GHANA AIDS COMMISSION

THE GHANA MEN'S STUDY II

2017

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COLLABORATING INSTITUTIONS

Human Sciences Research Council (HSRC)

Kwame Nkrumah University of Science and Technology (KNUST)

US Centers for Disease Control and Prevention (CDC)

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
CAPI	Computer-Assisted Personal Interview
CBO	Community-based Organization
CDC	U.S. Centers for Disease Control and Prevention
CEPEHRG	Centre for Popular Education and Human Rights, Ghana
CHRAJ	Commission for Human Rights and Administrative Justice
CHRPE	Center for Human Research and Publication Ethics
CI	Confidence Interval
EIA	Enzyme Immunoassay
FGDs	Focus Group Discussions
GAC	Ghana AIDS Commission
GHS	Ghanaian Cedis
GMS	Ghana Men's Study
HBV	Hepatitis B Virus
HCT	HIV Counseling and Testing
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
HSV-2	Herpes Simplex Virus Type 2
IBBSS	Integrated Biological-Behavioral Surveillance Surveys
IECs	Independent Ethics Committees
INFANET	Interfaith Family network
IRBs	Institutional Review Boards
KNUST	Kwame Nkrumah University of Science and Technology
MOH	Ministry of Health
MPSE	Mapping and Population Size Estimation
MSM	Men who have Sex with Men
NGO	Non-Governmental Organization
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PWIDs	Persons Who Inject Drugs

QC	Quality Control
RDS	Respondent Driven Sampling
SL-KATH	Serology Laboratory of the Komfo Anokye Teaching Hospital
STIs	Sexually Transmitted Infections
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
WAAF	West Africa AIDS Foundation
WAPCAS	West Africa Project to Combat AIDS and STI, Ghana

FOREWORD

Periodic implementation of an Integrated Biological Behavioral Surveillance Survey (IBBSS) for key populations in general and men who have sex with men (MSM) in particular is part of the Ghana AIDS Commission's (GAC's) effort to fill in the data gaps to reach the target population with comprehensive services. The first IBBSS and Mapping and Population Size Estimation (MPSE) of MSM conducted in Ghana was conducted in 2011. This study was called the Ghana Men's Study I (GMS I). In line with the GAC's policy to conduct IBBSS and MPSE for key populations every three to four years, the second round of IBBSS and MPSE for MSM in Ghana (GMS II) was launched in 2014.

The GMS II was coordinated by the GAC in collaboration with the President's Emergency Plan for AIDS Relief (PEPFAR) through the Centres for Disease Control and Prevention (CDC) and implemented by the School of Medical Science, Kwame Nkrumah University of Science and Technology with technical assistance from the Human Sciences Research Council (HSRC).

The survey was launched beginning with a series of in-country stakeholder meetings that included local Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs) providing health and social services to MSM in Ghana, academics considered to be experts on the social and health issues affecting MSM and other sexual minority populations, government public health officials, international donors and community members. A collaborative network of MSM-friendly service providers was also formed to accept study participants for any needed services. This process of involving every stakeholder was important in ensuring ownership of both data and findings of the project.

Stakeholder input shaped the composition of the research team with respect to sexual orientation, and gender representation and also informed the formation of a Scientific Advisory Committee made up of implementers of the GMS I, implementers of Key Population programs, NGOs providing services to MSM and representatives from academia and research institutions.

This report provides the most comprehensive national scale data on MSM in Ghana that then can be used to inform evidence-based programming targeted at a known population with tailored services reducing new HIV infections and improving the care and treatment for MSM. I am confident that the data is comprehensive to providing the information necessary to inform programme implementation to achieve the targets as outlined in the National Strategic Plan (NSP) of HIV/AIDS 2016 –- 2020.

EXECUTIVE SUMMARY

Background

HIV impacts key populations such as men who have sex with men (MSM) disproportionately. This study, called the Ghana Men's Study II (GMSII), was a mapping and population size estimation (MPSE) study and integrated bio-behavioral surveillance survey (IBBSS) conducted amongst MSM in Ghana. The term MSM refers to a form of sexual behaviour. It is not limited to individuals with any one sexual orientation or gender expression or identity. For the purpose of this study, MSM referred to all biological males who have sex with other biological males, irrespective of the person's sexual orientation and gender expression. Three objectives guided the implementation of the IBBSS amongst MSM. The first was to assess the prevalence of HIV and other selected sexually transmitted infections (STIs) (i.e. Hepatitis B, HBV), Syphilis, and Herpes Simplex Virus Type 2, HSV-2). Secondly behavioral risk factors that contribute to the HIV vulnerability of MSM in Ghana was also assessed through an anonymous behavioral survey. Finally, the GMS II generated estimates of the size and distribution of MSM in the 10 regions in Ghana. The implicit aim of the study was to provide recommendations to address gaps in access to critical prevention, treatment, care and support services for MSM. Overall, the results of the MPSE and the IBBSS will be used to inform the National HIV and AIDS Strategic Plan 2016-2020 of Ghana.

Methodology

This study had three parts. First pre-surveillance formative research was conducted in order to inform implementation of the IBBSS. The main goal of the pre-surveillance formative research was to assess the acceptability of using respondent driven sampling (RDS) to recruit MSM into the IBBSS. Secondly, the IBBSS was implemented to assess HIV risk taking behaviours and HIV and STI prevalence amongst MSM. Finally, a MPSE was implemented to determine the scale and size of the MSM population in Ghana.

MSM across 10 selected regions of Ghana were recruited using RDS. The following regions were included in the GMS II: Greater Accra Region (Accra and Tema); Eastern Region (Koforidua); Brong-Ahafo Region (Sunyani); Western Region (Takoradi); Central

Region (Cape Coast): Ashanti region (Kumasi); Northern region (Tamale); Upper East (Bolgatanga); Upper West (Wa) and the Volta region (Ho). Implementation of the IBBSS took place in all 10 regions of Ghana. For data analysis purposes, Wa, Tamale and Bolgatanga were collapsed and renamed to Northern Ghana.

Study population

The inclusion criteria for MSM to participate in the IBBSS were if they were; biologically male; aged 18 years or older (i.e. inclusive of men 18 years old); consensual sex with another man in the last 12 months (self-reported) and if they lived/worked/socialized in either one of the study regions in Ghana. The GMS II recruited 4,095 MSM across 10 regions of Ghana: Greater Accra region (N=546); Ashanti region (N=511); Brong-Ahafo region (N=504); Central region (N=503); Eastern region (N=501); Northern Ghana (N=510); Volta region (N=505) and in the Western region (N=515). Across study regions recruitment occurred on average in a period of 15 weeks.

Data analysis

Crude and adjusted HIV and behavioral risk-factor prevalence were estimated, and weights that adjusted for personal network size and biases in recruitment were generated using the RDS-Analyst (RDS-A).

Results

Socio-demographic characteristics

MSM across study regions were predominantly young (18-24 years old); have completed a secondary school educational level and reported a "single/never married" marital status. Concerning self-identification as gay, bisexual, straight or transgender, region-specific estimates revealed that most MSM identify as bisexual.

HIV and STI prevalence

The GMS II found an aggregate HIV prevalence of 18.1% amongst MSM in Ghana. Concerning, testing positive for syphilis, we found an aggregate prevalence of 1.0% amongst MSM in Ghana. Results show that while 7.0% of MSM tested positive for HBV 67.0% of MSM sampled were found to be HSV2 positive.

HIV prevalence differed in each of the study regions. An unusually high adjusted HIV prevalence estimate of 42.2% was found amongst MSM in the Greater Accra region. In

the Ashanti region 25.4%, of MSM were found to be HIV positive, Volta region recorded 14.0% MSM HIV prevalence, while Western and Central regions recorded 10.0% and 10.1% MSM HIV prevalence respectively. In the Eastern region 9.0% of MSM were estimated to be HIV positive, amongst MSM in Northern Ghana HIV prevalence was estimated at 4.3% and 4.0% of in the Brong-Ahafo region.

Behavioral risks

HIV testing history

Ever having tested for HIV varied per study region. In the Eastern region 69.2% of the study sample reported **ever having tested for HIV** and received their results whilst the lowest testing prevalence were recorded for participants in Northern Ghana, where 24.1% of the study sample reported ever having tested and receiving their test results.

Higher estimates of having tested for HIV in the last 12 months were found in all study regions. In the Central, region, 86.1% of MSM sampled reported to have tested for HIV in the last 12 months compared to 64.0% of MSM in Northern Ghana

Self-reporting of STI symptoms to sexual partner(s) in the last 12 months

Across study regions MSM differed in terms of self-reporting STI symptoms to sexual partner(s) in the last 12 months. Estimates with regards to having informed "none of them" ranged from 14.6% in the Eastern region, to 31.3% in the Greater Accra region. Concerning informing "all of them", estimates ranged from lowest, 3.7% amongst MSM in the Eastern region of Ghana to 15.1% of MSM reporting the same in the Brong-Ahafo region.

Sexual practices and sexual partnerships amongst MSM in Ghana

The GMS II assessed sexual practices and sexual partnerships amongst MSM in terms of transactional sex; preferred sexual practice (receptive, insertive, versatile) and number of sex partners.

Transactional sex with men and women in the last six months

Adjusted estimates for transactional sex with men and women were found to be high across study regions. With regards to receiving sex in exchange for money, region specific estimates show that 19.3% of MSM sampled in the Eastern region of Ghana reported receiving sex in exchange for money with a male partner whilst 32.8% of MSM in Northern Ghana did the same.

Region specific estimates revealed the following with regards to **selling sex in exchange for money with a male partner**: 47.8% of MSM in the Central region reported that they had sold sex in exchange for money with a male partner whilst 13.7% of MSM in the Volta region had done the same.

Concerning **receiving sex in exchange for money with a female partner** in the last six months. Region specific estimates show that 10.8% of MSM in the Volta region reported having received sex in exchange for money whilst 38.7% of MSM in Northern Ghana reporting the same. With regards to selling **sex in exchange for money with a female partner**, 5.7% of MSM in the Volta region reported positively to this question. Region specific estimates show that 21.6% of MSM in Northern Ghana reported that they sold sex in exchange for money with a female partner.

Sexual practices amongst MSM in Ghana in the last six months

Across the study regions, MSM mostly reported exclusively preferring receptive anal intercourse. In Northern Ghana, 55.7% of MSM sampled reported a versatile preferred type of anal intercourse; with 40.2% reporting the same in the Eastern region of Ghana; 30.9% reporting this preferred type of anal intercourse in the Central region. In the Greater Accra region, 35.7% of MSM preferred receptive anal intercourse; with 35.6% of MSM in the Ashanti region, reporting the same; followed by 34.3% of MSM in the Brong-Ahafo region reporting a preferred receptive anal type of anal intercourse. Population adjusted estimates of exclusive insertive anal intercourse were found to be highest (61.1%) in the Western region and the lowest in Northern Ghana (25.8%).

Number of male insertive sex partners in the last six months

In the Eastern region, 80.8% of MSM reported one or no male insertive sex partners in the last six months; followed by Volta region (78.8%); and 73.5% of MSM sampled in the Brong-Ahafo region reporting the same. Concerning having two or more male insertive partners, 59.2% of the study sample in the Central region and 54.3% in Northern Ghana reported having two or male insertive partners whilst 35.3% of the study sample in the Greater Accra region reported the same.

Number of male receptive sex partners in the last six months

Region specific estimates reveal that 89.7% of MSM sampled in the Western region reported one or less receptive male sex partners in the last six months, followed by 85.2% in the Brong-Ahafo region and 85.0% of MSM sampled in the Eastern region. Concerning having two or more male receptive sex partners, 50.7% of the study sample reported having two or more male receptive sex partners; followed by 43.6% of the study sample reporting the same in the Central region whilst 36.9% did the same in the Greater Accra region.

Condom and lubricant use amongst MSM in Ghana

Condom and lubricant use varied across study regions. It should be noted that across study regions, MSM reported that it was very easy to obtain condoms. Population adjusted estimates varied with regards to frequency of condom use during sex with a man or a woman and condom use at last sex with a man or a woman. Low estimates of "always" using condoms during sex with a man or a woman was recorded across study regions. A simple majority of 56.1% of MSM sampled in the Central region of Ghana reported to have "always" used a condom during sex with a man or a woman. This constitutes the highest estimate across the study regions. Similarly low estimates for "rarely" using a condom were reported in by MSM across study regions.

Concerning the use of lubricant, prevalence of "always using lubricant during anal sex" varied across study regions, with estimates ranging from a low of 12.2% of MSM sampled in the Northern Ghana to 80.7% of MSM sampled in the Central region. Of note is that only 15.0% of MSM sampled in the Ashanti region reported that lubricant was very affordable.

Alcohol use

Of note is that MSM across study regions reported abstaining from drinking alcohol. Region specific estimates ranges from 94.8% of MSM sampled in the Brong-Ahafo region, reported abstaining from alcohol, followed by 88.6% in the Volta region, and 84.0% reporting in Northern Ghana.

HIV knowledge

Composite measures of HIV knowledge showed that MSM had low correct knowledge of HIV. Correct knowledge estimates across study regions, ranged from 36.7% in the Greater Accra region to 70.2% of MSM who had correct knowledge in the Eastern

region of Ghana. With regards to individual questions of HIV knowledge, MSM across study regions were consistent in terms of their correct knowledge of HIV. Estimates on each individual item scored between 60% - 90%.

Self-disclosure of HIV status

MSM sampled across study regions indicated that they would disclose their HIV positive status to family, friends, and male/female sex partner(s), all respectively, if they found themselves HIV positive. Region specific estimates differed across each one of the type of person. With regards to disclosure to all in the family, regionally specific estimates varied from 40.6% amongst MSM in the Western region to only 5.7% amongst MSM in the Ashanti region. As for disclosure to all friends, this ranged from 27.0% amongst MSM in Northern Ghana to only 3.0% amongst MSM in the Central region. Concerning disclosure to all female sexual partners, this ranged from 36.9% and 36.6% amongst MSM in Western and Northern Ghana respectively to 7.3% amongst MSM in the Central region. Finally, when it came to possible disclosure to all male sexual partners this ranged from 42.0% amongst MSM in the Western region to 8.7% amongst MSM in the Central region.

Treatment by healthcare provider during last visit for treatment of STIs

MSM reported across study regions in the GMS II that they were treated well by healthcare providers when they accessed services. In the Volta region, 64.9% of MSM sampled reported feeling very comfortable with the treatment by a healthcare provider during the last visit for STI infection, followed by 58.9% of MSM sampled in the Brong-Ahafo region reporting the same level of comfortability; and 49.5% reporting the same in the Central region of Ghana.

With regards to negative or discriminatory manner in which healthcare provider treated MSM, 3.4% in the Greater Accra region reported that they felt discriminated against whilst 2.3% reported the same in the Brong-Ahafo region and 2.2% in Northern Ghana.

Refusal of services because of sexual orientation

Region specific estimates show that in all sectors (i.e. education, healthcare etc.) MSM reported not having experienced refusal of services because of sexual orientation. Concerning having refused healthcare services because of MSM status, Region specific estimates show that 89.1% of MSM in the Volta region reported no experiences of having been refused healthcare services, followed by 97.7% of MSM in the Greater Accra

region, 98.0% in Northern Ghana, 98.5% in the Western region, 98.8% in the Ashanti region, 99.5% in the Brong-Ahafo region and 99.7% in the Eastern region with 100.0% of MSM.

With regards to refusal of educational services, region specific estimates ranged from 87.7% to 99.8% who reported not having experienced refusal in the education service because of MSM status.

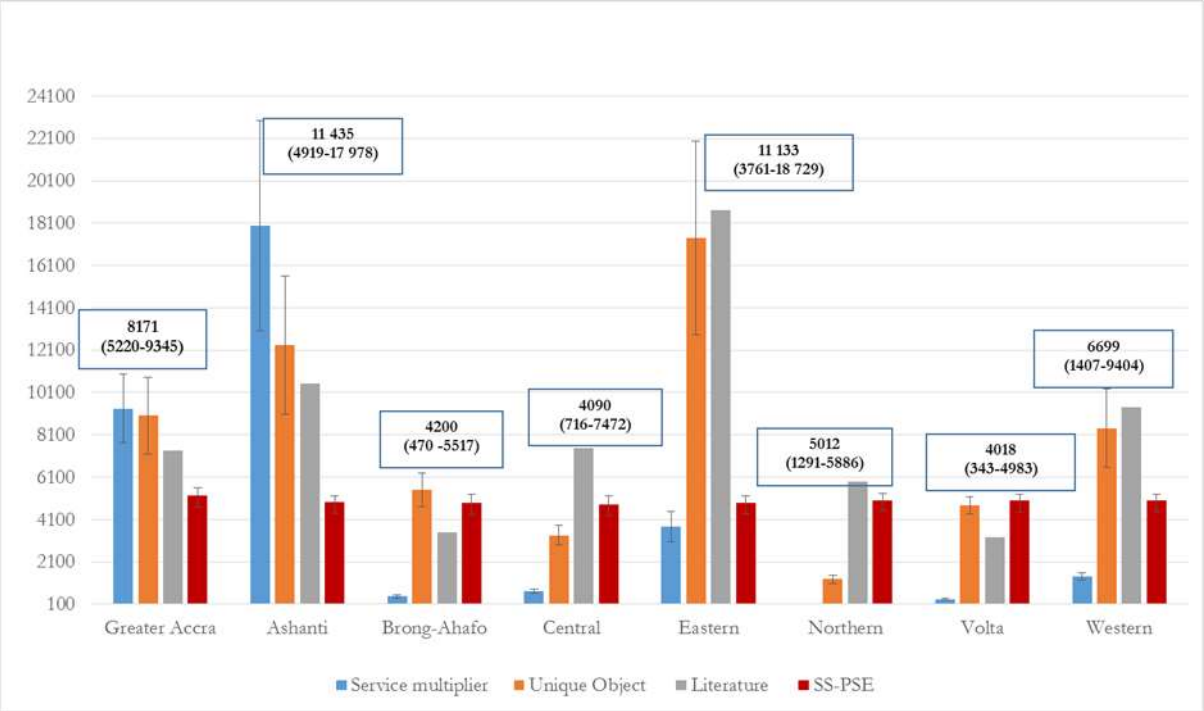
Physical violence experienced by MSM in Ghana

The majority of MSM reported across all study regions that there were no times in the last 12 months that they had experienced physical violence. Region specific estimates for having been spat on indicate, across regions that the overwhelming majority of MSM did not experience having been spat on. With estimates ranging from 86.6% in the Volta region to 100.0% in the Brong-Ahafo region for not being spat on because of sexual orientation. Concerning having been slapped in the last 12 months because of gay/bisexual sexual orientation, estimates range from 87.4% in the Volta region to 100.0% in the Brong-Ahafo region of MSM indicating that they have not been slapped. Similarly with regards to number of times having been sexually coerced in the last 12 months, the majority of MSM reported not having been sexually coerced. Estimates ranged from 87.2% in the Volta region to 100.0% in the Brong-Ahafo region.

