMed/NCBI • Google Scholar
14. Pathela P, Blank S, Sell RL, Schillinger JA (2006) The importance of both sexual behavior and identity. *Am J Public Health* 96: 765–766.  
View Article • PubMed/NCBI • Google Scholar
15. Khan S, Khan OA (2006) The trouble with MSM. *Am J Public Health* 96: 765–766.  
View Article • PubMed/NCBI • Google Scholar
16. Caceres C, Konda K, Pecheny M, Lyerla R, Chatterjee A (2006) MSM populations in low and middle-income countries: characteristics, risk behaviour and HIV prevalence [Abstract CDD0333]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2176436> Accessed 30 October 2007.
17. Johnson WD, Holtgrave DR, McClellan WM, Flanders WD, Hill AN, Goodman M (2005) HIV intervention research update. *AIDS Educ Prev* 17: 568–589.  
View Article • PubMed/NCBI • Google Scholar
18. International Lesbian and Gay Association (2007) State-sponsored homophobia: A world survey of laws pertaining to sexual orientation and gender identity. Brussels (Belgium): Available: [http://www.ilga.org/statehomophobia/State\\_sponsored\\_homophobia](http://www.ilga.org/statehomophobia/State_sponsored_homophobia) Accessed 30 October 2007.
19. Zulu KP (2005) Anal sex and HIV—an ignored tragedy, a case of Zambia. [Abstract MoPe10.7P03]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2176436> Accessed 30 October 2007.
20. Broqua C (2004) Men who have sex with men and AIDS prevention in Bamako, Mali [Abstract C12761]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2170003>. Accessed 30 October 2007.
21. Odumuye OO HIV/AIDS intervention for and with men who have sex with men in south-west, Nigeria-Alliance for the Elimination of HIV/AIDS [Abstract CDD0198]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2169450>. Accessed 30 October 2007.
22. Olowu O, Ademowo JSexual Identity of MSM in Nigeria [Abstract CDD0198]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2193624>. Accessed 30 October 2007.
23. Allman D, Adebajo S, Myers T, Odumuye OO, Ogunsola S, et al. (2006) At the end of the day: Findings from a cross-sectional survey of men who have sex with men (MSM) in Nigeria—phase I [Abstract WEPE0644]. <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2190670>. Accessed 30 October 2007.
24. Eki GO, George E (2006) Rectal microbicides and the fight against HIV/AIDS among men who have sex with men in Nigeria [Abstract WEPE0644]. Available: <http://www.iasociety.org/Default.aspx?pageid=11&abstractId=2190670>. Accessed 30 October 2007.

25. Niang C, Moreau A, Kostermans K, Binswanger H, Compaore C, et al. (2004) Men who have sex with men multi-country HIV/AIDS program approach [Abstract WePeC6156]. Available: <http://www.iasociety.org/Default.aspx?pageId=11&abstractId=2190057>. Accessed 30 October 2007.
26. UNAIDS (2005) Update on the Global HIV/AIDS Pandemic. Geneva (Switzerland): Available: <http://www.unaids.org>. Accessed 10 August 2007.
27. Aceijas C, Stimson GV, Hickman M, Rhodes T (2004) Global overview of injecting drug use and HIV infection. *Journal of Epidemiology and Community Health* 58: 2295–2303.  
View Article • PubMed/NCBI • Google Scholar
28. Moher D, Cook DJ, Eastwood S, Olkin I, Rennie D, et al. (1999) Improving the quality of reports of meta-analyses: QUOROM statement. Quality of reporting of meta-analyses. *Lancet* 354: 1896–1900.  
View Article • PubMed/NCBI • Google Scholar
29. US Census Bureau (2005) HIV/AIDS Surveillance. Washington (D. C.): Available: <http://www.census.gov/ipeds/data/hiv/>
30. International Bank for Reconstruction and Development, World Bank (2006) World Bank Annual Report 2006. Washington, DC: Available: <http://treasury.worldbank.org/web/AnnualReport2006.pdf>. Accessed 10 August 2007.
