

Estimating Levels of HIV Testing, HIV Prevention Coverage, HIV Knowledge, and Condom Use Among Men Who Have Sex With Men (MSM) in Low-Income and Middle-Income Countries

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Background: HIV prevalence data suggest that men who have sex with men (MSM) in low-income and middle-income countries (LMIC) are at increased risk of HIV. The aim of this article is to present global estimates on key HIV prevention needs and responses among MSM in LMIC.

Methods: Data on HIV testing, HIV prevention coverage, HIV knowledge and condom use among MSM were derived from UNGASS country progress reports submitted in 2008. Eligible country estimates were used to calculate global and regional estimates, weighted for the size of MSM populations.

Results: Of 147 LMIC, 45% reported at least 1 indicator that reflects the HIV prevention needs and responses in MSM. Global weighted estimates indicate that on average 31% of MSM in LMIC were tested for HIV; 33% were reached by HIV prevention programs; 44% had correct HIV knowledge; and 54% used condoms the last time they had anal sex with a man.

Conclusions: The 2008 UNGASS country reports represent the largest harmonized data set to date of HIV prevention needs and responses among MSM in LMIC. Although reporting is incomplete and does not always conform to requirements, findings confirm that, in many LMIC, HIV prevention responses in MSM need substantial strengthening.

Key Words: HIV/AIDS, men who have sex with men (MSM), low and middle income countries, HIV prevention, HIV testing, HIV knowledge, condom use

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INTRODUCTION

Men who have sex with men (MSM) are recognized as being at high risk for HIV infection in the concentrated epidemics in high-income countries (HIC).^{1,2} Supported by community engagement and activism, research and prevention responses for MSM were quickly put in place in many of those countries, as were treatment and care programs.³ Concerted behavioral and structural prevention responses have contributed to substantial epidemiological changes,^{4,5} even though these seem imperfect or insufficient to entirely halt the HIV epidemics among MSM in HIC^{1,2,6} and their sustainability is not guaranteed. In contrast, and with only some national or regional exceptions,⁷ the HIV epidemics and prevention needs among MSM in low-income and middle-income countries (LMIC) have been relatively neglected.^{8–10} Compounded by limited resources, the quality and coverage of services and programs for MSM in (most) LMIC remain low,¹¹ especially in contexts where the social stigma attached to male-to-male sex and the criminalization of this behavior is widespread.^{12–14}

The urgency of adequately addressing HIV prevention needs among MSM in LMIC, however, has become most obvious in recent years. Same-sex behaviors in adult men have been documented in a variety of LMIC,^{8,9} including in regions such as sub-Saharan Africa where these behaviors have sometimes been considered to be nonexistent or highly infrequent.^{15,16} Available data across LMIC suggest that proportions of men who engaged in male-to-male sex in the past year may reach 7%–8% in parts of some regions.⁸ In addition, HIV prevalence data suggest that MSM in many LMIC are at markedly increased risk for HIV infection compared with their heterosexual counterparts.¹⁰ Furthermore, HIV epidemics among MSM may be increasing in some LMIC, including in China,¹⁷ where the sheer number of MSM holds the possibility of a sizable HIV epidemic.

Several studies suggest that HIV knowledge and the self-perceived risk for HIV infection may be low among MSM in LMIC,^{18,19} but such data are too scarce to allow for firm conclusions regarding the extent of HIV knowledge in MSM across LMIC. The availability and comparability of data concerning the frequency of unprotected and protected anal intercourse is also limited. As documented in a recent review of the literature,⁹ condom use during the last occasion of

male-to-male anal sex was the indicator of protected sex reported most often, but this information was available for only 13 LMIC. Moreover, country estimates of this indicator of condom use were found to diverge widely, ranging from 0%–82%,⁹ and no overall average was computed from country estimates. Similarly, very little information is available on the number of male sex partners, the frequency and nature of sexual practices with male partners (penetrative sex or not), and the types of relationships among MSM in LMIC, including the prevalence of sex in exchange for money or other forms of compensation. Data concerning the uptake of HIV testing,²⁰ and the coverage of HIV prevention policies and programs in MSM in LMIC are equally scarce and no published reviews are currently available. In addition to the scarcity and limitations of available data, the implications of findings for prevention policies and programs in the wider MSM communities beyond the study samples are unclear. Country data are generally not weighted by MSM population size, reflecting the limited information that is available regarding the prevalence of male-to-male sex in LMIC.

To adequately inform prevention policies and monitor prevention responses among MSM, it is vital that standardized and weighted information regarding the prevalence of HIV-related knowledge, HIV testing, and sexual behaviors (particularly condom use) among MSM in LMIC is regularly obtained. It is equally important to continually monitor the availability and coverage of HIV prevention services and programs for MSM in LMIC.²¹ The UNGASS country progress reports uniquely provide data against a set of standardized indicators to map and monitor the global and regional HIV prevention needs and responses among MSM in LMIC.²²

This article presents data derived from the 2008 UNGASS reporting round. The 4 main indicators reflecting the HIV prevention needs and responses among MSM in LMIC covered by this article are the proportion of MSM who have tested for HIV and know the result, were reached by HIV prevention programs, hold correct knowledge regarding HIV transmission and prevention, and used condoms the last time they had anal intercourse with another man. For each of these indicators, the objective was to establish country estimates with 95% confidence intervals (CIs) and to calculate global and regional estimates weighted for the size of MSM populations in reporting LMIC.