Population Size Estimation

To date, the GMS II is the largest IBBSS using RDS to be conducted amongst MSM in Ghana. The overall size estimate of MSM in Ghana is 54,759 representing 0.72% of total adults male population aged 18 years and above. The plausibility bounds were estimated at (18,126 – 79,313) (Figure 1). Ashanti and Easter regions had the highest population size of MSM 11,436 and 11,133 respectively, while Volta, Central, and Brang-Ahafo has the lowest size of MSM 4,018, 4,090, and 4,200 respectively. Greater Accra size of MSM was 8,171 with a range of 5,220 – 9,345.

Figure 1: The estimates of MSM population size across the region using different methods.



Conclusions

MSM in all study regions are disproportionately affected by HIV. The IBBSS provides valuable information to the GAC to advocate for improved programmes for the health of MSM.

1. INTRODUCTION

1.1 Background

The current estimated adult HIV prevalence in Ghana of 1.6% might be relatively low, however HIV prevalence amongst key populations in this country has been consistently higher than that found in the general population (UNAIDS, 2017). According to the Ghana National HIV and AIDS Strategic Plan (2016-2020): the prevalence amongst key populations, such as men who have sex with-men (MSM), female sex workers (FSWs), persons who inject drugs (PWIDs) and prisoners is disproportionately high compared to the general population: five times higher among FSWs and more than eight times higher among MSM (GAC, 2016).

Moreover key populations are often marginalized by society and are greatly affected by discrimination and stigma (Scheibe, 2011). In addition, these populations are often neglected and underserved in terms of the necessary HIV resource allocation. MSM, in Ghana are a particularly stigmatized group (Attipoe, 2004). Sexual intercourse between men is viewed as "unnatural" and is illegal in Ghana (Usaid.Ghana, 2013). Given this, MSM are a critical, though difficult, population to reach with HIV-related services (Usaid.Ghana, 2013).

A starting point to understand the burden of HIV on MSM necessitates reliable population size estimates. Size estimates help policy makers and program staff understand the scope of the HIV problem, plan appropriate interventions, and allocate sufficient resources. In response to this, the Ghana AIDS Commission (GAC) initiated the Ghana Men's Study (GMS I) in 2011. The study was implemented in Accra/Tema, Cape Coast/Takoradi, Kumasi and Koforidua, over an average of 12 weeks between April and November 2011 amongst 1302 MSM (GAC, 2016). Results of the GMS I revealed a national HIV prevalence estimate of 17.5% amongst MSM in Ghana (GAC, 2016). The GMS I used multiple methods of size estimate to determine the size and the scale of the MSM population in Ghana. The estimate of 30,579 MSM in Ghana, according to Quaye et al. (2015) provides a basis for advocacy for the allocation of resources needed for MSM services in Ghana and for later measuring coverage of programs. .

Globally, studies show that MSM are also at high risk for sexually transmitted infections (STIs), including Hepatitis B virus (HBV) (WHO.http://www.who.int/hiv/pub/toolkits/msm-implementation-tool/en/, date). The GMS I measured the prevalence of STIs amongst MSM in four sites in Ghana (GAC, 2013) and found MSM at disproportionate risk of HIV infection (Aberle-Grasse et al., 2013; GAC, 2016). MSM were screened for syphilis, HSV-2, and Hepatitis B (HBV), in addition to HIV (GAC, 2013). The study found that the prevalence of HSV-2 was higher in all the sites than the other STIs (including HIV) (GAC, 2013). Adducing that the mode of acquisition of HIV is the same as other STIs in adults and also that the risks of infection is about the same for both HIV and STI, reaching MSM with HIV prevention interventions could be coupled with interventions against STI acquisition as MSM are known to be at high risk of STI including especially Hepatitis B virus (HBV) infection (WHO, 2014).

The Ghana Men's Study II (GMSII) is a follow on to the GMS I undertaken in 2011. This study is a mapping and population size estimation (MPSE) and integrated bio-behavioral surveillance survey (IBBSS) amongst MSM in Ghana. The results of the MPSE and the IBBSS will facilitate the measurement of indicators and tracking effectiveness and coverage of results of the National HIV and AIDS Strategic Plan 2016-2020, of PEPFAR Country Operational Plans and Global Fund Round grant agreements. Furthermore, the study will generate critical data for policy dialogue and decisions to inform both strategic and operational planning and resource allocation to ensure proper targeting of comprehensive prevention, treatment and care services for key populations, particularly, MSM.

1.2 Objectives of the study

a. To assess the prevalence of HIV and selected STIs (HBV, Syphilis, and HSV-2) and behavioral risks factors amongst MSM.
b. To generate estimates of the size of MSM and distribution in each mapping site, in the selected cities and towns.
c. To provide recommendations to address gaps in access to critical prevention, treatment, care and support services for MSM.

2. METHODOLOGY

This study had three parts. First, pre-surveillance formative research (including a Mapping Readiness Assessment (MRA)) was conducted in order to inform implementation of the IBBSS and the MPSE. Secondly, a behavioral survey and biological specimen collection was implemented to assess HIV risk taking behaviors and HIV and STI prevalence amongst MSM. The IBBSS used RDS[1] to recruit MSM into the IBBSS. In Phase 3, various size estimation methods were implemented to generate estimates of the size of MSM in Ghana.

2.1 Study regions

The following regions were included in the GMS II:

1. Greater Accra Region (Accra and Tema)
2. Eastern Region (Koforidua)
3. Brong-Ahafo Region (Sunyani)
4. Western Region (Takoradi)
5. Central Region (Cape Coast)
6. Ashanti Region (Kumasi)
7. Volta Region (Ho)
8. Northern Ghana (Wa, Tamale, Bolgatanga)

2.2 Eligibility criteria

The inclusion criteria for MSM to participate in this activity are:

1. Biologically male
2. Aged 18 years or older (i.e. inclusive of men 18 years old)
3. Self-reported consensual sex with another man in the last 12 months[2]
4. Live/work/socialize in either one of the 8 selected study regions of Ghana

[1]RDS is a form of chain-referral sampling where members of the subpopulation of interest are accessed through their social networks (Cloete et al., 2014).
[2] Sex with another man is defined as either oral sex or anal sex, as either the insertive or the receptive partner.

Transgender women were eligible if they were biologically male and have had sex with another man in the last 12 months

2.3 Phase 1: Pre-surveillance formative research

Pre-surveillance formative research consisted of interviews with key informants, semi-structured interviews with MSM and focus group discussions (FGDs) in each of the eight study regions. In this phase of the study ethnographic mapping by means of FGDs with MSM was conducted. Prior to the formative assessment a Mapping readiness assessment (MRA) was conducted in all 10 regions.

2.3.1 Objectives of the pre-surveillance formative research

The following objectives guided the implementation of the formative assessment:

a. To assess the acceptability of recruiting MSM into an IBBSS using RDS.

b. To identify the survey logistics needed to successfully implement a RDS study amongst MSM.

c. To conduct a rapid ethnographic mapping of MSM venues and MSM sub-populations.

d. To conduct a MRA in each of the study locations.

2.4 Pre-surveillance formative research methods

2.4.1 Key informants

In total 50 semi-structured interviews with key informants (five in each region) were conducted. Key informants were identified from universities, research institutions, NGOs working within HIV prevention for MSM and contacts made by the KNUST research staff. Key informants were purposively recruited, for their relevant expertise.

2.4.2 Semi-structured interviews to determine network size questions, selection of seeds and other survey logistics

For the purposes of RDS analysis, questions on each participant's network size are essential. Questions on network size have been formulated but final decisions regarding whether or not accurate responses regarding network size would be obtained was determined in this phase of the study.

A total of 100 MSM with diverse sociocultural and economic backgrounds from each of the study areas were recruited. Semi-structured interviews were conducted with MSM to assess the following: Estimation of social network, acceptability of RDS, seed selection and level of reimbursements, type of site, staffing and coupon design. MSM were purposively recruited from existing service providers for MSM.

2.4.3 Focus group discussions for ethnographic mapping purposes

A focus group guide was developed and used in all FGDs. The purpose of these FGDs was to help map out areas in each study region, identifying all hotspots where MSM can be found. The objective of this activity was to identify sites/locations where sufficient numbers of MSM may be found on a regular basis. Hence MSM themselves were consulted in a systematic fashion in order to construct a sampling frame of sites that is as complete as possible. The process of gathering this information is known as ethnographic or social mapping. The FGDs were 5 per region making a total of 50 with a minimum of 8 and a maximum of 10 participants in each group

2.5 Formative assessment locations

Selection of the formative assessment locations were based on the GMS I study locations. According to these criteria and following consultations, the following sites were selected: Accra and Tema; Koforidua; Sunyani; Takoradi; Cape Coast; Kumasi; Ho; Wa, Tamale, Bolgatanga.

2.6 Phase 2: HIV biological and behavioral survey

2.6.1 Sampling design

RDS was used to recruit MSM into the study because it is a sampling strategy designed to minimize bias and to sample 'hard-to-reach' populations. RDS is a method that has been adopted by researchers as an alternative means to sample key populations for biological and behavioral surveys. A detailed description of RDS methods is beyond this report's scope and can be found elsewhere (Abdul-Quader, Heckathorn, Sabin, & Saidel, 2006; D. Heckathorn & Joan Jeffri, 2005; D Heckathorn & Joan Jeffri, 2005; Douglas D. Heckathorn, Broadhead, Anthony, & Weakliem, 1999; Douglas D. Heckathorn & Jeffri, 2001; Douglas D Heckathorn, Semaan, Broadhead, & Hughes, 2002). Briefly, the main elements of RDS are as follows: a) a variant of chain-referral

methodology; b) designed to sample hard-to-reach populations; c) reduces biases associated with chain-referral methods by using a dual system of structured reimbursements: peers recruit their peers; d) progresses through several *recruitment waves*, the first wave constituting not-randomly selected subjects (seeds). After several waves, a sample is obtained that is independent of the first wave; e) in many cases, RDS has been shown to be faster and less expensive than other sampling methods (i.e. time location sampling) (L. G. Johnston, 2007; Lisa Grazina Johnston, Sabin, Hien, & Huong, 2006).RDS uses statistical adjustments for network size and recruitment patterns to produce generalizable samples (Abdul-Quader et al., 2006; Malekinejad et al., 2008; Ramirez-Valles, Heckathorn, Vázquez, Diaz, & Campbell, 2005; Salganik & Heckathorn, 2004).

According to Heckathorn and Jeffri (2005) , four requirements must be met for a population to be effectively sampled using RDS:

1) In the first instance, respondents must know one another as members of the target population, otherwise they would not know whom to recruit. This requirement is satisfied for populations linked by a "contact pattern" that is, ties created through participation in activities characteristic of the population.

2) The networks must be dense enough to sustain the chain-referral process, otherwise recruitment chains would die out after a few waves, so sampling would not reach the sociometric depth (i.e., long referral chains) required ensuring that each member of the population had a non-zero probability of inclusion.

3) *Equilibrium*. One important assumption is that the RDS process is a first-order Markov chain: the probability of recruiting a person with a specified characteristic depends on the properties of the recruiter but not on the properties of the person who recruited the recruiter. To evaluate whether this assumption is met we will track equilibrium for several indicators during the sampling process. Equilibrium indicates the extent to which the distribution of certain characteristics (e.g. HIV infection) represents that of the target population rather than the sample. When equilibrium is reached it is likely that the assumption that the sampling constitutes a first-order Markov chain has been met.

4) The population must not be so highly segmented that recruitment chains remain trapped within specific sub-groups, for otherwise sampling would be limited to the sub-groups from which seeds had been selected, and equilibrium would never be attained however many waves the sample reaches.

Peer recruitment is a random selection from the recruiter's network. Participants do not bias their recruitment toward or against any group. However, RDS-Analyst (available at: http://www.deducer.org/ Main.RDSAnalyst) uses statistical methods to help control differences in recruitment efficiency.

2.6.2 Sample size estimation

The sample size estimate was based on the surveillance purpose of tracking important changes in the epidemic over time; that is, between rounds of IBBSS. In the study, each site constituted a separate survey with the sample size needed to track changes at each location, important changes in the epidemic over time; that is, between rounds of IBBSS. The target sample of 500 MSM per region took into consideration factors such as estimated recruitment period, funding and high risky nature of such a study and foremost the ability to measure the following key indicators based on estimates from the GMS I, with 80% power at 95 % confidence level among others. The target sample ensured precise estimate of the expected equilibrium distribution for the indicators.

- Change in sexual behavior i.e. prevalence of always using condom use at last sex, to detect a 10% to 15% increase (48.4% to 53.4%) or decrease (to 28.4% - 23.4%) based on the ability to assess meaningful program effort between surveys
- Prevalence of HIV with assumed estimate of 34.3%
- Prevalence of HSV-2 predicted at of 45.9%
- Prevalence of HBV with assumed estimate of 13.5%
- Prevalence of Syphilis with assumed estimate of 4.9%

The following formula and assumptions was used to calculate the sample size

$$n = D\left[Z_{1-\alpha}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}\right]^2 / (P_2-P_1)^2$$

Where:

D = design effect of 2.0. Recent sample size estimates and simulations project that a larger design effect is needed in RDS (Salganik M., 2004). The GMS II will use a design effect of 2.0 to allow for comparison with the GMS I. In addition this is reasonable for this study of similar RDS design, similar measures, and similar target population. RDS surveys of MSM conducted in Kampala, Uganda and Soweto, South Africa observed design effects ranging from 1.20 to 4.65 with a median of 2.25 and a mean of 1.87 (Kajubi, 2006; Lane, Shade, McIntyre, & Morin, 2008).

P1 = the estimated proportion of the key variable or behavior at the time of the survey. For the purposes of estimation, we will use the indicator: the prevalence of always using condom use at last sex estimated at 38.4% in Kumasi, the highest across all the cities.

P2 = the estimated prevalence at the next round of IBBSS, so that (P2 - P1) is the magnitude of change we wish to be able to detect. In this case, we would like to be able to detect a 10% to 15% increase (to 48.4%- 53.4%) or decrease (to 28.4% -23.4% based on the ability to assess meaningful program effort between surveys. P = (P2 + P1)/2;

$Z_{1-\alpha}$=the Z-score corresponding to desired level of significance (we use 95% significance level and corresponding two-sided z-score);

$Z_{1-\beta}$ = the Z-score corresponding to the desired level of power (we use 80% power and corresponding two-sided z-score)

Respectively, the above parameters for 10%, 12% and 15% produce needed sample sizes of 793, 552, and 354 MSM participants per survey year, respectively. The numbers incorporate the response rate of approximately 97% based on the GMS I. Any sample in the range (354-793) was feasible to track change in behaviour between rounds of IBBSS.

To meet the primary objective of estimating a prevalence of HIV with an acceptable confidence interval (CI), the sample size was calculated for the CI for a single proportion. We determined that an effective sample size of 496 is sufficiently large to ensure a margin of error of ± 6% around an assumed prevalence estimate of 34.3% (the highest across all the four cities based on GMS I) with 80% power, a design effect of 2.0 and 97% response rate (GMS I). The margin of error of ±6% corresponds to intervals of

estimated HIV prevalence in the GMS I. And whilst the margin of error of ±6% is wider than the 2% discrepancy standard used by Heckathorn (2002) and Salganik and Heckathorn (2004) to determine whether sampling has reached equilibrium, it would still give a relatively precise estimate of the expected equilibrium distribution .The sample of 496, is calculated using the following formula (Fleiss, Tytun, & Ury, 1980):

$$n = Deff * \left(\frac{Z^2_{\alpha/2}\left(P * (1-P)\right)}{MOE^2} \right) \Big/ \text{response rate}$$

Similarly, for HSV-2 an effective sample size of 546 was determined to be sufficiently large to ensure a margin of error of ± 6% around an assumed HSV-2 prevalence estimate of 49.5%(from the range of estimates (34.9%, 45.9%, 32.9%, 27.1%) across all the four cities/regions studied in GMS I with 80% power, a design effect of 2.0 and 97% response rate (GMS I). For HBV, an effective sample size of 370 is sufficiently large to ensure a margin of error of ± 5% around an assumed prevalence estimate of 13.5% (the highest across all the four cities based on GMS I), and finally for Syphilis an effective sample size of 148 is sufficiently large to ensure a margin of error of ± 5% around an assumed prevalence estimate of 4.9% (the highest across all the four cities based on GMS I).

Indicator	**Effective Sample size**
HIV	496
Behaviour change: Condom use with partner/client –ability to detect 10% 12% to15% percent point change in behaviour	354- 793 (Target 500)
Syphilis	148
Herpes simplex type 2 (HSV-2)	546
Hepatitis B (HBV)	370
Target Sample size per region (Taking into consideration all factors)	**500**

2.6.3 Recruitment and participant selection

Two types of study respondents i) seeds, and ii) new survey respondents (recruits) recruited by the previous survey respondents (seeds) were enrolled. Seeds were non-randomly selected members of the target population who initiated the chain-referral process.

2.7 Survey procedures

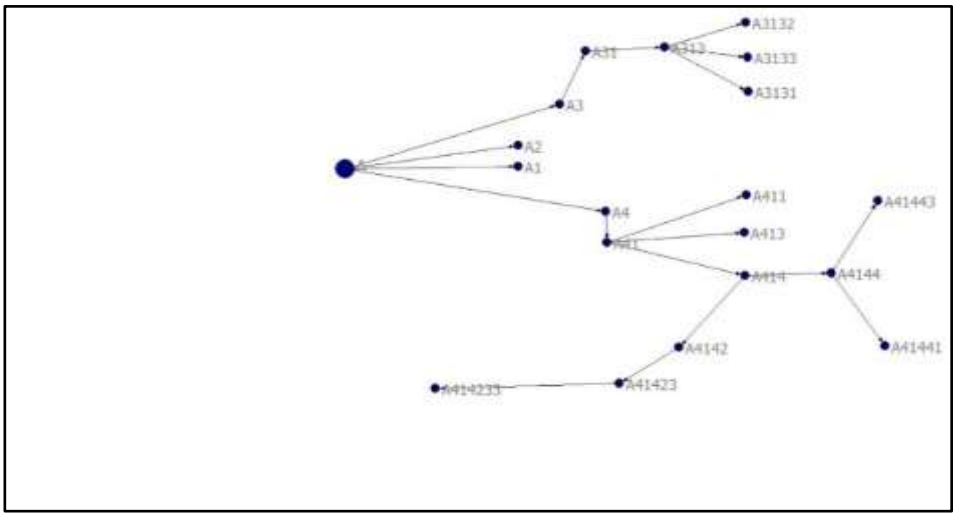
Each study region had separate fieldwork staff team consisting of eight members (a site manager, a screener, receptionist, 1 laboratory technician, two interviewers, and two HIV Counselling and Testing (HCT) counsellors). Each study region independently determined appropriate study sites, hours and seeds, informed by the findings of the pre-surveillance phase. Altogether, the teams operated for five days a week.