31. Stover J, Bertozzi S, Gutierrez JP, Walker N, Stanecki KA, et al. (2006) The global impact of scaling up HIV prevention in high-income countries. *Science* 311: 1474–1476.  
View Article • PubMed/NCBI • Google Scholar
32. US Census Bureau (2004 August) International Database. Washington (D. C.): Available: <http://www.census.gov/ipeds/data/international/>
33. StataCorp (2005) Stata Statistical Software: Release 9.1 [computer program]. College Station, Texas: Available: <http://www.stata.com>. Accessed 10 October 2007.
34. Takkouche B, Cadarso-Suarez C, Spiegelman D (1999) Evaluation of old and new tests of heterogeneity in meta-analysis. *Stat Med* 18: 206–215.  
View Article • PubMed/NCBI • Google Scholar
35. Dickersin K (1997) How important is publication bias? A synthesis of available data. *AIDS Educ Prev* 9: 15–21.  
View Article • PubMed/NCBI • Google Scholar
36. Koblin BA, Husnik MJ, Colfax G, Huang Y, Madison M, et al. (2006) Risk factors for HIV infection among men who have sex with men in the United States. *AIDS* 20: 103–111.  
View Article • PubMed/NCBI • Google Scholar
37. Buchbinder SP, Vittinghoff E, Heagerty PJ, Celum CL, Seage GR III, et al. (2005) Sexual risk, nitrite inhalant use, and HIV seroconversion in men who have sex with men in the United States. *J Acquir Immune Defic Syndr* 39: 103–111.  
View Article • PubMed/NCBI • Google Scholar
38. Egger M, Smith GD, Phillips AN (1997) Meta-analysis: Principles and procedures. *BMJ* 315: 1533–1537.  
View Article • PubMed/NCBI • Google Scholar
39. Caceres C, Konda K, Pecheny M, Chatterjee A, Lyerla R (2006) Estimating the number of men who have sex with men in the United States. *Sex Transm Infect* 82(Suppl 3): iii3–9.  
View Article • PubMed/NCBI • Google Scholar
40. Busibe H (2006) Men who have sex with men in Uganda: Breaking the silence [Abstract CDD0380]. Available: <http://www.iasociety.org/Default.aspx?pageId=11&abstractId=2190057>. Accessed 30 October 2007.
41. Broqua C Men who have sex with men and behaviours adopted to counter the risk of HIV infection in Bama, Nigeria. *AIDS* 20: 103–111. <http://www.iasociety.org/Default.aspx?pageId=11&abstractId=2197871>. Accessed 30 October 2007.
42. Diouf D, Moreau A, Castle C, Engelberg G, Tapsoba P (2004) Working with the media to reduce stigma and increase HIV testing among men who have sex with men in Senegal. *AIDS* 18: 103–111.

[Abstract WePeC6153]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2168565>

43. USAID Health Policy Initiative (2006) HIV expenditure on MSM programming in the Asia-Pacific Region. *W*: <http://www.healthpolicyinitiative.com/Publications/Documents/MSM%20HIV%20Expenditures%20FINAL%202007>.
44. Herbst JH, Sherba RT, Crepaz N, Deluca JB, Zohrabyan L, et al. (2005) A meta-analytic review of HIV bel behavior of men who have sex with men. *J Acquir Immune Defic Syndr* 39: 228–241.  
View Article • PubMed/NCBI • Google Scholar
45. Hierholzer J, Montano S, Hoelscher M, Negrete M, Hierholzer M, et al. (2002) Molecular epidemiology of t Argentina. *AIDS Res Hum Retroviruses* 18: 1339–1350.  