METHODS

Indicator Measurement

All Member States of the United Nations are encouraged to report biennially to UNGASS concerning their country's progress in the fight against HIV in various populations. To enable comparison of information reported to UNGASS, a set of standardized indicators has been developed for country progress reports.²³ However, heterogeneous data resulting from multiple sources may be available and used in any country to monitor the epidemic. In such cases, countries are advised to report the data that most closely reflect the specified indicators and that comply best with UNAIDS technical guidelines regarding internationally recommended methods of data collection and adequate sample size.²³

Table 1 describes the 4 indicators related to the HIV prevention needs and responses among MSM that are addressed in this article. Data concerning these 4 indicators were taken from reports submitted by UN Member States during the 2008 UNGASS reporting round. Countries were considered to be low-income or middle-income when classified as such by the World Bank.²⁴

Data Sources and Inclusion Criteria

For each of the indicator values reported, we assessed available information concerning measurement (the questions that were asked), methods of data collection (Behavioral Surveillance Survey or equivalent, AIDS Indicator Survey, population-based survey, mapping survey, desk review, program data, or other studies) and sample size to determine whether or not it was consistent with UNAIDS guidelines.²³ Data were considered to be consistent with technical guidelines when 2 criteria were met. First, if the questions asked were generally in accordance with specifications, although allowing for small variations to account for differences in cultures and contexts. Second, if the data were collected through eligible types of surveys and did not reflect programmatic data. Country reports were eligible for inclusion in the analysis of a specific indicator when data collection was consistent with UNAIDS guidelines and when sample size was provided and greater than 99.

Statistical Analyses

For each of the 4 indicators, we present crude country estimates and 95% CI, derived from the calculated standard error of the indicator value provided in country reports. Eligible country data were weighted for the estimated size of the MSM population. The weighted estimates were then averaged to estimate the global proportion of MSM across reporting LMIC who have tested for HIV, were reached by HIV prevention programs, held correct HIV knowledge and used condoms. Particular attention was paid to identifying reported indicator values that seemed "too close to perfection" (ie, >95%) and the potential impact of these values on global estimates was assessed. In addition to global weighted estimates, regional estimates weighted by population size were calculated for regions for which sufficient numbers of country reports were available. For each of the indicators, many regions were represented by only 1 country and estimates for those regions were not calculated. For the other regions, and across the 4 indicators, the number of reporting countries ranged from 3 to 13. For each of the indicators, the number of reporting countries was sufficient to calculate regional estimates for 3 regions: Eastern Europe and Central Asia; Latin America; and South and Southeast Asia. Regarding condom use, the regional weighted estimates could also be calculated for the Caribbean and sub-Saharan Africa.

Estimating MSM Population Sizes

To estimate the size of the population of men who had sex with another man in the last year in each of the countries included, we used data from the published literature^{8,9} and made several assumptions, as explained below. Note, however,

TABLE 1. UNGASS Indicators Related to Men Who have Sex With Men

Indicator	Description
HIV testing (indicator 8)	Percentage of MSM who received an HIV test in the last 12 months and who know the result
Prevention programs coverage (indicator 9)	Percentage of MSM reached with HIV prevention programs Defined as the percentage of respondents replying “yes” to the 2 following questions: Do you know where you can go if you wish to receive an HIV test? In the last 12 months have you been given condoms? (e.g. through an outreach service, drop-in centre or sexual health clinic)
Knowledge about HIV prevention (indicator 14)	Percentage of most-at-risk populations who both correctly identify ways of preventing the sexual transmission of HIV and who reject major misconceptions about HIV transmission Defined as the percentage of respondents giving correct answers to all of the following five questions: Can having sex with only one faithful, uninfected partner reduce that risk of HIV transmission? - (Yes) Can using condoms reduce the risk of HIV transmission? - (Yes) Can a healthy-looking person have HIV? - (Yes) Can a person get HIV from mosquito bites - (No) Can a person get HIV by sharing a meal with someone who is infected? - (No) The last two questions can be replaced by the most common misconceptions in the country
Condom use (indicator 19)	Percentage of MSM reporting the use of a condom the last time they had sex, among men who reported having had male partner(s) in the previous 6 months

that estimates of MSM population sizes in LMIC, as reported in the literature, are often derived from small samples of relatively visible MSM, mostly from the major city or cities in a country. Although providing important and unique information, the representativeness of the samples used to derive estimates of the prevalence male-to-male sex may then be limited. Consequently, most currently available estimates of the prevalence of male-to-male sex should be considered as tentative and requiring further improvement.

Based on both the original and revised data reported by Caceres et al,^{8,9} we derived the potential lower and upper bounds of the percentage of men who had sex with another man in the last year in East Asia, South Asia, Southeast Asia, the Caribbean, Eastern Europe and Central Asia, and Latin America (Table 2). Because Caceres et al^{8,9} provided no estimates for sub-Saharan Africa, the Middle East and North Africa, the Pacific, and Western and Central Europe, we had to make several assumptions. For sub-Saharan Africa, the Middle East and North Africa, and the Pacific, we conservatively assumed that prevalence of male same-sex behaviors in the

previous year was 1%–3% (reflecting the lowest values for the lower and upper bounds estimated for other regions). For Macedonia (the only LMIC included in Western and Central Europe), we assumed a prevalence of male same-sex behaviors of 1%–8%, which mirrored the estimated prevalence in Eastern Europe.

Due to the scarcity of country-specific data, the lower and upper bounds of the prevalence of same sex behaviors in the last year among males in a given country was considered equal to the estimate for the region in which the country is located. Furthermore, the midpoint of the regional estimate was taken to reflect the proportion of sexually active men in a country who engage in same sex behavior. Estimates of the numbers of men engaging in same sex behaviors were derived from estimates of the numbers of sexually active men in the general population. Men between the ages of 15 and 64 years were considered sexually active, and data regarding the size of this population in countries in 2007 were derived from the United Nations 2006 revision of World Population Prospects.²⁵ SPSS (version 16.0) was used for all analyses.