Dependent on formative research findings, interview sites were located in secured, "closed" (discrete) and above all MSM friendly organizations.

The study used a web-based system, the BRYANT Research Systems©,[3] that created a unique, automated serial numbering system, linking members from a social network via a unique serial number and thus simplifying the eligibility screening of respondents. The system prints recruitment coupons with a serial number and allows the number to be scanned into the database to capture the required data. In the study, each seed who consented to take part was assigned a letter of the alphabet. For example, the first seed identified in each of the study cities was automatically captured as Seed A. Consequently, the web-based system created recruitment coupons linked to Seed A in the following manner: A1, A2, A3. Our recruitment quota was set at 3 and each recruit was assigned a number from 1 to 3 (see Figure 1).

[3] See www.bryantresearchsystems.com

Figure 2. Recruit-recruiter relationship in the GMS II



2.7.1 Data management

The BRYANT Research Systems© was used to manage and monitor data collection. The questionnaire administration was computer based, and respondents had the option of completing the questionnaire using computer-assisted personal interview (CAPI) software. All data collected were stored in a manner that was compatible with RDS-A. No actual data were resident on a computer, as they were downloaded directly to the website as they were submitted. The only information on a computer using the BRYANT Research Systems© was on the screen during a current logged-on session. The BRYANT Research Systems© had a built-in session timeout function to log off any idle users.

Each study respondent was linked to the study via a unique study barcode number that corresponded to his recruitment coupon number. The system verified each barcode. Blood-test results and questionnaire data were linked using the unique study barcode number. No data contained personal identifiers.

The use of the web-based system meant that the research management staff were able to monitor the research site remotely and observe site statistics in real time. For example, the web-based system was used to generate respondent summary statistics on a weekly basis throughout our recruitment period, and research management staff monitored the various elements of the study on a daily basis without having to physically visit the site. Nonetheless, in the study, early supervision of the fieldwork staff was implemented as part of quality control measures. Measures implemented before the start of the fieldwork included a five-day training workshop in RDS methodology and the use of the web-based system, and the development of a standard operating

procedure (SOP) manual for use by all fieldwork staff. In each of the study regions, site managers were responsible for ensuring that teams in that region adhered to the overall principles of the study by: (i) checking that teams followed the stipulated SOP, (ii) checking that teams followed the agreed administrative procedures, (iii) checking that teams followed fieldwork plans to ensure progress of fieldwork, and (iv) conducting periodic checks in the field.

2.7.1.1 Biometrics

Registration of study participants was facilitated by a biometric fingerprint identification system which was linked to participants study identification codes only, for anonymity. Screeners who had signed confidentiality statements for the study, were trained to register and validate participants' thumbprints. The fingerprint biometric software was custom built and hosted on a site encrypted with a SSL certificate. The site was maintained and updated as and when necessary by the developers. The system was linked to all the study sites and sought to prevent multiple registration of study participants across the study sites. The study was guided by experiences from the GMS I in which it was alleged that multiple registrations of participants across study sites occurred.

2.7.1.2 Behavioral survey using Computer Assisted Personal Interview (CAPI)

Each participant was first asked by the interviewer to give informed consent to participate in the behavioral survey. After consenting, the respondent was introduced to CAPI by completing a 'test' questionnaire. The interviewer was always able to assist respondents if they needed help.

A modified version of the CDC CAPI IBBSS Tools and GMS I were used in the GMS II.

2.7.1.3 Biomarker collection

Serological testing for markers of infectious diseases used Ghana Ministry of Health (MOH) approved assays and standardized protocols. Rapid tests were done on site and serological tests for diagnosis and/or confirmation were done at the Serology Laboratory of the Komfo Anokye Teaching Hospital (SL-KATH), Kumasi. Serum from venous blood (10 mls) was used.

Four tests were conducted – HIV, Syphilis, HBV and Herpes simplex type 2. Participants consented before testing and specimens were collected after pre-test counselling.

2.7.1.3.1 Testing for HIV

Voluntary rapid testing of HIV status

After completion of pre-test counselling of study participants, study personnel screened enrolled participants for HIV antibody status using the national HIV sentinel surveillance algorithm. Specimens were screened using the First Response (Premier Medical Corporation Ltd, India) rapid test and reactive specimens were confirmed using the Oraquick rapid test (OraSure Technologies, Inc., USA). Testing were conducted at the study site locations by trained laboratory staff. Quality assurance were conducted at SL-KATH on 10% of the negative samples and 100% of the HIV positive samples using a line immunoassay, INNO-LIA HIV-I/II SCORE (Innogenetics NV, Belgium).

All participants were given posttest counseling and informed of their results. A positive test result was disclosed to participants with positive results on both rapid tests. If results are discordant, the venous sample of study subject was sent to the SL-KATH for further testing using the INNOLIA HIV-I/ II SCORE (Innogenetics, NV, Belgium). Participants were asked to return to the study sites after 2 weeks for results of the further test. Persons with a positive result on the final test were given referral to treatment services and further counselling. Referral sites for HIV treatment services were MSM Friendly facilities currently providing services to MSM.

2.7.1.3.2 STI testing

Syphilis - Treponema pallidum (TP) rapid testing

This test was conducted using serum from the venous sample at the study sites with the SD Bioline HIV+Syphilis Duo rapid test (SD Bioline, South Korea). This is a single step qualitative immunoassay for the detection of Treponemal antibodies with a simple two-step procedure on whole blood and/or serum. Study participants with positive results were referred to nearby STI clinics that currently provide services to MSM programs for clinical evaluation, and treatment. Quality assurance testing were done on 10% of all negative samples and 100% of the positives using the Foresight ®Syphilis Total Antibody Enzyme Immunoassay (EIA) kit (ACON Laboratories Inc. USA). This one step EIA enables the qualitative detection of IgG, IgM and IgA antibodies for the confirmation of Syphilis infection. Any person mentioning genital ulcer symptoms in the course of the interview or counselling was referred to the nearest STI clinic for evaluation.

HBV serological testing

The test for hepatitis B surface antigen (HBsAg) was conducted on venous blood to detect infection on-site using the Determine™ HBsAg Rapid test (Inverness Medical Innovations Inc., USA). Persons testing positive were further counselled and referred to care. Quality assurance was conducted at the SL-KATH on 10.0% of the negative samples and 100% of the Determine™ HBsAg positive samples using the line immunoassay, Foresight HBsAg EIA kit (ACON Laboratories Inc. USA) to confirm HBV infection.

Herpes simplex virus type 2 (HSV-2) testing

This test was offered to enrolled participants onsite using venous blood, with detection of HSV-2 antibodies using the Biokit HSV-2 rapid kit (Biokit USA). This is an HSV type 2 specific immunoassay rapid kit that enables the detection of participant exposure to HSV-2, the etiological agent for genital herpes simplex. Detection of HSV-2 antibodies does not necessarily imply current infection with the virus. Persons testing positive were further counselled and referred to care. SL-KATH conducted quality assurance testing on 10% of the negative samples and 50% of the Biokit positive samples using the Kalon HSV type 2 specific IgG assay (Kalon Biological Ltd, UK). This assay is based on the use of a recombinant antigen with specific antigenic characteristics of HSV type 2 to provide confirmation of HSV-2 infection.

2.8 Incentives and reimbursement

Survey participants received a primary reimbursement for completing the interview and providing a blood specimen to the value equivalent to about 6.5 US Dollars. This primary reimbursement was provided to participants as a token of appreciation for the transport, time/effort and costs that they had incurred whilst taking part in this study.

Participants (including seeds) who recruited additional participants were given an optional non-monetary reimbursement (secondary reimbursement) condoms and lubricants for each peer they recruited to the amount equivalent to about 4 US Dollars.

2.9 Phase 3: Population size estimate procedures

2.9.1 Method 1: Hot spot based size estimates

During the formative assessment, venues/sites (locations or 'hotspots'') where MSM congregate or meet new sexual partners were identified by secondary key informants. Secondary key informants included venue owners, managers, but also included MSM

peer educators or MSM themselves as primary key informants. Key informants at each venue/site were asked to provide a minimum and maximum estimate of the number of MSM onsite. The secondary key informant interviews were individuals considered knowledgeable about their local area, and were identified from a variety of public places such as at taxi ranks, bus stops, fuel stations, shopping malls, streets, bars, and other workplaces.

Second validation visits at the sites/venues were conducted. The research team revisited the sites to interview site/venue owners and MSM found on site to obtain the number of MSM (Minimum and Maximum); also interview MSM on site to obtain data on frequency of visits. New sites that were not identified in the first round were included in the second round.

The revisits were used to:

- Ascertain whether or not spots were in fact frequented by MSM (that is, if spots were active or inactive)
- Obtain estimates of the minimum and maximum number of MSM who frequented the spots.
- Establish MSM frequency of site visits and if the MSM visits of more than site per day (help adjust estimates to avoid double counting)

The MSM peer educators through existing MSM programmes in each selected region or city, where they were available, accompanied the study team to the identified spots and mobilized individual MSM for interviews on estimated MSM population at the hotspots. All MSM found on site were interviewed.

For the venues or hotspots revisited, the size estimation was based on data generated through these primary key informant (MSM and site owners) interviews during the revisit. For those venues or hotspots not re-visited, an average of the estimates from first visit were used.

2.9.2 Method 2: Service multipliers

For size estimation using multiplier methods, in each region/city, we used two sources of data. First is the unduplicated count *(M)* that included the number of MSM who utilized specific programme services from selected organizations within the course of six months

prior to the survey and a month during MSM survey. Service organizations have programmatic data counting MSM reached for outreach education, HCT, and condom and lubrication distribution. Data from STI clinics providing services for MSM was also collected. The second data consisted of proportion *(P)* of MSM who reported in the IBBSS questionnaire that they received or used use of services from the selected organizations over the course of six months. This will provide an estimate of the proportion of MSM (in the RDS survey) who have used the services. A variance and hence confidence interval for a population size estimate can be given by

$$Var(N) = \frac{Var(M)}{[E(P)]^2} + \frac{[E(M)]^2}{[E(P)]^4} Var(P)$$

Where *N* is the estimated MSM; *M* is the number of MSM in contact with service; and *P* is proportion of sample mentioned in RDS reported being reached with service.

2.9.3 Method 3: Unique Object Multiplier

For size estimation using unique objects, prior to survey unique objects were distributed across the study sites. Data used in size estimation include number of unique objects (Silicon HIV branded wrist band) distributed to MSM in the geographic area of the full RDS survey; and the proportion of MSM in IBBSS who reported receiving a unique object. A variance and hence confidence interval for a population size estimate using unique object can be given by

$$Var(N) = \frac{Var(M)}{[E(P)]^2} + \frac{[E(M)]^2}{[E(P)]^4} Var(P)$$

Where *N* is the estimated MSM; *M* is the number of distributed objects to MSM in each region; and *P* is proportion of sample mentioned in RDS reported receiving the object in each region.

2.9.4 Method 4: Mobile/Web Applications Multipliers

Although through the survey we were able to establish Mobile/Web Applications that MSM frequent often and the proportion that frequent these sites, it was difficult to get context relevant registered number of MSM on website given these are international websites and not necessarily local mobile networks. We were therefore hesitant to use the information is size estimation. This method was not applied.

2.9.5 Method 5: RDS size estimation (Using Network size questions)

Using RDS-Analyst SS-PSE methodology (McLaughlin et al., 2015) was applied to derive regional size estimates. SS-PSE uses a Bayesian framework, meaning that it uses prior knowledge or educated approximations of population size. Prior estimates need not be precise, but provide a rough idea based on expert belief, estimates from other methods, literature review, etc. In SS-PSE, posterior predictive distribution for population size is estimated given our prior belief about population size and observed data. The observed data include participants' network sizes and the order in which they were sampled indicated by the recruitment date. The size estimate was based on "impute visibility", which is better than self-reported network size that is prone to error, such as coarsening (heaping or rounding) of responses and under or over reporting by participant. Imputed visibility is a function of observed (self-reported) network size, but is not necessarily equal to network size. It cannot be directly observed and need to be estimated from information collected during the RDS study. Impute visibility also includes a measurement error model to account for errors in self-reported network size.

2.9.6 Method 6: Literature Review

The literature review method focused on a synthesis of local demographic data, local and international data on prevalence of key populations. The synthesis of data entailed an extensive review of the published and grey literature, searching for relevant data from similar cities and regions which was used to calculate benchmark estimates and estimated proportion in the male population. Estimated proportions derived from GMS I was applied to estimate MSM in Ghana 2017 male population 18 years and above.

2.9.7 Method 7: Consensus on estimates using a Modified Delphi approach

The Modified Delphi method was used to garner the highest-quality and least biased estimates possible and the plausibility bounds for overall size estimates. This was an opportunity to arrive at a consensus and synthesize the new information gathered during the study to revise estimates. The consensus workshop took place in March of 2018.

Facilitators from key organizations with experience in conducting size and prevalence estimation studies were nominated to participate in the consensus meeting. Experts with extensive experience in and knowledge of the MSM in the Ghanaian context formed a panel involved in agreeing of plausible size estimates. The list of experts included representatives from GAC, CDC, UNAIDS, Ghana Health Service, Ghana

Statistical Service, Universities, Population Council, NGOs working with MSM representatives of MSM community in Ghana amongst others.

The meeting looked at the study size estimates looking at the study methods used, the strengths and weakness. Looked at results by method i.e. each method and estimates generated; and also the results by region by method. Then a consensus on regional and national estimates with ranges or plausible bounds was reached. The modified Delphi process consisted of four rounds.

During the first round, study team presented estimates and justifications for the estimates based on data generated from the various survey methods. In the second round participants/experts discussed the initial estimate and also introduced new data outside the survey results. The third round established the best point estimate by region which was aggregated to the national size estimate. In the final round, participants agreed on a range (lower and upper bounds) that encompassed the point estimate established in the previous round.

2.10 Data analysis

All data were captured using different databases: the screener, IBBSS survey data and laboratory data bases. All data was managed using the BRYANT Research Systems© which stores data in a manner compatible with RDS-Analyst (RDS-A).

For each site/region, the different databases were downloaded from the BRYANT Research Systems©, cleaned confirming the skip patterns and barcodes, merged and checked in R-project (Version 3.2.2, The R-Foundation for Statistical Computing). Data variables value coding was also done in R-project. The cleaned valued coded data from R were exported to RDS-A for analysis using the RDS-A Tool (Version 7.1: www.hpmrg.org) software and STATA Version 14.0 for bivariate analysis.

First, data for each site/region was loaded into RDS-A using the recruit format identifying the Subject ID (subject's coupon), Network size, Number of coupons, Recruiter ID, and 'mid' population. The RDS-A Tool uses different estimators including Gile, RDS-I, RDS-II and RDS-II estimators . The Gile estimator was used for the analyses using 10,000 number of bootstraps. The specialized analyses within RDS-A were used to adjust for social network size and homophily within networks. Network size was determined by the following set of questions: "How many men who have sex (MSM) with men in <Study Area: different regions > do you know by name and they know yours?"; "Of those MSM,

about how many of them would you say are 18 years of age or older?"; "Of those MSM how many would be willing to participate in the study?" The answer to the last question was used as the network size question. Sample recruitment homophily, convergence and bottleneck checks were done in RDS-A to ensure key outcome variables reached convergence and had no bottlenecks.

The RDS-A produced survey individualized weights using the Giles estimator. The data along with the individual RDS-A generated weights were exported into standard statistical packages (STATA version 13.0) for determining individual associations between HIV prevalence and demographic and risk behavior variables. P-values from Wald tests are reported where P-values less than 0.05 are considered statistically significant and those between 0.05 and 0.10 as marginally significant.

For aggregate bivariate estimates of HIV and demographics plus socio-behavioural factors, we adjusted the individualised weights generated in RDS-A by relative population size of MSM of total adult males 18+years in each region using variation of the method applied previously for RDS for FSW in Brazil (Szwarcwald et.al 2011), and MSM in large middle income countries(Kerr et.al, 2013). The total regions dataset was then analysed using in STATA 13.0 using complex sample methods treating each of the regions as a stratum.

2.11 Ethical considerations

Ethics approval was obtained from KNUST's Committee on Human Research Publications and Ethics (Protocol Number CHRPE/AP/384/15) in Ghana and HSRC's Research Ethics Committee (REC) (Protocol No REC 7/23/09/15) for ethics approval as well as Human Subjects Review approval was also obtained from the CDC in Atlanta. A non-research determination by the Office of the Associate Director for Science at the Center for Global Health at the CDC in Atlanta, was obtained before fieldwork commenced.

Risks to participants

Social risks: In order to minimize any social risks, consultations were held prior to the start of the study with relevant stakeholders such as the Ghana Police, GAC, etc. Furthermore, the risks of participation, the voluntary character of the study and the applicability of the findings was discussed with participants prior to consent. All participants were given the name and telephone number of the Project Team Leader

should they have any question about the study or believe they have been disadvantaged or not well treated as the result of being or not being part of this study.

There is a psychological risk in participating in the study due to the sensitive nature of the questions asked (sexual and injecting drug use practices). To minimize this risk, the survey interview was conducted by interviewers who are empathetic to the everyday challenges of MSM, and the interviews were conducted in a private setting. Participants could refuse to answer any specific question. Also, study staff provided referrals to local services for care and treatment as appropriate. Again, all participants were given the name and telephone number of the Project Team Leader should they have had any questions about the study or believe they have been injured or not well treated as the result of being or not being part of this survey.

Informed consent

Following careful explanation of the study, fieldwork staff gave eligible participants the consent form to read or, if necessary, the consent form was read to the study participant by fieldwork staff.

All questions that arose were addressed. All participants verbally stated that they understood and agreed to all of the items contained in the consent in order to enroll in the study. Once the participant granted his consent a fieldworker signed on the consent form in the appropriate space. Study participants were not asked to sign as it would defeat the purposes of anonymity. Hence the names of study participants were not included on the consent form. Clients who did not consent to receive HIV results were excluded.

Protection of privacy of individual and confidential information

Where possible, a MSM friendly space was used for the interview, counselling and testing.

No names or personal identifiers were recorded on individuals participating in the survey and there were no way of linking names on consent forms to interviews or other data. During training all study staff signed confidentiality agreements and also passed a mandatory Human Subject Research Ethics Course.