View Article • PubMed/NCBI • Google Scholar
46. Montano SM, Sanchez JL, Laguna-Torres A, Cuchi P, Avila MM, et al. (2005) Prevalences, genotypes, and America. *J Acquir Immune Defic Syndr* 40: 57–64.  
View Article • PubMed/NCBI • Google Scholar
47. Montoya M, Montano SM, Vieira JC, Soria E, Esparza A, et al. (2004) HIV-1 infections among men who h sex play a role? [Abstract WePeC6159]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abs>
48. Lama J, Sanchez J, Galvan R, Carcamo C, Kusunoki L, et al. (2004) Trends in HIV, sexually transmitted in sex with men in Lima, Peru [Abstract WePeC6167]. Available: <http://www.iasociety.org/Default.aspx?page> 2007.
49. Guanira J, Pun M, Manrique H, Lama J, Galvan R, et al. (2004) Second generation of HIV sentinel surveill during 2002 [Abstract WePeC6162]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstrac>
50. Coates TJ, Caceres CF, Klausner JD, Leon S, Pajuelo J, et al. (2004) High risk for HIV, HSV-2, and syphil Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2176043>. Accessed 30 October 2
51. Zunt JR, La Rosa AM, Peinado J, Lama JR, Suarez L, et al. (2006) Risk factors for HTLV-II infection in Pe *Med Hyg* 74: 922–925.  
View Article • PubMed/NCBI • Google Scholar
52. Pando ML, Maulen S, Weissenbacher M, Marone R, Duranti R, et al. (2003) High human immunodeficiency with men in Buenos Aires, Argentina: Risk factors for infection. *Int J Epidemiol* 32: 735–740.  
View Article • PubMed/NCBI • Google Scholar
53. Avila MM, Marone R, Pando Pateiro MA, Segura M, Duranti R, et al. (2004) Monitoring for HIV-1 infection a cohort of men who have sex with men (MSM) in Buenos Aires, Argentina [Abstract WePpC2069]. Availal geld=11&abstractId=2168180. Accessed 30 October 2007.
54. Eyzaguirre L, Bautista CT, Ayala C, Acosta J, Negrete M, et al. (2006) First case of HIV Type 1 subtype F *AIDS Res Hum Retroviruses* 22: 808–811.  
View Article • PubMed/NCBI • Google Scholar
55. Mejía A, Gonzales M, Serrano C, Prieto F (2006) HIV seroprevalence and associated risk factors in men v Colombia, 2005 [Abstract CDC0734]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstra>
56. Vallejo F, Leal L, Alzate ML, Ayala CI, Mendieta L, et al. (2002) Prevalence and risk factors for HIV-1 amc C11071]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=9681>. Accessed 30 Oct
57. Carneiro M, Cardoso FA, Greco M, Oliveira E, Andrade J, et al. (2003) Determinants of human immunode bisexual men screened for admission to a cohort study of HIV negatives in Belo Horizonte, Brazil: Project t  
View Article • PubMed/NCBI • Google Scholar

58. Ferreira AD, Caiaffa WT, Bastos FI, Mingoti SA (2006) Profile of male Brazilian injecting drug users who h 849–860.  
View Article • PubMed/NCBI • Google Scholar
59. Périssé ARS, Amorim CMd, Silva JRGd, Schechter M, Blattner WA (2006) Relationship of egocentric netw MSM in Rio de Janeiro, Brazil [Abstract CDC0071]. Available: <http://www.iasociety.org/Default.aspx?page 2007>.
60. Ramon JS, Alvarenga M, Walker N, Garcia-Calleja JM, Zacarias F (2002) Estimating HIV/AIDS prevalence epidemics: The example of Honduras. *AIDS* 16(Suppl 3): S18–S22.  
View Article • PubMed/NCBI • Google Scholar
61. Ghee AE, Soto RJ, Padilla I, Alvarenga MA, Astete S, et al. (2002) Prevalence of HIV/STD and behavior i Central American Multicenter Study [Abstract WePeC6132]. Available: <http://www.iasociety.org/Default.as October 2007>.