TABLE 2. Regional Estimate Ranges of the Prevalence of Same Sex Behaviors Among Males in LMIC

Region	Caceres et al, ^{8,9} Lifetime, %	Caceres et al, ^{8,9} Last Year, %	Utilized Estimate, Last Year, %
Sub-Saharan Africa	N/A	N/A	1–3
East Asia	4	N/A	1–4
South Asia	6–8	7–8	7–8
Southeast Asia	7–12	4	3.5–4.5
Caribbean	1–3	N/A	1–3
Eastern Europe and Central Asia	6–27	N/A	1–8
Western and Central Europe	N/A	N/A	1–8
Latin America	2–25	1–8	1–8
Middle East and North Africa	N/A	N/A	1–3
Pacific	N/A	N/A	1–3

N/A, not available.

RESULTS

UNGASS Reporting and Inclusion of Data

Of the 147 LMIC that are Member States of the United Nations, only 66 (45%) reported to UNGASS in 2008 on at least 1 of the 4 indicators capturing the HIV prevention needs and responses among MSM (extent of HIV testing, coverage by HIV prevention programs, HIV knowledge and condom use). Reporting rates ranged from approximately 75% in Eastern Europe and Central Asia, Latin America and South and Southeast Asia to 25% and lower in sub-Saharan Africa, Middle East and North Africa, and Oceania. Calculations using data derived from Caceres et al^{8,9} indicate that the 66 reporting countries represent about half (52%) of the estimated total MSM population in all of the 147 LMIC.

HIV Testing

Fifty-one countries reported on HIV testing among MSM (Table 3). Of those countries, 9 (18%) reported inconsistent or programmatic data and 42 (82%) reported data consistent with the UNGASS guidelines. Of the countries reporting data that were consistent with the guidelines, 8 reports were ineligible because they reported data from surveys in small samples ($n < 100$) or with unknown sample sizes. One of those 8 excluded reports provided a population estimate without specifying the original data. Reports from 34 countries were eligible for analysis of the extent of HIV testing among MSM (the data were consistent with the guidelines and sample sizes were greater than 99). The estimated number of MSM in these 34 countries represented 42% of the MSM population in all of the 147 LMIC.

Among eligible countries, the range of HIV testing estimates was wide. Except for the extreme value reported by Argentina (98%), HIV testing estimates ranged between 5% in Lao and 76% in Panama. Across the 34 LMIC, the global estimate weighted by MSM population size indicates that less than a third of MSM on average were tested for HIV (mean = 31%, median = 33%, SD = 15, range: 5%–98%). Excluding the value reported by Argentina only slightly reduced this weighted global estimate (mean = 30%, median = 33, SD = 13, range: 5%–76%).

In 3 regions, enough countries reported data to allow for the calculation of regional estimates weighted by MSM population size (Table 4). HIV testing among MSM was found to be lowest in South and Southeast Asia (9 countries, mean = 20%, median = 16%, SD = 12, range: 5%–58%), intermediate in Eastern Europe and Central Asia (9 countries, mean = 33%, median = 31%, SD = 9, range: 5%–70%), and higher in Latin America (10 countries, mean = 57%, median = 54%, SD = 21, range: 21%–98%).

HIV Prevention Programs

Thirty-three countries reported on the coverage of HIV prevention programs among MSM (Table 3). Of those countries, 5 (15%) reported data that were inconsistent with the guidelines (including programmatic data from Côte d'Ivoire and Lebanon). Of the 28 countries (76%) that provided data consistent with the guidelines, 23 had drawn data from surveys with a sample size greater than 99, rendering

their reports eligible for analysis of prevention coverage. The estimated number of MSM in these 23 countries represented 37% of the MSM population in all of the 147 LMIC.

Argentina also reported the highest, near perfect, estimate of HIV prevention coverage among MSM (98%). Among the other countries, estimated HIV prevention coverage ranged from 10% in Armenia to 90% in Belarus. Across the 23 LMIC, the global estimate weighted by MSM population size indicates that on average only a third of MSM in LMIC were reached by HIV prevention programs (mean = 33%, median = 38%, SD = 16, range: 10%–98%). Excluding the high value reported by Argentina only slightly reduced this global estimate (mean = 32%, median = 38, SD = 13, range: 10%–90%).

Comparing the 3 regions represented by a sufficient number of reporting countries to calculate regional weighted estimates (Table 4), HIV prevention coverage among MSM was found to be lower in South and Southeast Asia (5 countries, mean = 26%, median = 18%, SD = 13, range: 13%–47%), intermediate in Eastern Europe and Central Asia (6 countries, mean = 30%, median = 17, SD = 20, range: 10%–90%), and higher in Latin America (9 countries, mean = 44, median = 26, SD = 31, range: 17%–98%).

HIV Knowledge

Of the 37 countries that reported on HIV knowledge among MSM (Table 5), 4 (11%) presented inconsistent data (no programmatic data were reported) and the remaining 33 countries (89%) reported consistent data. Data from 27 of the latter countries were eligible as they were derived from samples greater than 99. The estimated numbers of MSM in these 27 countries represented 37% of the MSM population in all of the 147 LMIC. Among eligible countries, the estimated level of correct HIV knowledge ranged from 10% in the Philippines to 89% in Kyrgyzstan.

The global estimate across LMIC weighted by MSM population size shows that less than half of MSM held correct HIV knowledge (mean = 44%, median = 47, SD = 15, range: 10%–89%). Assessed regionally (Table 4), the weighted estimates of HIV knowledge among MSM were lower in South and Southeast Asia (6 countries, mean = 30%, median = 27%, SD = 10, range: 10%–44%) and in Eastern Europe and Central Asia (8 countries, mean = 37%, median = 26%, SD = 15, range: 26%–89%), compared with Latin America (8 countries, mean = 57%, median = 65%, SD = 16, range: 21%–85%).

Condom Use

Of the 58 countries reporting on condom use among MSM (Table 5), 8 (14%) presented inconsistent data (including programmatic data for Côte d'Ivoire and Lebanon). Of the 50 countries (86%) presenting consistent data, 44 had extracted those data from surveys with a sample size larger than 99, making the data eligible for analysis of condom use in MSM. The estimated number of MSM in these 44 countries represented 47% of the MSM population in all of the 147 LMIC.