2.12 Fieldworker Training

Fieldworkers recruited from ten regions of Ghana were trained in RDS. A first batch of fifty fieldworkers from five regions (Ashanti, Greater Accra, Western, Eastern, and Central) were trained from the 17th to 20th January 2017 at the Kosados Arena Hotel at Aprade, Ashanti region. A second batch of forty fieldworkers from the five remaining regions (Volta, Brong Ahafo, Northern, Upper east, Upper West) were trained from 24th June – 29th 2017 at Splendor Hotel, Kumasi. Eight people were selected to operate at each site as Receptionist, Site Manager, Screeners, Interviewers (2) Counselors (2), and Laboratory Technician. The training team consisted of representatives from the GAC, the HSRC, the KNUST, and the CDC Ghana.

The methods used for the training included discussions, questions and answers, experience sharing, and role plays. These were done to enable fieldworkers to understand and get familiar with the study protocols used in the GMS II. The topics covered included; Brief overview of the GMS II, a brief overview of RDS, Ethical Principles and Guidelines for Research Involving Human Subjects, Roles and responsibilities of RDS staff, Sensitivity Training, Site Operations and Code of conduct.

3. RESULTS of IBBSS

Summary of Key findings

a. Socio demographic characteristics

i. Age

- 61.5% of MSM population in the study were aged between18-24
- 30.6% were aged between 25-34
- 4.7% were aged above 35

ii. Education

- 52.2% of MSM in study had completed secondary school

iii. Marital Status

- 93.4% of MSM in the study reported being single or never married

iv. Employment

- 44.1% wer

v. Sexual Orientation

- 40.34% of MSM in the study sexually identified as gay
- 42.6% of MSM in the study sexually identified as bisexual
- 9.7% identified as straight
- 1% of MSM in the study indicated they were transgender

b. HIV and STI Prevalence

- Prevalence of HIV amongst MSM was 18.1%
- 67.0% of MSM sampled tested positive for HSV2
- 7.0% of MSM tested positive for HBV
- Low prevalence estimates for syphilis amongst MSM in Ghana

HIV Prevalence by Regions

REGION	HIV Prevalence
Greater Accra	42.2%
Ashanti	25.4%
Volta	14.0%
Central	10.1%
Western	10.0%
Eastern	9.0%
Northern	4.3%
Brong Ahafo	4.0%

i. Aggregate HIV prevalence by sexual behaviors

- HIV prevalence was 37.4% among MSM with 4 sexual partners in the past 6 months preceding the survey
- MSM who had ever had sex with a female partner had prevalence of 21.6%
- Prevalence of HIV among MSM with 1 or no female sexual partners was 18.1%
- For MSM with no or regular partner, HIV prevalence was 24.7%
- MSM who engaged in receptive anal sex had a HIV prevalence of 30.2%
- MSM with 2 or more receptive partners had HIV prevalence of 34.2%

ii. HIV Prevalence among MSM by socio demographic characteristics

- HIV prevalence was 37.8% among older MSM (35+)
- Among MSM with Tertiary or higher educational attainment, prevalence was 38%
- MSM who were widowed/divorced/separated, HIV prevalence was 40.5%
- HIV prevalence among MSM whose employment status fell in the other category (31.3%)
- MSM with high income had an HIV prevalence of 25.3%
- HIV prevalence was 28.1% among MSM who identified as transgender
-

Aggregate HIV prevalence of MSM in Ghana by socio-demographic characteristics

	HIV Prevalence		
	Adjusted%	95%CI	N

Age(years)			
18-24	17.7	[15.5-20.1]	2471
25-34	24.8	[21.6-28.3]	1225
35+	37.8	[27.6-49.2]	183
Education Attainment			
Less than primary	14.7	[7.9-25.6]	168
Primary school	23.3	[15.7-33.2]	139
Junior High school	17	[14.1-20.4]	1078
Secondary school	19.8	[17.4-22.5]	2093
Tertiary or higher	30	[24.4-36.4]	476
Marital Status			
Married/living with a woman	22.5	[14.5-33.1]	177
Single/Never Married	20.2	[18.4-22.1]	3751
Widowed/Divorced/Separated	40.5	[23.3-60.5]	57
Employment			
Unemployed	17.3	[14.7-20.2]	1776
Formal	28	[24.3-31.9]	1035
Informal	17.3	[14.4-20.6]	1074
Sex worker	21	[6.8-49.1]	29
Other	31.3	[7.8-70.9]	10
Income(GHS)			
No Income	17.6	[14.6-21.2]	1409
Low Income	20.8	[18.3-23.5]	1803
Middle Income	23.6	[17.4-31.1]	288
High	25.3	[19.2-32.6]	305
Sexual Identity			
Gay	20.5	[17.9-23.5]	1620
Bisexual	18.4	[15.9-21.2]	1716
Straight	7.6	[4.4-12.6]	387
Transgender	28.1	[12.8-51.0]	31

c. Behavioral risks

i. HIV risk perception

- No risk: 23.6% (Northern Ghana) vs 68.1% (Eastern)
- Some risk: 49.6% (Ashanti region) vs 11.5% (Western)
- Did not know if they were at risk: 37.9% (Western) and 36.2% (Northern Ghana)

ii. Transactional sex with male and female partner(s)

- Selling sex in exchange for money with a male partner ranged from 47.8% (Central region) to 13.7% (Volta region)
- Selling sex in exchange for money with a female partner ranged between 21.6% (Northern Ghana) and 5.7% (Volta region)

iii. Condom use Frequency

- National estimate show that 48.2% of MSM sampled always using a condom during penetrative anal sex with other men.
- National estimate show that 29.7% of MSM sampled always using a condom during penetrative sex with women.
-

Condom use at last sex with a man or a woman

Region	Condom use at last sex
Greater Accra	56.6%
Ashanti	45.9%
Volta	74.5%
Central	63.0%
Western	68.2%
Eastern	88.3%
Northern	40.9%
Brong Ahafo	82.9%

iv. Accessibility of condoms

Across all study regions MSM reported that it was very easy to obtain condoms. 94.9% (Brong-Ahafo region) stated that it was easy to get condoms

v. Lubricant use

Study participants were asked if they, "always", "usually", "sometimes" or "never" use lubricant during anal sex.

Always used lubricant varied across study regions with estimates ranging from a high of 80.7% (Central Region) to a low of 12.2% (Northern Region)

vi. Affordability of lubricant

- Affordability of lubricant in all study regions ranged from 80.7% (Central Region to 15.0% (Ashanti Region)
- In Greater Accra 16.0% of the study sample reported that lubricant was expensive verses 0.7% of MSM sampled in the Brong-Ahafo
-

vii. Accessibility of water-based lubricant

- 60.7% of MSM sampled in Central Region, 59.1% in the Brong-Ahafo and 54.8% in the Volta Region reported that they found water-based lubricant to be accessible.
-

viii. Accessibility of oil-based lubricant

- 88.5% of MSM sample in the Central region, 77.7% in the Western region, and 66.4% of sample in the Greater Accra reported that oil-based lubricants were easily accessible and available.

ix. HIV Knowledge

- Estimate on comprehensive knowledge across all study regions was 51.1%
- With regards to individual questions of HIV knowledge, MSM across study regions were consistent in terms of their correct knowledge of HIV.
- Estimates on each individual item scored between 60%-90%.

x. Self-disclosure of HIV status

- Disclosure to all in the family, regional estimates varied from 40.6% amongst MSM in the Western region to only 5.7% amongst MSM in the Ashanti region

- Disclosure to all friends, ranged from 27.0% amongst MSM in Northern Ghana to only 3.0% amongst MSM in the Central region.
- Disclosure to all female sexual partners ranged from 36.9% and 36.6% amongst MSM in Western and Northern Ghana respectively to 7.3% amongst MSM in the Central region.
- Possible disclosure to all male sexual partners this ranged from 42.0% amongst MSM in the Western region to 8.7% amongst MSM in the Central region.

3.1 Formative assessment findings

Formative research was conducted before implementation of the IBBSS in all 10 regions of Ghana. These findings are reported in an internal report titled: Study report of Phase 1: Formative assessment (2017).

In summary, formative research findings indicated that MSM in most regions of Ghana is socially networked. In Northern Ghana however, recruitment of MSM was a challenge. MSM in these regions remained 'hidden' and highly stigmatized and discriminated. Thus to some extend they might not engage in social activities with other MSM and they might not know each other as MSM.

Secondly, formative research findings suggest that because of stigmatization, there was mention made of MSM socializing in other places – different from where they live. Hence to avoid duplicated participants a biometric system was used in the IBBSS.

The location of interview sites is an important aspect in the implementation of an IBBSS using RDS, in particular within this context of MSM experiencing stigmatization. In the GMS II we worked with organizations and networks of MSM who are familiar with the social organization of MSM in a particular region in terms of making a final decision as to the location of the sites. It is important to have the buy in of organizations, specifically MSM NGOs before implementation of the survey.

3.2 Recruitment of MSM in Ghana

The IBBSS was implemented using a staggered approach. Recruitment started in the Greater Accra region (Accra and Tema) followed by implementation Adjusted estimates of in the Western and Ashanti regions of Ghana. In Greater Accra,

recruitment took place in a period of 14 weeks. The recruitment process started with 7 seeds; 3 in Accra and 4 in Tema. In total, 1369 recruitment coupons were issued and 546 respondents were included in the final analysis. In the Ashanti region, recruitment took place in a period of 20 weeks, with a total of 1482 coupons distributed and 511 MSM included in the final analysis. In the Central region, recruitment took place in a period of 14 weeks. The total number of coupons distributed were 747, with 503 MSM included in the final analysis. In the Eastern region, recruitment took place in a period of 16 weeks, with 3 seeds starting the recruitment process. In total, 1329 coupons were distributed with 501 MSM recruited into the study. In Northern Ghana, recruitment took place in a period of 12 weeks. Recruitment started with nine seeds, 1153 coupons were distributed, and 510 MSM recruited into the study. In the Western region, recruitment took place in a period of 25 weeks, recruitment started with 3 seeds. In total 1326 coupons were distributed and 515 MSM were included in the final analysis. The study used an average of 16 weeks and 34 seeds to distribute 10,346 coupons to achieve a total sample of 4,095. Table 1 provides an overview of the recruitment of MSM in the GMS II.

Table 1. GMS II Participant summary recruitment

Study region	Number of weeks recruitment took place	Number of seeds	Total number of coupons distributed	Final sample size
Greater Accra	14 weeks	7	1369	546
Ashanti	20 weeks	3	1482	511
Brong-Ahafo	14 weeks	3	1443	504
Central	14 weeks	3	747	503
Eastern	16 weeks	3	1329	501
Northern Ghana	12 weeks	9	1153	510
Volta	14 weeks	3	1497	505
Western	25 weeks	3	1326	515
Total		**34**	10,346	**4095**

3.3 Socio-demographic characteristics of MSM in Ghana

Table 2 shows population adjusted socio-demographic characteristics of MSM in Ghana. Overall, similar patterns were observed across all study regions, with regards to the socially salient characteristics of MSM in Ghana.

Across study regions, population adjusted estimates show that the majority of the study sample fell in the 18-24 years age category. Volta region had the highest proportion of 18-24 year olds (76.3%), whilst in the Eastern region, 52.9% of the study sample fell in this age category. With regards to the 25-34 years age category, Eastern region had the highest proportion (42.8%) of MSM sampled in the Eastern region, with 19.8% of MSM sampled in the Volta region falling in this age category. In Northern Ghana 14.5% of MSM sampled fell in the 35+ age category, with 1.1% of MSM sampled in the Brong-Ahafo region falling in this age category.

With regards to educational status in each of the study regions, a majority of MSM reported to have completed secondary school. Region specific estimates revealed that 71.1% of MSM in the Brong-Ahafo region reported having completed secondary school, with 65.3% in the Eastern region and 54.3% in the Western region reporting the same.

With regards to primary school completed, 6.5% of MSM located in Northern Ghana reported having completed primary school, with 0.7% reporting the same in the Brong-Ahafo region. Reporting on having completed junior high school, 46.5% of MSM sampled in the Central region reported having completed junior high school. In the Brong-Ahafo region, 12.2% of MSM sampled completed junior high school, with 71.1% reported having completed secondary school. With regards to having completed a tertiary degree, 16.8% of MSM sampled reported having completed tertiary education in the Greater Accra region. MSM who reported having completed less than primary school educational level ranged from 0.2% (Ashanti region) to 17.7% reported on by MSM in Northern Ghana.

Majority of the MSM sampled reported "single/never married" and unemployed. In each of the 10 regions, the overwhelming majority of MSM sampled reported a "single/never married" marital status. In the Brong-Ahafo region, 99.2% reported a "single/never married" marital status, and the lowest (86.7%) of MSM sampled in the Central region reporting the same. Sixty percent of MSM recruited in the Volta region,

reported being unemployed. Formal employment ranged from 13.1% reported by MSM in Northern Ghana to 35.3% reporting the same in the Eastern region of Ghana. Adjusted estimates for informal employment ranged from 19.0% (Brong-Ahafo) to 43.1% in the Central region of Ghana.

Income category was defined as No income, Low income (less than 599 cedis/month), Middle income (600-999 cedis/month) and High income (greater or equal to 1000 cedis/month). The majority of MSM reported in each of the study regions, a low income status, with adjusted estimates ranging from 26.9% (Volta region) to 62.3% of MSM reporting the same in the Ashanti region.

MSM were asked to report on how they identify in terms of sexual orientation. Bisexuality was common across study regions, with estimates ranging from 27.5% of MSM reporting a bisexual sexual identity in the Brong-Ahafo region to 62.7% reporting the same in the Central region. Bisexual refers to men/women who identify their sexuality as being attracted to both men and women, or who are attracted to men, women and transgender individuals.

Table 2.Adjusted estimates of Socio-demographic characteristics of MSM by region in Ghana, 2017

	Greater Accra (N=546)			Ashanti(N=511)			Brong-Ahafo(N=504)			Central(N=503)			Eastern(N=501)			Northern(N=510)			Volta(N=505)			Western(N=515)		
	Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted	
Variable	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**	**n**	**%**	**95%CI**
Age(years)																								
18-24	305	63.8	58.7-68.6	345	72.7	67.4-77.3	282	57.5	52.5-62.4	309	67.3	62.1-72.1	257	55.1	50.4-59.7	325	61	55.4-66.4	331	78.2	73.4-82.3	364	74.4	69.5-78.7
25-34	197	32.0	27.4-37.0	128	24.0	19.6-29.0	213	41.3	36.5-46.3	170	29.5	24.9-34.6	208	41.3	36.7-45.9	117	24.4	20.0-29.6	86	19.1	15.1-23.8	132	23.8	19.6-28.5
35+	39	4.2	2.8-6.5	19	3.3	1.7-6.3	7	1.1	0.5-2.9	20	3.2	1.9-5.4	21.0	3.6	2.3-5.7	60	14.5	10.6-19.6	17	2.7	1.6-4.5	10	1.8	0.8-4.2
Educational attainment																								
Less than primary	13	2.8	1.4-5.4	3	0.2	0.0-0.8	21	4.0	2.4-6.6	19	3.3	1.8-6.0	9	1.2	0.6-2.5	72	17.7	13.4-22.9	16	3.4	2.0-5.8	21	4.0	2.4-6.6
Primary school	28	4.6	3.1-6.8	20	4.7	2.9-7.7	4	0.7	0.2-2.0	19	4.3	2.5-7.3	15	2.8	1.7-4.8	28	6.5	4.1-10.0	22	4.7	2.9-7.6	5	0.9	0.3-2.4
Junior high school	146	26.7	22.3-31.6	170	32.7	28.0-37.9	66	12.2	9.4-15.6	228	46.5	41.2-52.0	85	17.6	14.4-21.5	103	25.1	20.3-30.5	155	32.2	27.5-37.2	149	29.0	24.5-33.9
Secondary school	267	49.1	43.9-54.4	262	52	46.6-57.4	342	71.1	66.6-75.3	199	39.8	34.6-45.2	321	65.3	60.8-69.6	245	42.2	37.0-47.6	239	51.6	46.2-56.9	263	54.3	49.0-59.4
Tertiary or higher	89	16.8	13.2-21.2	55	10.3	7.3-14.3	69	12.0	9.3-15.4	37	6.1	4.2-8.7	70	12.9	10.2-16.2	55	8.6	6.4-11.5	34	8.2	5.4-12.1	76	11.9	9.0-15.6
Marital Status																								
Married/living with a woman	23	3.0	1.8-4.9	15	3.6	1.8-6.9	6	0.8	0.3-2.0	54	11.0	8.0-14.8	23	4.0	2.6-6.1	33	6.8	4.6-9.9	15	2.3	1.4-3.9	15	2.6	1.4-5.0
Single/Never Married	507	95.9	93.9-97.3	492	96.0	92.6-97.9	497	99.2	97.9-99.7	434	86.7	82.7-89.9	467	95	92.7-96.6	457	91.6	88.3-94.0	477	96.8	95.0-97.9	495	96.5	93.8-98.1
Widowed/Divorced/Separated	14	1.1	0.6-2.1	2	0.4	0.1-2.5	1	0.1	0.0-0.6	15	2.3	1.3-4.0	6	1.0	0.4-2.3	9	1.6	0.7-3.5	8	0.9	0.4-2.0	4	0.9	0.2-3.4
Employment																								
Unemployed	212	42.9	37.7-48.3	194	42.1	36.7-47.7	278	54.9	49.8-59.8	166	35.3	30.2-40.7	169	35.6	31.2-40.2	253	52	46.5-57.5	272	60.6	55.3-65.7	263	56.3	51.1-61.4
Formal	192	33.4	28.6-38.4	150	28.3	23.7-33.6	133	25.5	21.5-30.0	114	21.2	17.1-26.0	181	35.3	31.0-39.8	77	13.1	10.1-16.9	74	13.8	10.6-17.7	131	22.1	18.2-26.5
Informal	137	23.7	19.6-28.4	145	28.3	23.8-33.3	89	19.0	15.2-23.4	209	43.1	37.7-48.6	147	29.1	25.1-33.5	153	32.5	27.6-37.9	113	23.6	19.4-28.5	116	21.4	17.5-25.9
Sex worker	0	0	-	1	0.2	0.0-1.4	2	0.50	0.1-1.9	2	0.4	0.1-1.8	1	0.1	0.0-0.5	16	1.9	1.1-3.1	7	1.8	0.8-4.0	2	0.1	0.0-0.4
Other	0	0	-	7	1.0	0.5-2.3	1	0.20	0.0-1.5	0	0	-	0	0	-	1	0.4	0.1-3.1	1	0.2	0.0-1.1	1	0.2	0.0-1.1
Income (Ghana Cedis, GHS)																								
No Income	205	42.3	37.0-47.8	87	23.9	19.0-29.6	206	39.8	35.0-44.7	138	30.3	25.5-35.5	89	17.8	14.5-21.5	199	46	40.4-51.8	274	61.3	55.9-66.4	241	53.6	48.3-58.8
Low Income	214	42.0	36.8-47.4	264	62.3	56.3-67.9	224	45.7	40.8-50.8	298	61.3	55.9-66.4	295	60.7	56.1-65.1	216	42.3	36.8-47.9	132	26.9	22.4-31.8	202	36.3	31.5-41.4
Middle Income	59	8.1	5.8-11.0	29	4.8	3.1-7.5	35	7.1	4.9-10.2	30	4.8	3.0-7.6	50	9.4	7.0-12.4	31	6.2	4.2-9.1	32	6.9	4.5-10.3	27	5.0	3.2-7.7
High	46	7.7	5.5-10.5	47	8.9	6.2-12.8	38	7.3	5.1-10.4	24	3.7	2.3-5.7	63	12.2	9.4-15.6	31	5.5	3.7-8.1	24	4.9	3.0-7.9	38	5.1	3.4-7.5
Sexual Orientation																								
Gay	209	44.3	38.8-50.0	230	46.1	40.6-51.7	251	53.1	48.1-58.0	70	13.2	9.9-17.5	255	51.6	46.9-56.2	178	40.8	35.1-46.7	291	58.0	52.8-63.1	168	38.2	32.9-43.8
Bisexual	237	51.7	46.0-57.4	227	51.2	45.6-56.8	144	27.5	23.3-32.2	320	62.7	57.1-67.9	235	47.3	42.7-52.0	188	42.8	37.0-48.7	167	34.8	29.9-40.0	227	50.4	44.7-56.0
Straight	16	3.9	2.2-6.8	17	2.7	1.5-4.7	107	19.4	15.9-23.5	110	24.1	19.5-29.3	5	1.1	0.4-2.7	65	10.2	7.7-13.4	29	5.0	3.4-7.4	49	11.4	8.2-15.6
Transgender	1	0.1	0.0-0.5	1	0.1	0.0-0.4	0	0	-	0	0	-	0	0	-	16	6.2	3.5-10.9	13	2.1	1.2-3.8	0	0	-