62. Nuñez CA, Soto RJ, Foreit KG, Ghee AE, Astete S, et al. (2002) Prevalence of HIV/STD among men who Central American Multicenter Study of HIV/STD and behavior [Abstract LbOr03]. Available: <http://www.ias abstractId=9821>. Accessed 30 October 2007.
63. Ministry of Health, et al. (2003) Central American Multicenter Study on HIV/STI and Behavior. U.S. Census <http://www.census.gov/ipc/www/hivaidsd.html>. Accessed 10 August 2007.
64. Ruiz JD, Facer M, Ritieni A, Sheppard HW, Lopez Y, et al. (2002) HIV prevalence and risk behaviors amor Tijuana, Mexico [Abstract MoPeC3441]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abst>
65. Cruz Palacios C, Ramos U, Burgueño V, Escobedo P, Prado GMI (2006) More frequent infections of sexu (MSM) in the Mexico city: Prevalence of 2000–2004 [Abstract CDC0619]. Available: <http://www.iasociety.t Accessed 30 October 2007>.
66. Gayet C, Magis-Rodriguez C, Sacknoff D, Fernandez A, Guli L, et al. (2006) High prevalence of HIV and li a biological and behavioral surveillance in Mexican urban contexts [Abstract MOPE0480]. Available: <http:// abstractId=2192474>. Accessed 30 October 2007.
67. Lee RK, Poon King C, Legall G, Trotman C, Samiel S, et al. (2006) Risk behaviours for HIV among men w [Abstract CDD0366]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2198563>. A
68. Angala P, Parkinson A, Kilonzo N, Natecho A, Taegtmeier M (2006) Men who have sex with men (MSM) a MOPE0581]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2196877>. Accessec
69. Elrashied S (2006) Prevalence, knowledge and related risky sexual behaviors of HIV/AIDS among receptiv State, Sudan, 2005 [Abstract TUPE0509]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&at>
70. abd El-Rahman A (2004) Risky behaviors for HIV/AIDS infection among a sample of homosexuals in Cairo <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2167490>. Accessed 30 October 2007.
71. van Griensven F, Thanprasertsuk S, Jommaroeng R, Mansergh G, Naorat S, et al. (2005) Evidence of a p among men who have sex with men in Bangkok, Thailand. *AIDS* 19: 521–526.  
View Article • PubMed/NCBI • Google Scholar
72. Cao HN, Le VD, Luong TT, Truong XL (2002) Knowledge, attitudes, and practices on HIV/AIDS among me Consultation Unit of the Pasteur Institute in Ho Chi Minh City (Ho Chi Minh City), Vietnam [Abstract MoPeC /Default.aspx?pagelId=11&abstractId=4445]. Accessed 30 October, 2007.
73. Colby D, Cao NH, Doussantousse S (2004) Men who have sex with men and HIV in Vietnam: A review. All View Article • PubMed/NCBI • Google Scholar

74. Truong TM, Ton That T, Colby D (2006) HIV risk behavior and prevalence among MSM in Khanh Hoa provi <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2190162>. Accessed 30 October 2007.