Among the eligible countries, the estimated use of condoms at last anal sex with another man ranged from 24% in

TABLE 3. Low-Income and Middle-Income Country Reports on HIV Testing and HIV Prevention Coverage Among MSM

Countries	Male Adult Population Aged 15–64 Years in 2007	Prevalence of MSM Among 15–64 Years Old, %	HIV Testing Among MSM						HIV Prevention Coverage Among MSM							
			Data Reported by Countries			Calculated Estimates			Data Reported by Countries			Calculated Estimates				
			Year	Data as Collected	Methods Required	Sample Size	Eligible Data	Indicator (Proportion)	95% CI (Low to High)	Year	Data as Collected	Methods Required	Sample Size	Eligible Data	Indicator (Proportion)	95% CI (Low to High)
Argentina	12,329,000	1–8	2007	Yes	274	Yes	0.982	0.966	0.998	2007	Yes	274	Yes	0.982	0.966	0.998
Armenia	936,000	1–8	2007	Yes	100	Yes	0.050	0.007	0.093	2007	Yes	100	Yes	0.100	0.041	0.159
Bangladesh	49,433,000	7–8	2006–2007	Yes	787	Yes	0.064	0.047	0.081	2006–2007	Yes	843	Yes	0.127	0.105	0.149
Belarus	3,323,000	1–8	2007	Yes	297	Yes	0.532	0.475	0.589	2007	Yes	297	Yes	0.899	0.865	0.933
Bolivia	2,675,000	1–8	2007	No	242	No	0.996	N/A	N/A	—	—	—	—	—	—	—
Bosnia	1,328,000	1–8	2001–2002	No	30	No	0.100	N/A	N/A	—	—	—	—	—	—	—
Bulgaria	2,646,000	1–8	2006	Yes	199	Yes	0.286	0.224	0.349	2006	Yes	199	Yes	0.297	0.233	0.360
Cambodia	4,103,000	3.5–4.5	2007	Yes	729	Yes	0.581	0.545	0.616	—	—	—	—	—	—	—
Chile	5,534,000	1–8	2006–2007	Yes	6,345	Yes	0.369	0.357	0.381	—	—	—	—	—	—	—
China	487,060,000	1–4	2007	Yes	4,995	Yes	0.327	0.314	0.340	2007	Yes	4,995	Yes	0.378	0.365	0.391
Colombia	14,467,000	1–8	2007	Yes	527	Yes	0.615	0.573	0.656	—	—	—	—	—	—	—
Costa Rica	1,487,000	1–8	2006	Yes	400	Yes	0.428	0.379	0.476	2006	Yes	400	Yes	0.263	0.219	0.306
Cuba	3,943,000	1–3	2006	Yes	N/A	No	0.334	N/A	N/A	2006	Yes	N/A	No	0.558	N/A	N/A
Côte d'Ivoire	5,383,000	1–3	2006–2007	No	93	No	0.570	N/A	N/A	2006–2007	No	93	No	1.000	N/A	N/A
Ecuador	4,076,000	1–8	2006–2007	No	1,450	No	0.499	N/A	N/A	2006–2007	Yes	1,450	Yes	0.487	0.461	0.513
El Salvador	1,992,000	1–8	2007	Yes	606	Yes	0.553	0.513	0.592	2007	Yes	606	Yes	0.621	0.582	0.660
Georgia	1,419,000	1–8	2004–2005	Yes	70	No	0.300	N/A	N/A	—	—	—	—	—	—	—
Ghana	6,718,000	1–3	2006	Yes	N/A	No	0.250	N/A	N/A	—	—	—	—	—	—	—
Guatemala	3,261,000	1–8	2007	Yes	598	Yes	0.644	0.605	0.682	2007	Yes	598	Yes	0.753	0.718	0.787
Guyana	242,000	1–8	2005	No	331	No	0.438	N/A	N/A	2005	Yes	200	Yes	0.172	0.120	0.224
Haiti	2,691,000	1–3	2006	Yes	1,626	Yes	0.480	0.456	0.504	—	—	—	—	—	—	—
Honduras	1,928,000	1–8	2006	Yes	600	Yes	0.398	0.359	0.437	2006	Yes	N/A	No	0.243	N/A	N/A
Indonesia	75,928,000	3.5–4.5	2007	Yes	998	Yes	0.319	0.290	0.348	2007	Yes	998	Yes	0.401	0.370	0.431
Kazakhstan	5,025,000	1–8	2006–2007	Yes	450	Yes	0.384	0.339	0.429	2006–2007	No	450	No	0.000	N/A	N/A
Kyrgyzstan	1,658,000	1–8	2006	Yes	100	Yes	0.700	0.610	0.790	2006	No	100	No	0.770	N/A	N/A
Lao	1,637,000	3.5–4.5	2007	Yes	540	Yes	0.048	0.030	0.066	—	—	—	—	—	—	—
Lebanon	1,261,000	1–3	2005–2006	No	130	No	0.139	N/A	N/A	2005–2006	No	130	No	0.146	N/A	N/A
Lithuania	1,124,000	1–8	2007	Yes	94	No	0.277	N/A	N/A	2007	Yes	94	No	0.404	N/A	N/A
Macedonia	714,000	1–8	2007	Yes	195	Yes	0.559	0.489	0.629	—	—	—	—	—	—	—
Malaysia	8,580,000	3.5–4.5	2006–2007	No	266	No	1.000	N/A	N/A	2007	No	266	No	1.000	N/A	N/A
Mauritania	964,000	1–3	2006–2007	No	26	No	0.154	N/A	N/A	—	—	—	—	—	—	—
Mauritius	434,000	1–3	2004	Yes	50	No	0.160	N/A	N/A	—	—	—	—	—	—	—
Mexico	32,472,000	1–8	2005–2006	Yes	1,111	Yes	0.536	0.506	0.565	2005–2006	Yes	1,111	Yes	0.182	0.159	0.204
Moldova	1,296,000	1–8	2007	Yes	94	No	0.383	N/A	N/A	2007	Yes	94	No	0.862	N/A	N/A
Mongolia	883,000	1–4	2005	Yes	50	No	0.600	N/A	N/A	2005	Yes	88	No	0.670	N/A	N/A
Montenegro	195,000	1–8	2006–2007	No	57	No	0.807	N/A	N/A	—	—	—	—	—	—	—
Nepal	7,796,000	7–8	2007	Yes	400	Yes	0.300	0.255	0.345	2007	Yes	400	Yes	0.468	0.419	0.516
Nigeria	38,074,000	1–3	2007	Yes	879	Yes	0.302	0.271	0.332	—	—	—	—	—	—	—
Panama	1,056,000	1–8	2007	Yes	285	Yes	0.758	0.708	0.808	2007	Yes	285	Yes	0.891	0.855	0.927
Papua New Guinea	1,788,000	1–3	2006	Yes	300	Yes	0.417	0.361	0.472	2006	Yes	300	Yes	0.103	0.069	0.138
Peru	8,713,000	1–8	2006	Yes	4,090	Yes	0.206	0.194	0.218	2006	Yes	4,168	Yes	0.445	0.430	0.460
Philippines	26,147,000	3.5–4.5	2007	Yes	1,059	Yes	0.160	0.138	0.182	2007	Yes	1,059	Yes	0.185	0.162	0.208
Romania	7,469,000	1–8	2007	Yes	128	Yes	0.469	0.382	0.555	2007	Yes	128	Yes	0.586	0.501	0.671
Russian Federation	49,188,000	1–8	2005	Yes	680	Yes	0.315	0.280	0.350	2006	Yes	303	Yes	0.168	0.126	0.210
Sri Lanka	6,582,000	7–8	2006–2007	Yes	302	Yes	0.136	0.097	0.175	—	—	—	—	—	—	—
Thailand	21,775,000	3.5–4.5	2006–2007	Yes	906	Yes	0.349	0.318	0.380	—	—	—	—	—	—	—
Tunisia	3,509,000	1–3	—	Yes	N/A	No	0.350	N/A	N/A	—	—	—	—	—	—	—
Turkey	24,884,000	1–3	2006–2007	Yes	200	Yes	0.307	0.243	0.371	2006–2007	Yes	200	Yes	0.187	0.133	0.241
Ukraine	15,510,000	1–8	2007	Yes	1,764	Yes	0.275	0.254	0.296	2007	Yes	1,764	Yes	0.499	0.476	0.523
Uzbekistan	8,442,000	1–8	2005	Yes	102	Yes	0.255	0.170	0.339	—	—	—	—	—	—	—
Vietnam	28,176,000	3.5–4.5	2005–2006	Yes	790	Yes	0.163	0.138	0.189	2005–2006	Yes	790	Yes	0.256	0.225	0.286