3.4 Prevalence of HIV and STIs

Weighted aggregate estimates across all regions for the biomarkers were generated using RDS-A., Table 3 shows weighted aggregate HIV prevalence and STI estimates amongst MSM in Ghana based on the surveyed 10 sites and a given estimated population of MSM in Ghana as a percentage of adult male population. The GMS II found an aggregate national HIV prevalence of 18.1% amongst MSM in Ghana. Concerning, testing positive for syphilis, aggregated prevalence was 1.0%. Results also show 7.0% of MSM tested positive for HBV and 67.0% to be positive for HSV2.

Table 3. HIV prevalence and STI aggregate estimates

Outcome	Aggregate Prevalence Estimate	
	%	95% Confidence Interval
HIV Positive	18.1	[15.8-20.3]
Syphilis Positive	1.0	[0.6-1.5]
Hepatitis B Positive	7.0	[3.8-10.1]
HSV2 Positive	67.0	[65.4-68.7]

3.4.1 HIV prevalence amongst MSM in Ghana

Table 4 shows region specific population adjusted estimates of HIV and STI prevalence amongst MSM in Ghana.

HIV prevalence differed in each of the study regions. An unusually high adjusted HIV prevalence estimate of 42.2% was found amongst MSM in the Greater Accra region. In the Ashanti region 25.4%, of MSM were found to be HIV positive, 14.0% in the Volta region and in the Western and Central regions 10.0% and 10.1% of MSM sampled respectively were found to be HIV positive. In the Eastern region 9.0% of MSM recruited into the study were found to be HIV positive and amongst MSM in the Northern Ghana HIV prevalence was 4.3% and 4.0% of in the Brong-Ahafo region.

3.4.2 Prevalence of sexually transmitted infections (STIs) amongst MSM in Ghana

Syphilis

In all the study regions, the adjusted prevalence estimates of syphilis was found to be low amongst the population of MSM in Ghana. In the Eastern and Volta regions, respectively, 1.9% and 1.8% of MSM sampled tested positive for syphilis. In the Central region, 1.7% and 1.6% in the Western region tested positive for syphilis; with 0.8% testing positive for syphilis in the Greater Accra, and lowest (0.1%) estimates for syphilis was found amongst MSM sampled in the Ashanti region.

HBV

Region specific HBV estimates show that 9.8% of the study sample in the Western region tested positive for, HBV. In the Central region 9.2%; of the study sample tested positive for HBV. In the Ashanti region 8.5% were found to be positive for Hepatitis B; in the Brong-Ahafo region, 7.9% tested positive for HBV; and 7.5% in the Eastern region, Northern 5.9% and Greater Accra 4.3%, and the lowest percentage of MSM testing positive for HBV were in in the Volta region, with 4.2% testing positive for this STI.

HSV-2

Region specific HSV-2 estimates show that 75.1% of MSM tested positive for HSV-2 in the Greater Accra region, with 69.0% of MSM sampled in the Brong-Ahafo region testing positive for this STI. In the remaining region HSV-2 estimates amongst MSM ranged from 61.7% - 68.5% (i.e. Eastern region; 61.7%; Ashanti 62.6%; Northern Ghana 65.2%; Central 65.3%; Volta 65.6% and Western region with 68.5% who tested positive for HSV-2.).

Table 4. HIV and STI prevalence amongst MSM in Ghana

	Greater Accra (N=546)			Ashanti(N=511)			Brong-Ahafo(N=504)			Central (N=503)			Eastern (N=501)			Northern(N=510)			Volta(N=505)			Western	
	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%
HIV-1/2	262	42.4	[37.2-47.7]	140	25	[20.9-30.6]	26	4	[2.6-6.2]	69	10	[7.5-13.5]	44	9	[6.5-12.2]	22	4.3	[2.6-6.9]	69	14	[10.7-18.0]	66	10
Syphilis TP	4	0.8	[0.2-3.1]	1	0.1	[0.0-0.6]	5	0.7	[0.3-1.7]	7	1.7	[0.6-4.8]	9	1.9	[1.0-3.7]	7	0.9	[0.3-2.1]	6	1.8	[0.7-4.5]	8	1.6
HBsAg	26	4.3	[2.6-7.0]	45	8.5	[6.1-11.7]	41	7.9	[5.6-11.1]	42	9.2	[6.0-13.7]	34	7.5	[5.3-10.4]	33	5.9	[4.1-8.6]	18	4.2	[2.5-7.0]	49	9.8
HSV2	388	75.5	[70.5-79.8]	302	63	[57.1-67.7]	337	69	[64.2-73.4]	318	65	[60.0-70.3]	256	62	[56.5-66.7]	322	65.2	[59.7-70.3]	325	65.6	[60.4-70.4]	338	69

3.4.3 HIV prevalence by socio-demographic characteristics of MSM in Ghana

Table 5 shows the adjusted estimates for HIV by socio-demographic characteristics by age, education, marital status, income and sexual identity

In the 35+ years age group 31.1% of the study sample were HIV positive, with 29.0% in the 25-34 years age category, and 18.5% of MSM infected with HIV in the 18-24 years age categories.

With regards to educational attainment, 34.3% of the study sample who reported a tertiary or higher educational status were found to be HIV positive; with 23.3% and 22.2% were respectively, found to be HIV positive amongst those that had attained primary and secondary school level of education. Of MSM sampled who reported a junior high school educational attainment 17.7% were found to be HIV positive, whilst 11.3% of MSM were found to be HIV positive who reported a less than primary school educational level.

Almost forty percent (39.9%) of MSM who reported a widowed/divorced/separated marital status were found to be HIV positive; with 21.9% of MSM sampled who reported a single/never married marital status, tested HIV positive; whilst 21.2% of MSM sampled who reported being married/living with a woman were found to be HIV positive.

In terms of level of income, 30.2% of MSM categorized in the high income bracket were found to be HIV positive; whilst 28.5% in the middle income category tested positive for HIV; and 22.4% of MSM in the low income, and 18.9% of those in the no income bracket tested positive for HIV.

Considering sexual identity, 23.6% of MSM who self-identified as gay were found to be HIV infected, with 19.4% of MSM who reported a bisexual identification tested positive for HIV and 16.3% of MSM who identified as transgender tested positive for HIV. Table 5 shows adjusted estimates for HIV by socio-demographic characteristics of MSM in Ghana.

Table 5. Aggregate HIV prevalence of MSM in Ghana by socio-demographic characteristics

	HIV Prevalence		
	Adjusted%	**95%CI**	**N**
Age(years)			
18-24	17.7	[15.5-20.1]	2471
25-34	24.8	[21.6-28.3]	1225
35+	37.8	[27.6-49.2]	183
Education Attainment			
Less than primary	14.7	[7.9-25.6]	168
Primary school	23.3	[15.7-33.2]	139
Junior High school	17	[14.1-20.4]	1078
Secondary school	19.8	[17.4-22.5]	2093
Tertiary or higher	30	[24.4-36.4]	476
Marital Status			
Married/living with a woman	22.5	[14.5-33.1]	177
Single/Never Married	20.2	[18.4-22.1]	3751
Widowed/Divorced/Separated	40.5	[23.3-60.5]	57
Employment			
Unemployed	17.3	[14.7-20.2]	1776
Formal	28	[24.3-31.9]	1035
Informal	17.3	[14.4-20.6]	1074
Sex worker	21	[6.8-49.1]	29
Other	31.3	[7.8-70.9]	10
Income(GHS)			
No Income	17.6	[14.6-21.2]	1409
Low Income	20.8	[18.3-23.5]	1803
Middle Income	23.6	[17.4-31.1]	288
High	25.3	[19.2-32.6]	305
Sexual Identity			
Gay	20.5	[17.9-23.5]	1620
Bisexual	18.4	[15.9-21.2]	1716
Straight	7.6	[4.4-12.6]	387

Transgender	28.1	[12.8-51.0]	31

3.4.3 Aggregate HIV prevalence amongst MSM by sexual behaviors

The GMS II assessed the following sexual behaviors amongst MSM: Number of male sex partners in the last six months; ever having had a female sex partner; self-reported oral, vaginal or anal sex with a woman in the last six months; number of female sex partners; use of condoms at last sex with main male/female sex partner; preferred type of anal intercourse; number of male insertive/receptive sex partners and HIV risk perception and ever tested.

Table 6 shows the adjusted aggregate of HIV prevalence amongst MSM by the above-mentioned sexual behaviors.

Study findings revealed that of those who reported having four male sex partners in the last six months 34.5% of MSM were HIV positive; whilst 27.4% of MSM who had five and more sex partners category tested positive for HIV. With regards to ever having had sex with a woman, 22.5% of MSM who responded in the affirmative tested positive for HIV, also almost 17 percent (16.9%) of MSM who reported penetrative sex with a woman in the last six months were found to be HIV positive. In terms of number of female sex partners in the last six months, 18.2% of MSM who reported 1 or less number of female partners were found to be HIV positive, with almost 25 percent (24.9%) of those who reported not having a male regular partner found to be HIV positive, whilst 21.8% of those who reported having used a condom at last sex with a main/regular male partner were found to be HIV positive. Concerning the use of a condom at last sex with a main/regular female partner, 33.7% of those who reported not having a main/regular female partner tested positive for HIV, whilst 23.2% of MSM sampled who reported having used a condom at last sex with main/regular female partner tested positive for HIV.

Regarding, insertive, receptive or versatile anal sexual behavior, one third of the study sample (32.0%) who reported a preferred receptive anal intercourse tested positive for HIV; with 25.3% reporting a versatile type of anal intercourse were found to be HIV positive. Concerning insertive anal intercourse, 13.0% of MSM who preferred this type of anal intercourse were found to be HIV positive. With regard to number of male insertive sex partners, 24.1% of MSM sampled who reported a 1 or no male sex partners were found to be HIV positive; whilst 31.7% of MSM who reported 1 or no male receptive sex partners in the last six months were found to be HIV positive. For those who reported 2

or more number of male insertive sex partners 31.7% of the study sample tested positive for HIV.

Thirteen percent (13.0%) of the study sample who responded that they had no risk of acquiring HIV were found to be HIV positive; with 14.0% indicating that they do not know if they are at risk of getting HIV tested positive; whilst 16.2% of MSM sampled reported having some risk of getting HIV tested HIV positive. Concerning HIV risk perception, nearly half (46.0%) of MSM who responded that they already had HIV, tested positive for HIV.

Pertaining to MSM ever having tested for HIV and having received HIV test results; 30.9% of MSM sampled who reported having received their HIV test results were found to be HIV positive. Almost 40 percent (37.8%) of MSM sampled who reported not having received HCT at a healthcare facility in the last 12 months were found to be HIV positive. Regarding knowledge of most recent HIV test result, 85.5% of MSM who reported a HIV positive status, were found to be HIV positive.

Table 6. HIV prevalence among MSM by sexual behaviors in Ghana, 2017

	HIV Prevalence		
	Adjusted%	**95%CI**	**N**
Number of male sex partners, past 6 months(oral or anal)			
1	16.2	[13.9-18.8]	1744
2	21.6	[17.7-26.1]	826
3	27.4	[21.6-34.1]	418
4	37.8	[28.2-48.4]	209
5+	28.4	[22.1-35.7]	425
Ever had sex with a female partner			
Yes	21.6	[19.3-24.2]	2239
No	19	[16.3-21.9]	1710
In the past 6 months, have you had oral, vaginal, or anal sex with a woman			
Yes	17.7	[14.3-21.7]	990
No	24.7	[21.5-28.1]	1218
Number of Female Sexual Partners			
1 or less	18.1	[13.9-23.3]	512
2 or more	17.6	[12.0-24.9]	437
The last time you had sex with your main/regular male partner, did you use a condom			
Yes	18.5	[16.4-20.8]	2269
No	22.1	[18.5-26.2]	1137
I don't have a male/regular partner	24.7	[19.8-30.3]	543
The last time you had sex with your main female partner, did you use a condom			
Yes	19.9	[16.4-24.0]	883
No	18.5	[15.2-22.2]	1019
I don't have a main female partner	31.7	[24.9-39.3]	309
Type of Anal intercourse			
Versitile	24.6	[20.9-28.6]	1062

Receptive	30.2	[25.9-34.8]	853
Insertive	11.1	[9.0-13.5]	1529
Number Male Insertive sex partners			
1 or less	20.7	[18.6-23.1]	2283
2 or more	19.7	[16.4-23.4]	1266
Number Male receptive partners			
1 or less	17.5	[15.6-19.7]	2459
2 or more	34.2	[29.6-39.2]	930
What do you think your own risk is for becoming infected with HIV			
No risk of getting HIV	10.7	[7.9-14.4]	896
Some risk of getting HIV	17.3	[13.2-22.3]	599
Don't know	15.2	[10.2-22.0]	407
Decline to answer	6.3	[1.5-23.6]	112
Alcohol Use			
Abstainers	16.9	[15.0-19.1]	2944
Low risk-Light drinker	28.4	[24.3-32.7]	781
Moderate drinker	21.9	[14.4-31.9]	148
High risk/Harmful Drinker	29.9	[18.0-45.3]	78
Ever received HIV testing and counselling, and received your results			
Yes	26.6	[24.0-29.3]	2011
No	13.4	[11.2-16.1]	1871
Decline to answer	7.8	[2.4-22.4]	49
Received HIV testing and counselling at a health			
Yes	24.3	[21.6-27.3]	1615
No	35	[28.7-42.0]	397
HIV test result of your most recent HIV			
Positive	86.7	[74.8-93.5]	66
Negative	20	[17.2-23.1]	1392
Indeterminate	24.2	[10.5-46.6]	25
Decline to answer	48.4	[36.9-60.0]	99

3.5 Behavioral risks

3.5.1 HIV Testing History and MSM Cascade

3.5.1.1 Ever tested

In the Eastern region 69.2% of the study sample reported ever having tested for HIV and received their results whilst the lowest testing prevalence were recorded for participants in Northern Ghana, where 24.1% of the study sample reported ever having tested and receiving their test results.

Region specific estimates show that those who have never tested for HIV constitute 72.5% of MSM sampled in Northern Ghana whilst 30.8% of MSM sampled in the Eastern region reported to have never tested for HIV.

3.5.1.2 Tested in the last 12 months

In the Central, region, 86.1% of MSM sampled reported to have tested for HIV in the last 12 months compared to 64.0% of MSM in Northern Ghana.

3.5.1.3 Knowledge of HIV status

Regional estimates show that 7.9% of MSM in the Central region self-reported a HIV positive status compared to zero study participants who reported a HIV positive status in the Volta region. With regards to self-reporting a HIV negative status, 98.1% of study participants in the Brong-Ahafo region self-reported a HIV negative status, and the lowest in the Greater Accra region self-reporting of 74.4%. In the Greater Accra region, 13.3% of MSM sampled declined to disclose their HIV status whilst 0.2% declined to do so in the Brong-Ahafo region.

3.5.1.4 MSM cascade in Ghana

We also conservatively explored those who knew their status and were diagnosed positive during the study in an attempt to establish the MSM cascade in Ghana. The inclusion criterion for diagnosed as defined in the UNAIDS report has the numerator for first 90 as all the individuals who had tested before the survey and knew they were infected. The second 90 is defined as all individuals who had traces of ART in their blood including i) those who self-reported being negative but had traces of ART in the specimen collected ii) those who refused to disclose their results, but also had traces of ART, iii) those who said they had never tested but had ART traces, and iv) those who

had missing response on ever testing but had traces of ART. However, in the absence of ART testing for our sample we calculated the cascade as follows

1st 90= *Numerator: Number of HIV-positive participants who are aware of their HIV-positive status*

Denominator: Number of participants who Tested HIV Positive

2nd 90= *Numerator: Number of HIV-positive participants eligible for treatment but report not on HIV treatment*

Denominator: Number of HIV-positive participants who are eligible for treatment (Tested HIV Positive)

First 90; Diagnosed	**Proportion**	**Std. Err.**	**[95% Conf. Interval]**
Not aware of HIV status/Tested HIV positive	47.7%	0.027	[42.5%-53.1%]
Aware/Tested HIV positive	52.3%	0.027	[46.9%-57.5%]
Second 90; on Treatment			
Treatment			
HIV Positive & not on ARVs	96.3%	0.008	[94.2%-97.6%]
HIV Positive & on ARVs	3.7%	0.008	[2.4%-5.8%]

Of the total 689 MSM who tested positive in the study, 52.3% were already aware of their HIV positive status, but only 3.7% of those who tested positive were self-reported to be on treatment. For proper reflection on the MSM cascade, it is recommended that ARV testing be done if possible on the samples to get a true reflection of those who are on AR.