75. Phalkun M, Morineau G, Neal JJ, Saphonn V, Chhi Vun M (2006) HIV, sexually transmitted infections, and r have sex with men [Abstract CDC0618]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abst>
76. Choi KH, Liu H, Guo Y, Han L, Mandel JS, et al. (2003) Emerging HIV-1 epidemic in China in men who hav [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
77. Ko NY, Lee HC, Chang JL, Lee NY, Chang CM, et al. (2006) Prevalence of human immunodeficiency virus sexual behaviors among men visiting gay bathhouses in Taiwan. *Sex Transm Dis* 33: 467–473. [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
78. Jiang J, Cao N, Zhang J, Xia Q, Gong X, et al. (2006) High prevalence of sexually transmitted diseases ar Province, China. *Sex Transm Dis* 33: 118–123. [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
79. Li X, Li D, Ruan Y, Shi W, Zhang X, et al. (2006) HIV and syphilis infection among men who have sex with transmission [Abstract CDC0093]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId>
80. Choi K, Pan Q, Ning Z, Gregorich S (2006) Social and sexual network characteristics are associated with (MSM) in Shanghai, China [Abstract TUPE0470]. <http://www.iasociety.org/Default.aspx?pagelId=11&abstr>
81. Ma X, Zhang Q, Zhao J, Chen SY, Raymond HF, et al. (2006) Possible rise in HIV prevalence among men MOPE0526]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2195683>. Accessec
82. Ma X Chen SY, Zhao J, Raymond HF, He X, et al. (2006) Predictors of HIV infection among MSM in Beijin <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2196129>. Accessed 30 October 2007.
83. Lai SF, Hong CP, Lan YC, Chen KT, Wong WW, et al. (2004) Molecular epidemiology of HIV-1 in men who from 2000 to 2003 [Abstract WePeC6097]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&a>
84. Xu H, Zhang B, Zeng Y, Li X (2006) HIV epidemic status and behavioral surveillance among MSM in China <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2193899>. Accessed 30 October 2007.
85. Liu H, Wang N, Shao Y, Zhang Q, Zhang L (2006) HIV prevalence and the risk behaviors amongst MSM in <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2194526>. Accessed 30 October 2007.
86. Pisani E, Girault P, Gultom M, Sukartini N, Kumalawati J, et al. (2004) HIV, syphilis infection, and sexual pr and other men who have sex with men in Jakarta, Indonesia. *Sex Transm Infect* 80: 536–540. [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
87. Go VF, Srikrishnan AK, Sivaram S, Murugavel GK, Galai N, et al. (2004) High HIV prevalence and risk beh India. *J Acquir Immune Defic Syndr* 35: 314–319. [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
88. Brahme RG, Sahay S, Malhotra-Kohli R, Divekar AD, Gangakhedkar RR, et al. (2005) High-risk behaviour disease clinics in Pune, India. *AIDS Care* 17: 377–385. [View Article](#) • [PubMed/NCBI](#) • [Google Scholar](#)
89. Kumta S, Lurie M, Weitzen S, Jerajani H, et al. (2006) Sociodemographics, sexual risk behavior and HIV a voluntary counseling and testing services in Mumbai, India [Abstract WEPE0736]. Available: <http://www.ias> abstractId=2194661. Accessed 30 October 2007.
90. Srinivasan B, Durairaj VS, Venkateswaran G, Murugan G, Chakrapani V (2004) Sexual behavior, STD and men (MSM) attending a government STD clinic in Chennai, India [Abstract WePeC6092]. Available: <http://v> abstractId=2171814. Accessed 30 October 2007.

91. Palwade P, Jerajani H, Ashok RK, Shinde S, Vivek A (2004) Prevalence of HIV infection and sexually transmitted infections among men who have sex with men in Mumbai, India [Abstract C10822]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2191816>. Accessed 30 October 2007.
92. Sravankumar K, Prabhakar P, Mythri STI/HIV Study Group (2006) High risk behaviors among HIV positive attending Mythri clinics in Andhra Pradesh, India [Abstract MOPE0582]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2196510>. Accessed 30 October 2007.
93. Mohanty P (2006) Profile and counselling of male homosexuals in Orissa, India—A study of 180 cases [Abstract MOPE0558]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2191816>. Accessed 30 October 2007.
94. Acharya LB, Neilsen G, Basnyat A, Tamang A, Guruvacharya VL, et al. (2006) HIV and STI prevalence among men who have sex with men in Mumbai, India [Abstract MOPE0558]. Available: <http://www.iasociety.org/Default.aspx?pagelId=11&abstractId=2196510>. Accessed 30 October 2007.