N/A, not available or applicable.

TABLE 4. Regional Variations in Global Estimates Weighted by MSM Population Size

Regions	HIV Testing				HIV Prevention Coverage				HIV Knowledge				Condom Use			
	N	W M	Mdn	SD	N	W M	Mdn	SD	N	W M	Mdn	SD	N	W M	Mdn	SD
Caribbean	1	48	NA	NA	NA	NA	NA	NA	1	36	NA	NA	3	74	73	8
East Asia	1	33	NA	NA	1	38	NA	NA	1	55	NA	NA	1	64	NA	NA
Eastern Europe and Central Asia	9	33	31	9	6	31	17	20	8	37	26	15	10	58	60	10
Latin America	10	57	54	21	9	44	26	31	8	57	65	16	13	73	79	17
North Africa and Middle East	1	31	NA	NA	1	19	NA	NA	NA	NA	NA	NA	1	37	NA	NA
Oceania	1	42	NA	NA	1	10	NA	NA	1	71	NA	NA	1	62	NA	NA
South and South-East Asia	9	20	16	12	5	26	18	13	6	30	27	10	9	38	24	19
Sub-Saharan Africa	1	30	NA	NA	NA	NA	NA	NA	1	44	NA	NA	5	57	53	8
Western and Central Europe	1	56	NA	NA	NA	NA	NA	NA	1	41	NA	NA	1	56	NA	NA
Total	34	31	33	15	23	33	38	16	27	44	47	15	44	54	61	19

N, number of reporting countries; W M, mean weighted by MSM population size of countries represented in the region; Mdn, median; SD, standard deviation; NA, not available or applicable.

Pakistan to 90% in Argentina. The global estimate weighted by population size indicates that, on average, slightly more than half of MSM across LMIC had used condoms the last time they had sex with another man (mean = 54%, median = 61%, SD = 19, range: 24%–90%). Weighted estimates of condom use among MSM were found to be lower in South and Southeast Asia (9 countries, mean = 38%, median = 24%, SD = 19, range: 24%–88%), intermediate in both sub-Saharan Africa (5 countries, mean = 57%, median = 53%, SD = 8, range: 53%–75%) and Eastern Europe and Central Asia (10 countries, mean = 58%, median = 60%, SD = 10, range: 39%–83%), and higher in the Caribbean (3 countries, mean = 74%, median = 73%, SD = 8, range: 47%–79%), and highest in Latin America (13 countries, mean = 73%, median = 79%, SD = 17, range: 29%–90%).

DISCUSSION

The aim of this study was to assess the HIV prevention needs and responses among MSM in LMIC. In particular, we derived country-level, global and regional estimates of HIV testing, coverage by HIV prevention programs, HIV knowledge and condom use in these communities from data provided during the 2008 UNGASS reporting round.²² To the best of our knowledge, the data presented in this article represent the largest set of country-level information to date on each of the 4 indicators of HIV prevention needs and responses among MSM in LMIC. The analyses of these country data can substantially enhance understanding of the status and monitoring of HIV prevention needs and responses among MSM in LMIC at national and global levels and provide valuable information for at least 3 specific regions.