3.5.1.5 HIV risk perception

HIV risk perception estimates show that 23.6% of MSM sampled in Northern Ghana compared to 68.1% of MSM in the Eastern region perceived themselves not to be at risk of getting HIV. Almost half (49.6%) of MSM sampled in the Ashanti region perceived themselves to be at some risk, whilst 11.5% in the Western region reported the same. Of note, 37.9% and 36.2% of the study sample respectively in the Western region and Northern Ghana indicated that they did not know if they were at risk of acquiring HIV.

Table 7 shows adjusted estimates of HIV testing history and HIV risk perception of MSM in Ghana.

Table 7. HIV testing history and HIV risk perception, by region in Ghana, 2017.

Variable	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Ever having received HIV testing and counseling, and received HIV results at health facility																
Yes	58.0	[52.6-63.2]	38.8	[33.8-44.2]	44.2	[39.3-49.3]	41.3	[36.2-46.7]	69.2	[64.7-73.4]	24.1	[19.8-29.0]	50.0	[44.8-55.3]	51.6	[46.3-56.9]
No	41.8	[36.6-47.2]	61.2	[55.8-66.2]	55.8	[50.7-60.7]	55.1	[49.7-60.4]	30.8	[26.6-35.3]	72.5	[67.4-77.0]	47.2	[41.9-52.4]	47.8	[42.6-53.1]
Decline to answer	0.2	[0.0-1.4]	-	-	-	-	3.5	[1.9-6.3]	-	-	3.4	[1.9-5.9]	2.8	[1.4-5.5]	0.5	[0.2-1.9]
Having received HIV testing and counseling in the last 12 months at a health facility																
Yes	74.1	[67.7-79.6]	74.1	[66.2-80.8]	83.6	[77.4-88.4]	86.2	[80.6-90.4]	84.9	[80.3-88.6]	66.4	[55.9-75.5]	84.4	[78.8-88.7]	78.8	[72.3-84.1]
No	25.9	[20.4-32.3]	25.9	[19.2-33.8]	16.4	[11.6-22.6]	13.8	[9.6-19.4]	15.1	[11.4-19.7]	33.6	[24.5-44.1]	15.6	[11.3-21.2]	21.2	[15.9-27.7]
Most recent HIV test results (among 1642 who indicated receiving results of their most recent test)																
Positive	7.7	[4.5-12.7]	4.8	[2.5-8.9]	0.8	[0.2-3.2]	7.9	[4.5-13.5]	0.8	[0.2-3.0]	1.2	[0.2-7.8]	-	-	2.6	[1.2-5.6]
Negative	78.6	[72.1-83.9]	89.7	[83.5-93.8]	99.0	[96.9-99.7]	90.6	[84.8-94.4]	91.6	[87.7-94.3]	94.2	[87.2-97.5]	92.9	[87.6-96.0]	87.9	[81.7-92.2]
Indeterminate	0.3	[0.1-1.6]	0.1	[0.0-0.5]	-	-	1.0	[0.2-5.0]	-	-	-	-	6.0	[3.2-10.8]	4.3	[2.0-8.8]
Decline to answer	13.4	[9.4-18.8]	5.5	[2.6-11.3]	0.2	[0.0-0.8]	0.5	[0.1-3.5]	7.6	[5.1-11.3]	4.7	[1.9-11.2]	1.1	[0.2-5.7]	5.2	[2.5-10.7]
HIV infection risk perception (excludes 9 who knew were HIV positive)																
No risk of getting HIV	52.9	[44.6-61.1]	23.9	[18.5-30.2]	57.1	[50.4-63.6]	36.4	[29.7-43.7]	67.8	[59.7-74.9]	25.9	[21.1-31.5]	50.5	[43.4-57.6]	49.3	[41.8-56.8]
Some risk of getting HIV	31.0	[23.9-39.1]	49.5	[42.4-56.6]	40.2	[33.8-46.9]	29.9	[23.6-37.0]	15.4	[10.5-22.1]	23.9	[19.2-29.3]	17.5	[12.6-23.9]	11.5	[7.9-16.3]
Don't know	13.5	[8.9-20.1]	25.1	[19.2-32.2]	2.1	[0.9-4.8]	24.0	[18.5-30.5]	12.2	[7.6-18.8]	34.7	[28.4-41.5]	24.9	[19.2-31.5]	37.9	[30.7-45.6]
Decline to answer	2.5	[0.7-8.2]	1.5	[0.5-4.3]	0.5	[0.1-2.2]	9.7	[6.1-15.2]	4.6	[2.3-9.2]	15.5	[11.5-20.6]	7.2	[4.2-11.9]	1.3	[0.4-4.2]

3.5.2 Self-reported STI symptoms in the last 12 months

Study participants responded to the question of whether or not MSM self-reported a STI symptom or diagnosis to the last person(s) they had sex with in the following categories: "Yes all of them", "Yes but only some of the", "None of them", "Don't know" and "decline to answer". Table 8 shows the adjusted estimates of self-reported STI symptoms in the last 12 months.

The MSM differed across study regions in terms of having informed the last person they had sex with. Estimates with regards to having informed "none of them" ranged from 14.6% in the Eastern region, to 31.3% in the Greater Accra region. Concerning informing all of them, estimates ranged from lowest, 3.7% amongst MSM in the Eastern region of Ghana to 15.1% of MSM reporting the same in the Brong-Ahafo region.

Table 8. Self-reported STI symptoms in the last 12 months, by region in Ghana, 2017.

Variable	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Last time I had symptoms of an STI or an STI diagnosis, I informed the person(s) I had sex with																
Yes, all of them	12.7	[9.6-16.7]	8.9	[6.6-11.9]	15.1	[11.9-18.9]	13.9	[10.3-18.3]	3.7	[2.3-5.8]	7.2	[5.0-10.1]	12.0	[9.0-15.9]	7.9	[5.4-11.2]
Yes, but only some of them	10.9	[7.9-14.7]	8.0	[5.4-11.7]	2.4	[1.4-4.0]	6.3	[4.0-9.8]	10.4	[8.0-13.5]	10.3	[7.7-13.8]	3.2	[1.7-5.9]	5.6	[3.6-8.6]
None of them	31.3	[26.6-36.3]	26.7	[22.2-31.8]	22.8	[18.8-27.4]	18.9	[15.0-23.5]	14.6	[11.6-18.3]	24.1	[19.5-29.3]	19.1	[15.4-23.4]	26.5	[22.0-31.6]
Don't know	29.1	[24.6-34.1]	22.9	[18.5-27.9]	39.2	[34.4-44.2]	4.6	[2.8-7.4]	9.4	[7.0-12.6]	18.2	[14.6-22.4]	14.2	[10.9-18.4]	26.1	[21.8-30.9]
Decline to answer	16.0	[12.5-20.3]	33.5	[28.5-38.9]	20.6	[16.8-24.9]	56.4	[50.9-61.7]	61.8	[57.2-66.2]	40.3	[34.8-45.9]	51.5	[46.4-56.6]	34.0	[29.2-39.1]
The last time you had STI symptoms or a diagnosis of an STI infection, you notified your regular sexual partner																
Yes	68.0	[56.9-77.4]	75.2	[62.1-84.9]	85.8	[75.6-92.1]	72.5	[59.0-82.8]	40.0	[29.1-52.0]	45.1	[34.0-56.7]	66.5	[52.7-77.9]	71.9	[56.6-83.4]
No	13.4	[7.5-22.8]	11.2	[4.7-24.7]	8.8	[4.2-17.5]	5.3	[1.2-20.0]	6.7	[2.8-15.5]	45.6	[34.4-57.2]	2.8	[0.7-10.6]	23.0	[12.3-38.9]
I did not have a regular sex partner at the ti	16.3	[9.4-26.7]	8.9	[3.7-19.8]	0.6	[0.1-4.2]	18.9	[10.6-31.5]	52.1	[40.3-63.6]	3.0	[0.5-14.5]	19.7	[11.6-31.5]	5.0	[2.0-12.3]
Don't know	2.2	[0.7-7.0]	4.3	[1.6-11.0]	0	-	0.8	[0.1-5.6]	1.2	[0.2-8.1]	2.5	[0.4-15.7]	3.4	[1.0-10.5]	0	-
Decline to answer	0	-	0.3	[0.0-2.2]	4.8	[1.5-14.4]	2.5	[0.7-8.5]	0	-	3.8	[1.5-9.5]	7.7	[2.2-23.5]	0	-

3.5.3 Sexual practices and sexual partnerships amongst MSM in Ghana

Table 9 shows self-reported sexual practices of MSM in the 10 study regions of Ghana.

3.5.3.1 Transactional sex with men and women in the last six months

Estimates of MSM receiving sex in exchange for money, show that 19.3% of MSM sampled in the Eastern region of Ghana and 26.9% in the Central region received sex in exchange for money with a male partner, whilst 32.8% of MSM in Northern Ghana did the same. Concerning receiving sex in exchange for money with a female partner in the last six months. Region specific estimates show that 10.8% of MSM in the Volta region and 13.4% of MSM in the Western region reported that they received sex in exchange for money in the last six months with a female sex partner; followed by 27.5% of MSM in the Eastern region; 28.6% of MSM in the Greater Accra region and 38.7% of MSM in Northern Ghana reporting the same.

Region specific estimates also showed that with regards to selling sex in exchange for money with a male partner: 47.8% of MSM in the Central region reported that they had sold sex in exchange for money with a male partner whilst 13.7% of MSM in the Volta region had done the same. Concerning selling sex in exchange for money with a female partner, 5.7% of MSM in the Volta region reported positively to this question while 21.6% of MSM in Northern Ghana reported that they sold sex in exchange for money with a female partner.

3.5.3.2 Sexual practices amongst MSM in Ghana in the last six months

Across the study regions, MSM report a balanced preference for receptive assertive or versatile anal intercourse. In Northern Ghana, 55.7% of MSM sampled reported a versatile preferred type of anal intercourse; with 40.2% reporting the same in the Eastern region of Ghana; 30.9% reporting this preferred type of anal intercourse in the Central region. In the Greater Accra region, 35.7% of MSM preferred receptive anal intercourse; with 35.6% of MSM in the Ashanti region, reporting the same; followed by 34.3% of MSM in the Brong-Ahafo region reporting a preferred receptive anal type of anal intercourse. Estimates of exclusive insertive anal intercourse were found to be highest (61.1%) in the Western region and the lowest in Northern Ghana (25.8%).

3.5.3.3 Number of male insertive sex partners in the last six months

In the Eastern region, 80.8% of MSM reported one or no male insertive sex partners in the last six months; followed by Volta region (78.8%); and 73.5% of MSM sampled in the

Brong-Ahafo region reporting the same. In terms of having two or more male insertive partners, 59.2% of the study sample in the Central region and 54.3% in Northern Ghana reported having two or male insertive partners whilst 35.3% of the study sample in the Greater Accra region reported the same.

3.5.3.4 Number of male receptive sex partners in the last six months

Region specific estimates reveal that 89.7% of MSM sampled in the Western region reported one or less receptive male sex partners in the last six months, followed by 85.2% in the Brong-Ahafo region and 85.0% of MSM sampled in the Eastern region. Concerning having two or more male receptive sex partners, 50.7% of the study sample reported having two or more male receptive sex partners; followed by 43.6% of the study sample reporting the same in the Central region whilst 36.9% did the same in the Greater Accra region.

Table 9. Sexual practices of MSM by region in Ghana in the last six months

	Greater Accra (n=546)		Ashanti (N=511)		Brong-Ahafo (N=504)		Central (N=503)		Ëastern (N=501)		Northern (N=510)		Volta (N=505)		Western (N=515)	
	%	[95%CI]	%	[95%CI]	%	[95%CI]	%	[95%CI]	%	[95%CI]	%	[95%CI]	%	[95%CI]	%	[95%CI]
Received sex in exchange for money with male partner in the past 6 months																
Yes	25.8	[21.4-30.7]	31.9	[27.2-37.1]	19.9	[16.2-24.1]	47.8	[42.0-53.5]	32.5	[28.1-37.1]	37.7	[32.6-43.2]	13.7	[10.8-17.2]	21.2	[17.3-25.8]
No	74.2	[69.3-78.6]	68.1	[62.9-72.8]	80.1	[75.9-83.8]	52.2	[46.5-58.0]	67.5	[62.9-71.9]	62.3	[56.8-67.4]	86.3	[82.8-89.2]	78.8	[74.2-82.7]
Received sex in exchange for money with female partner in the past 6 months																
Yes	18.2	[11.7-27.2]	14.8	[9.5-22.3]	14.9	[5.9-32.9]	11.4	[7.4-17.3]	10.8	[5.0-21.7]	21.6	[15.5-29.4]	5.7	[2.4-12.7]	6.8	[3.2-13.8]
No	81.8	[72.8-88.3]	85.2	[77.7-90.5]	85.1	[67.1-94.1]	88.6	[82.7-92.6]	89.2	[78.3-95.0]	78.4	[70.6-84.5]	94.3	[87.3-97.6]	93.2	[86.2-96.8]
Sold sex in exchange for money with male partner in the past 6 months																
Yes	16.1	[12.8-20.1]	11.7	[8.8-15.4]	7.1	[4.9-10.1]	26.9	[21.9-32.6]	19.3	[15.9-23.2]	32.5	[27.6-37.8]	8.1	[5.4-12.2]	8	[6.0-10.7]
No	83.9	[79.9-87.2]	88.3	[84.6-91.2]	92.9	[89.9-95.1]	73.1	[67.4-78.1]	80.7	[76.8-84.1]	67.5	[62.2-72.4]	91.9	[87.8-94.6]	92	[89.3-94.0]
Sold sex in exchange for money with fe male partner in the past 6 months																
Yes	28.6	[20.3-38.6]	18.9	[12.6-27.4]	20.3	[9.7-37.8]	20.9	[14.8-28.7]	27.5	[18.6-38.7]	38.7	[31.1-47.0]	10.8	[5.5-20.0]	13.4	[7.9-22.0]

No	71.4	[61.4-79.7]	81.1	[72.6-87.4]	79.7	[62.2-90.3]	79.1	[71.3-85.2]	72.5	[61.3-81.4]	61.3	[53.0-68.9]	89.2	[80.0-94.5]	86.6	[78.0-92.1]
Type of Anal intercourse																
Versitile	30.2	[25.6-35.4]	21.1	[16.7-26.3]	12.1	[9.0-16.0]	30.9	[25.8-36.4]	40.2	[35.5-45.2]	55.7	[49.6-61.7]	25	[20.4-30.2]	21.6	[17.4-26.4]
Receptive	35.7	[30.5-41.3]	35.6	[30.2-41.4]	34.3	[29.2-39.7]	10.9	[8.1-14.4]	20.4	[16.7-24.6]	18.5	[13.9-24.1]	29.2	[24.1-34.9]	17.3	[13.7-21.6]
Insertive	34.1	[29.1-39.4]	43.3	[37.6-49.1]	53.6	[48.1-59.0]	58.3	[52.5-63.8]	39.4	[34.6-44.4]	25.8	[21.0-31.3]	45.8	[40.2-51.6]	61.1	[55.7-66.3]
Number Male Insertive sex partners																
1 or less	64.7	[59.5-69.7]	70.2	[65.1-74.9]	73.5	[68.7-77.8]	40.8	[34.8-47.1]	80.8	[76.7-84.3]	45.7	[39.8-51.8]	78.8	[73.9-83.0]	72.9	[68.0-77.3]
2 or more	35.3	[30.3-40.5]	29.8	[25.1-34.9]	26.5	[22.2-31.3]	59.2	[52.9-65.2]	19.2	[15.7-23.3]	54.3	[48.2-60.2]	21.2	[17.0-26.1]	27.1	[22.7-32.0]
Number Male receptive partners																
1 or less	63.1	[57.8-68.2]	77.1	[72.4-81.2]	85.2	[81.3-88.4]	56.4	[49.1-63.4]	85	[81.1-88.1]	49.3	[43.1-55.6]	79.3	[73.8-83.9]	89.7	[86.6-92.2]
2 or more	36.9	[31.8-42.2]	22.9	[18.8-27.6]	14.8	[11.6-18.7]	43.6	[36.6-50.9]	15	[11.9-18.9]	50.7	[44.4-56.9]	20.7	[16.1-26.2]	10.3	[7.8-13.4]

3.5.4 Condom use

Table 10 shows adjusted estimates of how often MSM use condoms during sex with a man or a woman in the last six months. MSM responded to frequency of condom use in terms of "always", "usually", "sometimes", "rarely", "never" and "decline to answer" or "not applicable".

3.5.4.1 Frequency of condom use amongst MSM in Ghana during sex with a man or a woman

With regards to frequency of condom use, adjusted estimates varied per study region. Concerning "always" using a condom during sex with a man or a woman, estimates ranged from lowest, 17.4% recorded amongst MSM in Northern Ghana to the highest, 56.1% in the Central region of Ghana. Regarding "rarely" using a condom during sex with a man or a woman, adjusted estimates show that 2.6% of MSM in the Eastern region, reported to "rarely" use a condom compared to the highest amongst the regions, 18.0% of MSM reporting to "rarely" use a condom in the Ashanti region of Ghana.

3.5.4.2 Condom use at last sex with a man or a woman

Region specific estimates show that 88.3% of MSM sampled in the Eastern region reported condom use at last sex with a man or a woman; whilst 82.9% of MSM sampled in the Brong-Ahafo region reported having used condoms at last sex with a man or a woman; 74.5% reported the same in the Volta region. In the Western region, 68.2% of MSM sampled reported having used condoms at last sex with a man or a woman; similarly 63.0% reported the same in the Central region of Ghana. Whilst 56.6% of MSM sampled in the Greater Accra region reported using a condom at last sex with a man or a woman; 45.9% and 40.9% respectively having reported the same in the Ashanti region and Northern Ghana.

3.5.4.3 Frequency of condom use amongst MSM in Ghana during penetrative anal sex with other men

Population adjusted estimates of how often MSM use condoms during penetrative anal sex with other men is presented in Table 10.

Region specific estimates show that 56.1% of MSM sampled in the Central region, reported always having used condoms during penetrative anal sex, followed by 54.1% of MSM sampled in Volta reporting the same.

The region specific estimates also show that 2.5% of the study sample in Northern Ghana reported never having used a condom during penetrative anal sex, whilst less than two percent (1.9%) of MSM sampled in the Ashanti region reported the same. The remaining regions ranged from less than one percent to 1.0% reported never having used condoms during penetrative anal sex with other men.