The findings show that the extent to which LMIC report on MSM remains limited. Of 147 LMIC, only 51 reported on the prevalence of HIV testing in MSM, 33 reported on coverage by HIV prevention programs, 37 reported on HIV knowledge and 58 countries reported on condom use. Strong variations were observed in the proportion of reporting countries per region: the highest reporting rates were observed in Eastern Europe and Central Asia, in Latin America and in South and Southeast Asia and the lowest reporting rates were

found in sub-Saharan Africa, North Africa and Middle East, and Oceania. Moreover, for each of the indicators, a substantial minority of country reports provided data that were not eligible because the measurement of indicators differed substantially from the UNAIDS guidelines or because sample sizes were small or unspecified. These observations corroborate commentaries in the literature noting that the HIV epidemics among MSM are neglected in many countries^{11,16,26} and that the quality, utility and comparability of available data are limited.^{8,9}

For each of the indicators of HIV testing, coverage by HIV prevention programs, HIV knowledge and condom use, between two-thirds and three-quarters of available country reports provided eligible data for analysis (HIV testing 67%; coverage of HIV prevention programs 73%; HIV knowledge 73%; condom use 76%). In addition, the estimated number of MSM across countries reporting eligible data represented a substantial proportion of the total estimated MSM population in all of the 147 LMIC (HIV testing 42%; coverage of HIV prevention programs 37%; HIV knowledge 37%; condom use 47%). Using a calculation of standard errors based on sample sizes, this study estimated the CIs around indicator values provided in eligible country reports. For a substantial proportion of countries, these CIs were wide. This reflects the limited reliability of indicator values derived from smaller samples and suggests that understanding of the HIV prevention needs and responses among MSM in some of the limited number of countries that do collect MSM-pertinent data is still surrounded by substantial uncertainty. Larger studies in more countries will be needed in the future to extend the availability and strengthen the reliability of country indicator values.

Nevertheless, until now there has been no compilation of data describing levels of HIV testing, coverage of HIV prevention programs, HIV knowledge and condom use among MSM in LMIC. In addition, although UNGASS data previously have been used mainly without weighting for the size of MSM populations,²⁷ the weighted indicator values presented here enable the calculation of more accurate global and regional indicator estimates of HIV services coverage.

TABLE 5. Low-Income and Middle-Income Country Reports on HIV Knowledge and Condom Use Among MSM

Countries	Male Adult Prevalence of MSM Aged 15–64 Years in 2007	Prevalence of MSM 15–64 Old, %	HIV Knowledge Among MSM						Condom Use Among MSM							
			Data Reported by Countries			Calculated Estimates			Data Reported by Countries			Calculated Estimates				
			Year Data Collection	Methods as Required	Sample Size	Eligible Data	Indicator (Proportion)	95% CI (Low to High)	Year Data Collection	Methods as Required	Sample Size	Eligible Data	Indicator (Proportion)	95% CI (Low to High)		
Argentina	12,329,000	1–8	—	—	—	—	—	N/A	N/A	2007	Yes	252	Yes	0.905	0.869	0.941
Armenia	936,000	1–8	2007	Yes	100	Yes	0.737	0.651	0.823	2007	Yes	100	Yes	0.835	0.762	0.908
Bangladesh	49,433,000	7–8	2006–2007	Yes	843	Yes	0.273	0.243	0.303	2006–2007	Yes	747	Yes	0.243	0.212	0.274
Belarus	3,323,000	1–8	2007	Yes	297	Yes	0.563	0.507	0.620	2007	Yes	297	Yes	0.668	0.614	0.721
Bolivia	2,675,000	1–8	—	—	—	—	—	—	—	—	No	473	No	0.693	N/A	N/A
Bulgaria	2,646,000	1–8	2006	Yes	199	Yes	0.322	0.257	0.386	2006	Yes	199	Yes	0.462	0.393	0.532
Cambodia	4,103,000	3.5–4.5	—	—	—	—	—	—	—	2007	Yes	729	Yes	0.865	0.840	0.889
Chile	5,534,000	1–8	—	—	—	—	—	—	—	2006–2007	Yes	6345	Yes	0.291	0.280	0.302
China	487,060,000	1–4	2007	Yes	4,995	Yes	0.551	0.537	0.565	2007	Yes	4995	Yes	0.644	0.631	0.657
Colombia	14,467,000	1–8	—	—	—	—	—	—	—	2007	Yes	527	Yes	0.803	0.769	0.837
Costa Rica	1,487,000	1–8	2006	Yes	400	Yes	0.853	0.818	0.887	2006	Yes	400	Yes	0.705	0.660	0.750
Croatia	1,530,000	1–8	—	—	—	—	—	—	—	2006	Yes	360	Yes	0.533	0.482	0.585
Cuba	3,943,000	1–3	2006	Yes	—	No	0.545	N/A	N/A	2006	Yes	N/A	No	0.551	N/A	N/A
Côte d'Ivoire	5,383,000	1–3	—	—	—	—	—	—	—	2007	No	47	No	0.468	N/A	N/A
Dominican Republic	2,929,000	1–3	—	—	—	—	—	—	—	2004	Yes	597	Yes	0.790	0.757	0.823
Ecuador	4,076,000	1–8	—	No	1,450	No	0.588	0.563	0.614	2006	Yes	900	Yes	0.635	0.603	0.666
El Salvador	1,992,000	1–8	2007	Yes	606	Yes	0.250	0.216	0.285	2007	Yes	606	Yes	0.831	0.802	0.861
Fiji	267,000	1–3	—	—	—	—	—	—	—	—	No	N/A	No	0.200	N/A	N/A
Georgia	1,419,000	1–8	2004–2005	Yes	70	No	0.000	N/A	N/A	—	—	—	—	—	—	—
Guatemala	3,261,000	1–8	2007	Yes	599	Yes	0.329	0.291	0.367	2007	Yes	418	Yes	0.778	0.738	0.817
Guyana	242,000	1–8	2005	Yes	421	Yes	0.671	0.626	0.716	2005	Yes	200	Yes	0.807	0.752	0.862
Haiti	2,691,000	1–3	2006	Yes	600	Yes	0.358	0.320	0.397	2006	Yes	600	Yes	0.730	0.694	0.766
Honduras	1,928,000	1–8	2006	Yes	806	Yes	0.211	0.183	0.239	2006	Yes	617	Yes	0.475	0.435	0.514
Indonesia	75,928,000	3.5–4.5	2007	Yes	998	Yes	0.416	0.385	0.446	2007	Yes	998	Yes	0.393	0.363	0.423
Iran	24,055,000	7–8	—	No	83	No	0.072	N/A	N/A	—	—	—	—	—	—	—
Kazakhstan	5,025,000	1–8	2006–2007	Yes	450	Yes	0.656	0.612	0.700	2006–2007	Yes	450	Yes	0.664	0.620	0.707
Kenya	9,935,000	1–3	—	—	—	—	—	—	—	2005–2006	Yes	500	Yes	0.750	0.712	0.788
Kyrgyzstan	1,658,000	1–8	2006	Yes	100	Yes	0.890	0.829	0.951	2006	Yes	100	Yes	0.810	0.733	0.887
Lao	1,637,000	3.5–4.5	2007	No	540	No	0.306	N/A	N/A	2007	No	540	No	0.242	N/A	N/A
Lebanon	1,261,000	1–3	—	—	—	—	—	—	—	2005–2006	No	130	No	0.392	N/A	N/A
Lithuania	1,124,000	1–8	2007	Yes	94	No	0.389	N/A	N/A	2007	Yes	94	No	0.585	N/A	N/A
Macedonia	714,000	1–8	2007	Yes	195	Yes	0.410	0.341	0.479	2007	Yes	195	Yes	0.565	0.495	0.634
Mali	2,782,000	1–3	—	—	—	—	—	—	—	2007	Yes	417	Yes	0.539	0.491	0.587
Mauritius	434,000	1–3	2004	Yes	50	No	0.480	N/A	N/A	2004	Yes	50	No	0.522	N/A	N/A
Mexico	32,472,000	1–8	2005–2006	Yes	1,111	Yes	0.655	0.627	0.683	2005–2006	Yes	710	Yes	0.794	0.765	0.824
Moldova	1,296,000	1–8	2007	Yes	94	No	0.468	N/A	N/A	2007	Yes	94	No	0.481	N/A	N/A
Mongolia	883,000	1–4	2005	Yes	88	No	0.227	N/A	N/A	2005	Yes	88	No	0.670	N/A	N/A
Nepal	7,796,000	7–8	2007	Yes	400	Yes	0.445	0.396	0.494	2007	Yes	400	Yes	0.735	0.692	0.778
Nigeria	38,074,000	1–3	2007	Yes	879	Yes	0.440	0.407	0.473	2007	Yes	879	Yes	0.528	0.495	0.561
Pakistan	49,631,000	7–8	—	—	—	—	—	—	—	2007	Yes	2,288	Yes	0.242	0.224	0.259
Panama	1,056,000	1–8	2007	Yes	285	Yes	0.775	0.727	0.824	2007	Yes	285	Yes	0.860	0.819	0.900
Papua New Guinea	1,788,000	1–3	2007	Yes	300	Yes	0.707	0.655	0.758	2007	No	300	No	0.885	N/A	N/A
Peru	8,713,000	1–8	2006	Yes	4,101	Yes	0.402	0.387	0.417	2006	Yes	3334	Yes	0.472	0.455	0.489
Philippines	26,147,000	3.5–4.5	2007	Yes	1,059	Yes	0.100	0.082	0.118	2007	Yes	1059	Yes	0.319	0.291	0.347
Poland	13,391,000	1–8	—	—	—	—	—	—	—	2004	No	400	No	0.320	N/A	N/A
Romania	7,469,000	1–8	2007	Yes	128	Yes	0.453	0.367	0.539	2007	Yes	128	Yes	0.727	0.649	0.804
Russian Federation	49,188,000	1–8	2005	Yes	690	Yes	0.264	0.231	0.297	2006	Yes	539	Yes	0.596	0.554	0.637
Saint Lucia	52,000	1–3	—	—	—	—	—	—	—	2007	Yes	19	No	0.737	N/A	N/A
Senegal	3,207,000	1–3	—	—	—	—	—	—	—	2004	Yes	463	Yes	0.553	0.508	0.598
Sri Lanka	6,582,000	7–8	2006–2007	Yes	302	Yes	0.199	0.154	0.244	2006–2007	Yes	400	Yes	0.609	0.561	0.657
Suriname	146,000	1–8	—	—	—	—	—	—	—	2006	Yes	421	Yes	0.891	0.861	0.921
Thailand	21,775,000	3.5–4.5	2006–2007	Yes	1456	Yes	0.253	0.231	0.275	2006–2007	Yes	237	Yes	0.882	0.841	0.923
Togo	1,707,000	1–3	—	—	—	—	—	—	—	2006	Yes	122	Yes	0.598	0.511	0.685
Trinidad and Tobago	469,000	1–3	—	—	—	—	—	—	—	2004	Yes	307	Yes	0.469	0.413	0.525
Turkey	24,884,000	1–3	—	—	—	—	—	—	—	2006–2007	Yes	200	Yes	0.367	0.300	0.434
Tuvalu	4,000	1–3	—	—	—	—	—	—	—	2005	Yes	187	Yes	0.625	0.556	0.694
Ukraine	15,510,000	1–8	2007	Yes	1,764	Yes	0.469	0.446	0.493	2007	Yes	1764	Yes	0.387	0.365	0.410