3.5.4.4 Frequency of condom use during penetrative sex with women

"Always" using condoms during penetrative anal sex, estimates ranged from a low of 15.0% (Ashanti region) to a high of 53.7% in the Eastern region of Ghana. With regards to "never" using a condom during penetrative sex with women, estimates across study regions ranged from 2.1% (Central region) to 10.6% in the Greater Accra region.

Table 10. Condom use amongst MSM by region in Ghana, 2017.

	Greater Accra		Ashanti		Brong-Ahafo		Central		Ëastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Frequency of condom use during sex with a man or a woman																
Always	27.1	[22.7-31.9]	21.9	[17.8-26.5]	44.1	[39.2-49.1]	56.1	[50.6-61.4]	36.5	[32.2-41.1]	17.4	[13.8-21.8]	54.4	[49.3-59.4]	44.4	[39.2-49.7]
Usually	14.1	[10.9-17.9]	16.1	[12.4-20.7]	38.2	[33.4-43.3]	11.2	[8.2-15.2]	47.9	[43.3-52.6]	7.4	[5.3-10.2]	13.8	[10.8-17.6]	13.6	[10.4-17.6]
Sometimes	39.9	[34.8-45.2]	33.4	[28.6-38.6]	4.5	[2.9-6.8]	21.8	[17.8-26.4]	8.5	[6.3-11.5]	40.8	[35.5-46.4]	18.3	[14.8-22.4]	21.7	[17.6-26.3]
Rarely	7.4	[5.2-10.5]	18	[14.0-22.9]	4.6	[3.0-6.9]	6.4	[4.0-10.1]	2.6	[1.4-4.7]	11.8	[8.9-15.4]	4.4	[2.6-7.6]	6.5	[4.3-9.5]
Never	11.6	[8.4-15.8]	10.6	[7.7-14.4]	8.7	[6.3-11.9]	4.5	[2.5-8.0]	4.2	[2.5-7.1]	21.1	[16.6-26.5]	8.8	[6.3-12.2]	13.9	[10.6-18.0]
Decline to answer									0.2	[0.0-1.6]	1.4	[0.4-4.9]	0.2	[0.0-1.7]		
Condom use at last sex with a man or a woman																
Yes	56.6	[50.9-62.0]	45.9	[40.2-51.7]	82.9	[78.7-86.4]	63	[57.6-68.1]	88.3	[84.9-91.0]	40.9	[35.1-47.0]	74.5	[69.5-78.9]	68.2	[62.7-73.3]
No	43.4	[37.9-49.0]	53.5	[47.7-59.1]	15.5	[12.2-19.6]	33.7	[28.7-39.0]	11.7	[9.0-15.1]	52	[45.8-58.0]	21	[17.1-25.5]	30.8	[25.8-36.3]
Decline to answer	0.1	[0.0-0.6]	0.7	[0.2-2.0]	1.6	[0.7-3.3]	3.3	[2.0-5.5]	0		7.1	[4.4-11.2]	4.5	[2.4-8.1]	0.9	[0.4-2.5]
Frequency of condoms use during penetrative anal sex with other male																
Always	33.7	[28.8-39.1]	26	[21.4-31.3]	67.8	[62.7-72.5]	56.1	[50.5-61.5]	72.1	[67.7-76.1]	21.9	[17.4-27.1]	56.7	[51.3-62.0]	51.4	[45.7-57.0]
Usually	15.9	[12.4-20.2]	14.4	[10.8-19.0]	13.3	[10.3-16.9]	14	[10.3-18.8]	13.8	[10.9-17.4]	11.7	[8.2-16.3]	15.7	[12.1-20.2]	12.5	[9.3-16.5]
Sometimes	42.8	[37.4-48.4]	33.7	[28.6-39.3]	2.8	[1.6-4.9]	22.6	[18.4-27.4]	7.2	[5.1-10.1]	44.7	[38.8-50.7]	17.9	[14.2-22.2]	23.1	[18.6-28.2]
Rarely	5.8	[3.8-8.9]	17.7	[13.5-22.9]	4.4	[2.8-6.8]	5.4	[3.3-8.7]	2.9	[1.6-5.2]	11.5	[8.2-15.9]	4	[2.1-7.5]	7.3	[4.9-10.8]
Never	0.4	[0.1-2.1]	2.1	[0.8-5.4]	0.8	[0.3-2.1]	0.2	[0.1-1.1]	0.2	[0.0-1.7]	3.4	[1.9-6.0]	1.2	[0.5-3.0]	1.1	[0.5-2.5]
Not applicable - I don't	1.3	[0.6-2.5]	5.9	[4.1-8.5]	11	[7.8-15.2]	1.7	[0.8-3.8]	3.7	[2.3-5.8]	6.9	[4.6-10.3]	4.5	[2.9-6.9]	4.7	[2.8-7.7]
Frequency of condom use during penetrative sex with woman																
Always	17.8	[14.2-22.3]	15.1	[11.5-19.5]	30.9	[26.2-35.9]	50.2	[44.6-55.7]	53.7	[48.9-58.3]	19.4	[15.1-24.6]	26.6	[21.8-31.9]	24.2	[19.6-29.4]
Usually	6.8	[4.4-10.4]	9	[6.1-13.1]	3.1	[1.9-5.0]	15.1	[11.2-20.0]	4.6	[3.0-6.9]	7.6	[4.8-11.9]	10	[7.2-13.8]	6	[3.8-9.5]
Sometimes	18.9	[14.8-23.8]	21.6	[17.2-26.8]	1.8	[0.9-3.3]	19.2	[15.4-23.7]	4.9	[3.3-7.2]	43.4	[37.5-49.5]	13.3	[10.1-17.4]	20.1	[15.8-25.1]
Rarely	7.9	[5.3-11.7]	16	[12.0-21.0]	1.9	[1.0-3.8]	4.5	[2.6-7.7]	4.8	[3.1-7.3]	8.4	[5.6-12.5]	2.7	[1.5-4.8]	6.8	[4.6-10.0]
Never	10.6	[7.6-14.6]	13.9	[10.2-18.6]	3.4	[2.0-5.7]	2.1	[1.0-4.4]	2.6	[1.4-4.6]	3.2	[1.6-6.0]	2.5	[1.2-5.2]	2.5	[1.2-5.0]
Not applicable - I don't	37.9	[32.7-43.3]	24.4	[20.0-29.5]	58.9	[53.7-63.9]	9	[6.4-12.4]	29.5	[25.4-34.0]	18	[13.8-23.2]	44.9	[39.7-50.3]	40.5	[35.0-46.1]

3.5.4.5 Affordability of condoms

Table 11 shows adjusted estimates of the affordability of condoms. With regards to affordability, 93.2%; and 92.3% of MSM sampled respectively in the Central and Brong-Ahafo regions reported that condoms were very affordable.

3.5.4.6 Accessibility of condoms

Table 11 presents how easily accessible condoms are to MSM in Ghana. Across study regions MSM reported that it was very easy to obtain condoms. A large majority of MSM sampled (94.3%) in the Brong-Ahafo region and 60.0% of MSM sampled in the Northern Ghana reporting the same; whilst 10.2% of the study sample in Greater Accra reported that condoms are not easily accessible.

3.5.4.7 Condom breakage

Across study regions, the majority of MSM reported that condom breakage "rarely" occurs. In the Brong-Ahafo region, 77.5% of MSM sampled in this region reported to have "rarely" experienced condom breakage, with the lowest percentage reported in Northern Ghana, of 25.4% reporting the same.

Of note, 18.2% of MSM sampled in the Central region reported that they "always" experience condom breakage; with lowest condom breakage compared to other regions, being reported by MSM in Northern Ghana (0.8%). Almost sixty percent (58.5%) of MSM in Northern Ghana reported to "sometimes" experience condom breakage, with the lowest having reported by MSM in the Brong-Ahafo region (0.9%).

3.5.4.8 Perception of condoms in preventing HIV infection

Table 11 presents the perception of MSM with regards to condoms preventing HIV infection. Across all regions, MSM sampled believed that condoms were very effective. The highest proportion of MSM reporting that condoms prevent HIV infection were found in Central region (91.8%) and the lowest in Northern Ghana (59.2%).

Table 11. Access, affordability of condoms, condom breakage and perception of condoms in prevention of HIV amongst MSM by region in Ghana

	Greater Accra		Ashanti		Brong-Ahafo		Central		Ëastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Affrodability of condoms																
They are very affordable or very cheap	68.6	[63.1-73.7]	69	[63.1-74.3]	95.3	[92.9-96.9]	95.7	[93.4-97.2]	86.1	[82.6-89.1]	59.5	[53.8-64.9]	83.3	[79.0-86.9]	89.8	[86.1-92.5]
Somewhat affordable	21.7	[17.4-26.8]	25.1	[20.2-30.8]	4.2	[2.7-6.6]	3.4	[2.1-5.4]	11	[8.4-14.3]	27.3	[22.6-32.6]	5.6	[3.9-8.2]	6.9	[4.6-10.3]
They are not affordable, or are expensive	9.7	[6.6-13.8]	5.9	[3.5-9.7]	0.3	[0.1-1.2]	0.7	[0.2-2.4]	2.8	[1.6-4.9]	7	[4.6-10.4]	11.1	[8.0-15.0]	3.1	[1.9-5.1]
Decline to answer					0.2	[0.0-1.2]	0.3	[0.0-1.9]			6.2	[3.9-9.9]			0.2	[0.0-1.6]
The accessibility and Availability of Condoms																
Very easy	70.7	[65.5-75.4]	64.1	[58.7-69.2]	94.9	[92.4-96.6]	89.5	[85.8-92.4]	84.7	[80.9-87.7]	59.8	[54.4-65.0]	89.9	[86.4-92.6]	83.2	[79.0-86.6]
Somewhat easy	14.1	[10.7-18.3]	25	[20.5-30.1]	2.1	[1.2-3.7]	7.1	[4.9-10.3]	12.7	[10.0-16.0]	21.7	[17.6-26.4]	5.3	[3.7-7.8]	6	[4.0-8.8]
Not easy	11.3	[8.2-15.2]	5.7	[3.4-9.5]	0.6	[0.2-2.2]	0.5	[0.2-1.5]	1.6	[0.6-4.2]	5.8	[3.9-8.5]	3	[1.6-5.6]	1.1	[0.5-2.3]
Don't know	4	[2.3-6.9]	5.2	[3.5-7.8]	2.2	[1.2-4.3]	1.8	[0.9-3.4]	1.1	[0.5-2.5]	6.6	[4.2-10.1]	1.7	[0.7-4.3]	9.8	[7.1-13.3]
Decline to answer					0.2	[0.0-1.1]	1	[0.2-4.7]			6.1	[4.1-9.0]				
Frequency of condom breakage																
Always	2	[0.7-6.2]	1.2	[0.2-5.9]	0.9	[0.1-6.1]	18.2	[9.4-32.2]	9.6	[5.4-16.7]	0.8	[0.1-5.6]	1.1	[0.2-7.7]	1.1	[0.2-7.3]
Usually	7.9	[4.7-13.1]	5.1	[2.7-9.4]	4.5	[1.6-11.9]	5.2	[2.3-11.0]	12.3	[7.3-20.1]	8.4	[4.0-17.0]	11.2	[4.6-24.8]	8.2	[2.7-22.8]
Sometimes	47.5	[40.1-55.1]	41.6	[33.8-49.9]	9.7	[4.3-20.3]	27.9	[18.6-39.7]	22.4	[15.6-31.1]	58.5	[46.5-69.5]	32.8	[22.3-45.4]	33	[22.6-45.2]
Rarely	41.9	[34.8-49.3]	50.5	[42.4-58.6]	77.5	[65.1-86.4]	48	[36.6-59.6]	53.9	[44.6-63.0]	25.4	[17.0-36.0]	54.4	[41.9-66.4]	54.7	[42.1-66.7]
Never	0.6	[0.1-2.3]	1.6	[0.4-6.4]	7.5	[2.7-19.2]	0.7	[0.2-3.0]	1.7	[0.3-8.5]	6.9	[1.4-27.4]	0.4	[0.1-2.9]	3	[0.7-12.4]
Perceptions of the effectiveness of condoms in HIV prevention																
Very effective	61.2	[56.0-66.2]	88.2	[84.1-91.3]	74.2	[69.7-78.3]	91.8	[88.1-94.4]	91	[88.1-93.2]	59.2	[53.7-64.4]	91.4	[87.9-93.9]	80.6	[76.0-84.6]
Somewhat effective	23.7	[19.6-28.4]	8.7	[6.1-12.2]	23.9	[20.0-28.4]	6.2	[4.0-9.4]	8.2	[6.1-11.0]	24.9	[20.4-29.9]	7.4	[5.1-10.7]	12.8	[9.7-16.7]
Not effective	11.1	[8.0-15.2]	1.2	[0.3-4.7]	0.5	[0.2-1.7]	0.1	[0.0-0.8]	0		1.2	[0.6-2.6]	0.9	[0.3-2.5]	1.9	[0.9-4.2]
Don't know	3.9	[2.4-6.3]	1.7	[0.8-3.4]	1.1	[0.5-2.3]	1.1	[0.5-2.5]	0.6	[0.2-1.9]	8	[5.5-11.7]	0.3	[0.1-1.5]	4.6	[2.7-7.8]
Decline to answer			0.3	[0.0-1.8]	0.2	[0.0-1.1]	0.8	[0.1-5.3]	0.2	[0.0-1.6]	6.7	[4.6-9.6]				

3.5.4.9 Reasons for not always using condoms

In Table 12 the reasons for MSM are not always using condoms is presented. The main reason given by MSM as to why they do not always use condoms was that they trust their partners. Not always using a condom because they trusted their partner was reported on by 40.7% of MSM sampled in Northern Ghana; 41.7% of MSM sampled in the Western region reported the same and 39.4% of the study sample reported trusting their partner and therefore they do not always used a condom.

The second reason provided by MSM sampled was that they did not like condoms/condoms as they did not feel good. With regards to this reason, 40.0% of MSM sampled in Northern Ghana reported the same, with 39.0% reporting in the Ashanti region that they did not like condoms; whilst 28.6% of MSM sampled in the Central region reporting that they did not like condoms/condoms because they did not feel good.

The third reason provided for not always using condoms by MSM sampled was inconvenient to use condoms in the heat of the moment. With regards to this reason, 28.9% of MSM sampled in the Ashanti region, reported that they did not always use condoms because it was inconvenient; with 22.7% of MSM sampled in the Greater Accra region reported the same; and 15.6% of MSM in the Central region reported that the use of condoms are inconvenient.

The fourth reason provided by MSM was that the partner refused to use a condom. Region specific estimates indicated that in Northern Ghana 21.4% of MSM sampled reported that they do not use a condom frequently because their partner refused to do so; whilst 19.8% of MSM sampled in the Greater Accra region reported the same; and 15.5% reported the same in the Ashanti region.

With regards to accessibility of condoms, 10.2% of MSM sampled in the Western region reported that condoms were not accessible and 9.3% in the Brong-Ahafo region; whilst 8.7% reported the same in the Greater Accra region.

Region specific estimates show that 5.2% of MSM sampled in the Volta region, reported that condoms were not affordable.

3.5.4.10 Source of obtaining condoms

Table 13 shows adjusted estimates of where MSM are most likely to access condoms. Across study regions, MSM sampled reported obtaining condoms mostly from pharmacies, drug stores, followed by receiving condoms from peer educators and from friends.

In the Ashanti region, 82.8% of MSM sampled obtained condoms from pharmacy/chemist/drug story; whilst 77.9% of MSM sampled in the Eastern region of Ghana and 70.8% of the study sample reported the same in Northern Ghana.

In the Volta region, 54.7% of MSM reported receiving condoms from peer educators; with 47.4% of the study sample in the Western region reporting the same. However, only 35.8% of the study sample in the Central region reported the same.

Table 12. Ranking of reasons for not using condoms among MSM by region in Ghana, 2017.

Variable	Greater Accra	Ashanti	Brong-Ahafo	Central	Eastern	Northern	Volta	Western
Ranking of reasons for not using condoms frequently	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**
Trust in partner	22.0	25.1	25.07	37.1	21.4	40.7	39.4	41.7
Do not like condoms/They don't feel as good	28.5	39.0	12.5	28.6	7.5	40.0	17.1	20.1
Inconvenience/Don't think to use condoms in heat	22.7	28.9	2.63	15.6	2.1	15.4	3.4	2.4
Partner refuses or does not like condoms	19.8	15.5	4.9	12.9	4.4	21.4	11.9	14.3
Not easily accessible	8.7	6.5	9.3	5.1	4.3	3.3	5.9	10.2
Not affordable	0.5	0.7	0.5	2.5	0.3	1.9	5.2	0.6
Total cases	**435**	**367**	**407**	**370**	**366**	**406**	**263**	**304**

Table 13. Source of obtaining condoms among MSM across regions in Ghana, 2017

	Greater Accra	Ashanti	Brong-Ahafo	Central	Eastern	Northern	Volta	Western
Source of condoms	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**	**Adjusted%**
Pharmacy/chemist/drug store	64.2	82.9	73.0	52.7	77.9	70.8	63.5	64.0
From peer educator or an NGO	27.3	13.8	37.3	35.8	7.1	5.3	54.7	47.4
From friends	22.7	30.3	6.4	12.5	4.5	28.2	10.7	16.2
Government hospital or clinic	5.2	1.2	0.4	16.3	4.5	32.2	2.3	2.1
Shop/Supermarket	6.9	7.8	2.6	2.1	15.7	11.9	6.4	1.7
From sex partner/s	5.6	13.6	8.4	3.6	0.9	9.6	1.9	5.2
HIV Counseling and Testing Site (HCT site)	1.2	0.2	0.1	10.7	9.9	1.0	5.4	0.7
Mobile clinic or mobile outreach	3.0	0.2	1.3	4.8	3.4	0.6	1.7	0.1
From market/stand	0.6	1.4	1.1	7.5	0.2	6.2	1.7	0.0
Family planning or clinic	1.4	0.0	0.0	8.9	2.0	3.4	0.0	0.1
Private hospital or clinic	0.5	0.2	0.5	4.3	0.3	3.6	0.7	1.9
Total cases	**492**	**464**	**451**	**452**	**459**	**392**	**461**	**447**

3.5.5 Lubricant use amongst MSM in Ghana

The results of how often MSM use lube when engaging in anal sex are presented in Table 14. Study participants were asked if they, "always", "usually", "sometimes" or "never" use lubricant during anal sex. Region specific adjusted estimates show that 80.7% of MSM sampled in the Central region, always used lubricant, compared to 12.2% of MSM sampled in Northern Ghana who did so.