(continued on next page)

TABLE 5. (continued) Low-Income and Middle-Income Country Reports on HIV Knowledge and Condom Use Among MSM

Countries	Male Adult Prevalence of MSM Aged 15–64 Years in 2007		HIV Knowledge Among MSM						Condom Use Among MSM							
	Population	of MSM	Data Reported by Countries			Calculated Estimates			Data Reported by Countries			Calculated Estimates				
			Year	Methods	Sample	Indicator	95% CI	Year	Methods	Sample	Indicator	95% CI				
Years in	15–64	15–64	Data	as	Eligible	(Proportion)	(Low to High)	Data	as	Eligible	(Proportion)	(Low to High)				
Uruguay	1,029,000	1–8	—	—	—	—	—	—	—	—	No	7799	No	0.599	N/A	N/A
Uzbekistan	8,442,000	1–8	—	—	—	—	—	—	2005	Yes	102	Yes	0.610	0.516	0.705	
Vietnam	28,176,000	3.5–4.5	2005–2006	No	790	No	0.549	N/A	N/A	2005–2006	Yes	790	Yes	0.613	0.515	0.584

N/A, not available or applicable.

For each of the 4 indicators, regional weighted estimates were found to be much higher in Latin America than in the other regions, including South and Southeast Asia, Eastern Europe and Central Asia. Global weighted estimates across all reporting LMIC suggest that the HIV prevention needs among MSM in LMIC are high. On average, less than half of MSM in LMIC have correct HIV knowledge, slightly more than half of MSM used a condom the last time they had anal intercourse with another man, and less than a third of MSM in LMIC have tested for HIV. Limited HIV knowledge, condom use and HIV testing increase the risk and vulnerability of MSM to HIV infection,²⁸ and the 2008 UNGASS data provide clear indications that scaling-up of prevention responses among MSM in LMIC is urgently needed. Notably, 2008 UNGASS data also show that only one third of MSM may have been reached by HIV prevention programs. To be optimally effective, a comprehensive response is needed to ensure the availability, accessibility and acceptability of effective HIV prevention services and programs and to address social exclusion and other structural factors that increase the vulnerability of MSM in LMIC to HIV infection.^{5,11}

The data used in our analyses have several limitations, in addition to those noted above. Importantly, the MSM population estimates that were used in this study remain imperfect due to the ongoing scarcity of data on the prevalence of male–male sexual behaviors in most LMIC. Other limitations are inherent in the methodologies of country surveys, in particular data collection and recruitment strategies. MSM data reported by countries generally cannot be considered representative of the MSM populations in the country because those data are generally collected in 1 or a limited number of localities, usually the capital city and/or other major cities. Strengthening the representativeness of samples is an important challenge for future surveillance and research among MSM in LMIC. Furthermore, some country indicator value reports to UNGASS, in particular those that are “close to perfection,” may have been inflated, reflecting a social desirability bias. A major additional concern in this respect was the difficulty of external validation and triangulation of reported data using independent sources. For many countries included in this study, no published data were available on the indicators. For other countries, published data were not consistent with UNGASS requirements and reflected a heterogeneous set of ad hoc indicators that prevented triangulation. In addition, as many country reports do not

specify the source of the submitted data or the details of the survey from which they were extracted, it remains unclear whether other sources provide independent data.

Several further limitations are inherent in UNGASS indicator specifications and guidelines. The information that is requested regarding the prevalence of HIV testing among MSM, for example, does not enable differentiation between client-initiated, voluntary counseling and testing, and the impact of provider-initiated or compulsory HIV testing policies and programs. Similarly, the requested information regarding the coverage of HIV prevention programs should be specified to better reflect the diversity, intensity and quality of HIV prevention programs. Methodological improvements in measurement of HIV prevention coverage are also required to better monitor further progress at the country level and across LMIC. Also, questions to assess HIV knowledge are basic and they may have limited sensitivity for differentiating between individuals and communities with more or less relevant HIV knowledge. Questions that tap individuals’ beliefs regarding the transmission and prevention of HIV may be more informative than factual knowledge questions. Furthermore, if adequate understanding of risky and protective behaviors is to be achieved, condom use should be assessed beyond the last occasion of anal sex. Condom use data need to be put in perspective by also assessing the proportion of men who engage in anal sex, the number of partners with whom anal sex is practiced and the frequency of anal sex in these male–male sexual interactions, which may vary between countries, regions and cultures. Ideally, information would also need to be collected on types of partnerships and the HIV status of partners to gauge the extent to which unprotected sex is part of a range of risk-reduction strategies that have been observed among MSM in HIC, such as negotiated safety, serosorting and strategic positioning.^{29,30}

These limitations mean that the data from the 2008 UNGASS reporting round cannot be regarded as the final word on the HIV prevention needs and responses of MSM in LMIC. However, the data do provide important insights for HIV prevention and can serve as a base line against which future reporting rounds may be compared. The estimates presented here mark the first time that global level data addressing essential elements of HIV prevention programs for MSM have been compiled and analyzed. They constitute a potentially valuable resource for monitoring progress in HIV responses and can serve as a powerful tool for advocacy.

Our findings clearly support previous studies, which found that MSM are at high risk for HIV infection in many LMIC. Findings also unmistakably show that monitoring and prevention responses remain insufficient and do not reach satisfactory numbers of MSM. Increasing surveillance efforts and scaling up high quality evidence-based HIV prevention for MSM in LMIC is urgently needed to influence behaviors and alter epidemic trends. Extending and improving monitoring, research and prevention among MSM in LMIC is not only a matter of promoting sound public health practice, it also contributes to ensuring the human rights of MSM.³¹

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