Across the regions, 20.2% of MSM sampled in the Ashanti region reported that they usually used lubricants for anal sex compared to 5.1% of MSM sampled in the Central region who reported doing so. Region specific estimates show that in Northern Ghana, 33.2% of MSM sampled reported sometimes using lubricant compared to 2.5% of MSM sampled in the Brong-Ahafo region reported doing so. On the issue of never having used lubricant, 27.8% of MSM sampled in Northern Ghana compared to 8.1% in the Central region reported never having done so.

3.5.5.1 Affordability of lubricant

On the question of lubricant affordability, of MSM sampled in the Central region 80.7% compared to only 15.0% of MSM sampled in the Ashanti region reported that lubricant was very affordable.

In the Greater Accra region 16.0% of the study sample reported that lubricant was expensive compared to a low of 0.7% of MSM sampled in the Brong-Ahafo region who did so.

3.5.5.2 Accessibility of water-based lubricant

Regarding the accessibility and availability of water-based lubricants. In the Central region 60.7% of MSM sampled reported that they found water-based lubricant to be accessible; with 59.1% in the Brong-Ahafo region and 54.8% in the Volta region reporting the same.

3.5.5.3 Accessibility of oil-based lubricant

In terms of the accessibility and availability of oil-based lubricants. Almost ninety percent (88.5%) of MSM sampled in the Central region 77.7% of MSM sampled in the Western region, and 66.4% of MSM sampled in the Greater Accra reported that oil-based lubricants were easily accessible and available.

3.5.5.4 Type of lubricant

Table 15 shows adjusted estimates of the type of lubricant preferred by MSM in Ghana. The type of lubricant most used by MSM in Ghana is KY-jelly. With regards to the use of KY-jelly, 65.0% of MSM sampled in the Central region reported that they make use of KY-jelly whilst only 7.0% in Northern Ghana reporting the same. Of note is that the second most common lubricant used by MSM in Ghana is Vaseline. With regards to the use of Vaseline, 30.6% of MSM sampled in the Ashanti region reported making use of Vaseline as lubricant during anal sex whilst 29.5% in the Greater Accra region and 21.8% in Northern Ghana reported the same. Shea butter is the third most common lubricant used by MSM in Ghana. Region specific estimates show that 33.1% of MSM sampled in the Ashanti region reported to have used shea butter, followed by 25.1% of MSM in the Volta region; and 24.3% of MSM in the Greater Accra region.

Table 14. Lubricant use amongst MSM in Ghana

	Greater Accra		Ashanti		Brong-Ahafo		Central		Ëastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
The frequency lubrication use for anal sex																
Always	49.0	[43.7-54.3]	37.9	[32.8-43.2]	60.9	[56.0-65.6]	80.7	[76.6-84.3]	61.5	[56.8-66.0]	12.2	[9.2-16.1]	62.5	[57.5-67.2]	51.5	[46.2-56.7]
Usually	10.4	[7.6-14.0]	20.2	[16.2-24.9]	13.8	[10.8-17.5]	5.1	[3.4-7.6]	10.0	[7.4-13.3]	16.3	[12.6-20.8]	17.2	[13.7-21.4]	10.2	[7.6-13.5]
Sometimes	25.3	[20.8-30.4]	28.1	[23.3-33.5]	2.5	[1.4-4.3]	4.3	[2.7-6.6]	13.4	[10.4-17.2]	33.2	[28.3-38.5]	8.3	[6.2-11.2]	16.3	[12.8-20.6]
Rarely	4.2	[2.6-6.9]	3.4	[1.8-6.2]	0.8	[0.4-1.9]	1.8	[0.9-3.3]	2.9	[1.7-4.8]	3.1	[1.8-5.2]	1.0	[0.4-2.3]	4.0	[2.3-6.9]
Never	9.9	[7.0-13.8]	10.1	[7.5-13.4]	22.0	[18.2-26.4]	8.1	[5.8-11.3]	11.6	[8.9-15.1]	27.8	[22.9-33.3]	10.0	[7.4-13.3]	16.9	[13.3-21.3]
Don't know	1.2	[0.5-2.8]	0.3	[0.1-1.6]	0.0		0.0	[0.0-0.1]	0.6	[0.1-2.3]	2.6	[1.4-4.7]	0.4	[0.1-1.7]	1.1	[0.3-3.6]
Decline to answer	0.0		0.0		0.0		0.0		0.0		4.8	[2.8-8.1]	0.6	[0.2-2.0]	0.0	
The affordability of lubricant																
They are very affordable or very cheap	30.1	[25.6-35.1]	15.0	[11.6-19.2]	61.8	[56.8-66.5]	80.7	[76.2-84.5]	63.3	[58.6-67.8]	28.0	[23.4-33.1]	53.6	[48.5-58.7]	62.5	[57.2-67.6]
Somewhat affordable	18.6	[14.8-23.2]	16.1	[12.5-20.6]	7.3	[5.1-10.3]	9.8	[7.2-13.3]	18.7	[15.3-22.6]	21.8	[17.6-26.6]	10.5	[7.9-13.9]	4.4	[2.7-7.1]
They are not affordable, or are expensive	16.0	[12.7-20.0]	6.3	[4.2-9.4]	0.7	[0.2-2.0]	2.2	[0.9-5.0]	2.2	[1.1-4.2]	9.1	[6.5-12.8]	7.5	[5.1-10.8]	0.9	[0.3-2.4]
Don't know	34.8	[29.9-40.2]	62.0	[56.7-67.1]	28.4	[24.1-33.2]	6.4	[4.3-9.4]	15.7	[12.4-19.6]	34.4	[29.1-40.0]	28.4	[23.9-33.3]	32.2	[27.4-37.4]
Decline to answer	0.4	[0.1-1.9]	0.5	[0.1-2.4]	1.8	[1.0-3.2]	0.9	[0.3-2.4]	0.2	[0.0-1.2]	6.7	[4.6-9.8]	0.0		0.0	
Accessibility and avialbility of water-based lubricants																
Very easy	36.4	[31.5-41.5]	10.3	[7.5-13.9]	59.1	[54.2-63.9]	60.7	[55.3-65.7]	48.0	[43.4-52.7]	12.4	[9.4-16.3]	54.8	[49.7-59.8]	47.2	[42.0-52.4]
Somewhat easy	16.8	[13.1-21.3]	5.2	[3.3-8.0]	1.3	[0.7-2.6]	14.6	[11.3-18.6]	18.2	[14.9-22.0]	15.6	[12.2-19.8]	8.4	[6.0-11.7]	8.0	[5.3-11.8]
Not easy	21.9	[18.0-26.3]	19.8	[16.1-24.2]	0.6	[0.2-1.9]	17.1	[13.5-21.5]	4.0	[2.5-6.3]	21.8	[17.5-26.9]	11.6	[8.9-15.1]	1.7	[0.8-3.4]
Don't know	24.8	[20.3-29.9]	64.4	[59.2-69.3]	35.2	[30.6-40.1]	6.4	[4.3-9.3]	28.6	[24.5-33.2]	39.9	[34.6-45.5]	25.2	[21.0-29.9]	43.1	[38.0-48.4]
Decline to answer	0.1	[0.0-0.6]	0.3	[0.1-1.6]	3.8	[2.5-5.8]	1.3	[0.5-3.0]	1.1	[0.5-2.5]	10.2	[7.1-14.4]	0.0		0.1	[0.0-0.5]
Accessibility and avialbility of oil-based lubricants																
Very easy	66.4	[61.2-71.3]	55.0	[49.5-60.3]	18.4	[14.8-22.6]	88.5	[84.9-91.3]	59.9	[55.2-64.4]	43.3	[37.9-48.8]	58.9	[53.8-63.8]	77.7	[73.1-81.7]
Somewhat easy	6.2	[4.1-9.4]	28.6	[23.8-33.9]	6.2	[4.2-9.1]	5.2	[3.5-7.7]	17.7	[14.4-21.6]	22.6	[18.4-27.5]	20.3	[16.3-25.0]	2.7	[1.6-4.6]
Not easy	3.7	[2.3-5.8]	3.5	[1.9-6.4]	15.1	[11.9-18.9]	1.2	[0.5-2.7]	2.2	[1.2-3.9]	6.0	[3.5-10.1]	5.5	[3.6-8.4]	0.0	[0.0-0.3]
Don't know	23.3	[18.9-28.3]	12.8	[9.8-16.6]	53.4	[48.4-58.4]	4.2	[2.6-6.9]	19.8	[16.2-24.0]	18.7	[15.0-23.2]	15.2	[12.2-18.8]	19.5	[15.7-24.0]
Decline to answer	0.4	[0.1-1.9]	0.1	[0.0-0.6]	6.9	[4.7-9.9]	0.8	[0.3-2.3]	0.4	[0.1-1.5]	9.4	[6.6-13.2]	0.1	[0.0-0.9]	0.0	

Table 15. Type of lubricant

Variable	Greater Accra	Ashanti	Brong-Ahafo	Central	Eastern	Northern	Volta	Western
Ranking of type of lubricant used	Adjusted%	Adjusted%	Adjusted%	Adjusted%	Adjusted%	Adjusted%	Adjusted%	Adjusted%
KY-jelly	44.2	36.2	59.2	65.0	52.5	7.0	29.7	39.9
Vaseline	29.5	30.6	4.6	17.9	10.1	21.8	21.2	9.2
Shea Butter	24.3	33.1	1.4	8.8	5.5	21.0	25.1	12.4
Baby oil	15.4	20.3	5.3	11.5	21.9	29.8	14.9	4.3
Whatever we get from peer educator(s)	24.6	0.3	6.1	3.5	7.4	1.6	30.4	63.1
Other oil	4.2	11.4	0.1	2.1	0.6	11.8	2.2	4.0
Assagai	1.9	1.0	1.3	37.5	0.2	1.8	6.2	0.9
Soap	0.5	4.9	0.4	0.71	-	6.2	5.2	2.0
Okro	0.2	0.3	-	-	-	-	0.7	-
Total cases	**451**	**433**	**433**	**291**	**359**	**454**	**406**	**361**

3.5.6 Alcohol use amongst MSM in Ghana

Alcohol use amongst MSM across 10 regions of Ghana was measured as part of the study. The GMS II used the Alcohol Use Disorders Identification (AUDIT) to measure alcohol use amongst MSM in Ghana. The AUDIT is a 10-item screening tool developed by the WHO to assess alcohol consumption, drinking behaviors, and alcohol-related problems (Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). The alcohol AUDIT score was derived from the three items (frequency of having a drink containing alcohol, number of drinks containing alcohol in a day and frequency of having more than 6 drinks on one occasion) in Table 16.

3.5.6.1 The AUDIT Score

The MSM sampled across study regions self- reported that they abstain from drinking alcohol. In the Brong-Ahafo region, 94.8% of the study sample reported abstaining from alcohol, followed by 88.6% in the Volta region, and 84.0% reporting in Northern Ghana. Concerning high risk drinkers, 5.2% of MSM sampled in the Greater Accra region were categorized as high risk/harmful drinkers, followed by 2.8% of the MSM study sample in Northern Ghana and 2.1% of the study sample in the Ashanti region.

Table 16. Alcohol use amongst MSM by regions in Ghana, 2017

Variable	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Alcohol AUDIT Score*																
Abstainers	54.8	[49.4-60.0]	52.6	[47.2-58.0]	94.8	[92.4-96.6]	87.3	[83.3-90.4]	71.7	[67.3-75.8]	84.0	[80.3-87.1]	88.6	[84.8-91.6]	81.6	[77.2-85.3]
Low risk-Light drinker	32.8	[28.1-37.8]	39.8	[34.7-45.2]	4.4	[2.8-6.8]	11	[8.0-14.8]	25.8	[22.0-30.1]	9.6	[7.2-12.7]	8.9	[6.2-12.6]	15.0	[11.6-19.2]
Moderate drinker	7.3	[5.0-10.5]	5.5	[3.8-8.0]	0.7	[0.3-2.0]	1.1	[0.5-2.4]	2.3	[1.1-4.9]	3.6	[2.3-5.6]	2.3	[1.3-3.9]	1.5	[0.8-3.0]
High risk/HarmfulDrinker	5.2	[3.3-8.1]	2.1	[1.1-3.9]	0.1	[0.0-0.4]	0.7	[0.2-1.9]	0.1	[0.0-1.0]	2.8	[1.6-4.7]	0.2	[0.1-0.9]	1.9	[0.8-4.2]
Frequency of having a drink containing alcohol																
Never	54.8	[49.4-60.0]	52.6	[47.2-58.0]	94.8	[92.4-96.6]	87.3	[83.3-90.4]	71.7	[67.3-75.8]	84.1	[80.4-87.2]	88.6	[84.8-91.6]	81.6	[77.2-85.3]
Monthly or less	23.4	[19.3-28.0]	32.5	[27.6-37.8]	1.5	[0.8-3.0]	9.3	[6.7-12.8]	23.0	[19.2-27.2]	5.9	[4.1-8.6]	4.8	[2.9-8.0]	11.9	[9.0-15.5]
2 to 4 times a month	12.2	[9.2-15.9]	11.2	[8.6-14.5]	3.3	[1.9-5.5]	2.4	[1.1-5.2]	4.2	[2.7-6.4]	3.8	[2.4-5.8]	4.1	[2.4-6.8]	4.5	[2.6-7.6]
2 to 3 times a week	7.1	[4.8-10.4]	2.8	[1.5-4.9]	0.4	[0.1-1.4]	0.3	[0.1-0.9]	0.7	[0.2-2.1]	3.8	[2.5-5.8]	1.4	[0.7-2.9]	1.6	[0.6-3.8]
4 or more times a week	2.6	[1.3-4.9]	0.9	[0.4-2.5]	-	-	0.7	[0.3-1.6]	0.5	[0.1-2.1]	2.4	[1.4-4.2]	1	[0.5-2.3]	0.5	[0.1-1.9]
Number of drinks containing alcohol on a typical day																
1 or 2 drinks	57.1	[49.4-64.5]	70.3	[63.0-76.6]	31.6	[16.5-51.9]	77.2	[60.7-88.1]	77.3	[68.6-84.2]	60.2	[49.0-70.4]	79.6	[67.3-88.2]	58.7	[46.3-70.0]
3 or 4 drinks	32.8	[26.0-40.4]	22.4	[16.7-29.3]	63.7	[43.4-80.0]	20.6	[10.2-37.2]	19.8	[13.8-27.7]	26.3	[18.0-36.7]	17.2	[9.5-29.2]	29.7	[19.9-41.9]
5 or 6 drinks	6.4	[3.9-10.5]	6.3	[3.8-10.3]	1.2	[0.2-8.3]	2.2	[0.3-14.0]	2.9	[0.6-13.6]	9.7	[4.5-19.4]	1.9	[0.4-7.7]	9.3	[4.1-19.9]
7, 8, or 9 drinks	2.4	[0.7-8.2]	0.8	[0.1-5.6]	-	-	-	-	-	-	1.3	[0.3-5.3]	-	-	-	-
10 or more drinks	1.2	[0.3-4.4]	0.3	[0.0-1.9]	3.5	[0.5-21.5]	-	-	-	-	2.5	[0.5-11.2]	1.3	[0.2-8.8]	2.3	[0.5-9.8]
Frequency of having six or more drinks on one occasion or at one single time																
Never	63.0	[55.2-70.2]	77.1	[70.2-82.8]	94.7	[77.5-98.9]	75.1	[60.7-85.4]	86.1	[78.1-91.6]	45.5	[34.9-56.5]	87.9	[76.7-94.2]	77.2	[66.0-85.5]
Less than monthly	20.8	[15.0-28.0]	14.8	[10.3-20.7]	-	-	-	[8.0-30.4]	10.7	[5.9-18.6]	29.8	[20.2-41.6]	5.1	[1.6-15.2]	8.8	[4.6-16.3]
Two to four times a month	12.6	[8.1-19.1]	6.4	[3.3-12.0]	1.2	[0.2-8.0]	2.6	[0.7-9.0]	3.1	[1.2-7.7]	14.6	[7.8-25.6]	4.4	[1.3-14.1]	9.2	[4.1-19.6]
Two to three times per week	2.1	[1.0-4.3]	1.2	[0.4-3.7]	4.1	[0.6-24.3]	0.5	[0.1-3.5]	-	-	5.3	[2.3-11.9]	2.5	[0.7-8.5]	1.6	[0.2-10.7]
Four or more times a week	1.5	[0.5-4.9]	0.5	[0.1-2.2]	-	-	5.5	[1.8-16.0]	-	-	4.8	[1.7-13.0]	-	-	3.1	[0.9-10.1]
*Alcohol Audit Score derive from the three items in the table																

3.5 HIV Knowledge

Although accurate knowledge about HIV prevention and transmission does not necessarily lead to behavioral change, it is a prerequisite for informing decision-making leading to behavioral change amongst those who engage in risky behaviors, or for maintenance of protective behaviors (Shisana, 2014; Shisana, Rehle, Simbayi, Zuma, & Jooste, 2014).

Table 17 presents information about a composite measure of correct HIV knowledge, as recommended by UNAIDS (2013). If a study participant answered all questions correctly they scored '1', whilst if they answered any of the questions incorrectly they scored '0'.

Correct knowledge estimates across study regions, ranged from 36.7% in the Greater Accra region to 70.2% of MSM who had correct knowledge in the Eastern region of Ghana. With regards to individual questions of HIV knowledge, MSM across study regions were consistent in terms of their correct knowledge of HIV. Estimates on each individual item scored between 60% - 90%.

Table 17. HIV knowledge among MSM by region in Ghana, 2017

Variable	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Comprehensive HIV knowledge*																
Correct knowledge	36.7	[31.8-42.0]	42.3	[36.9-47.8]	57.9	[52.8-62.9]	51.0	[45.2-56.7]	70.2	[65.6-74.4]	52.5	[46.4-58.5]	48.1	[42.7-53.6]	50.3	[45.0-55.6]
Incorrect knowledge	63.3	[58.0-68.2]	57.7	[52.2-63.1]	42.1	[37.1-47.2]	49.0	[43.3-54.8]	29.8	[25.6-34.4]	47.5	[41.5-53.6]	51.9	[46.4-57.3]	49.7	[44.4-55.0]
People can reduce their chances of getting HIV by having just one sex partner who is not infected																
TRUE	83.5	[79.1-87.2]	89.1	[85.5-91.9]	-	-	93.6	[90.0-95.9]	98.6	[96.8-99.4]	96.5	[92.9-98.3]	95.3	[92.3-97.2]	99.1	[97.7-99.7]
FALSE	16.5	[12.8-20.9]	10.9	[8.1-14.5]	-	-	6.4	[4.1-10.0]	1.4	[0.6-3.2]	3.5	[1.7-7.1]	4.7	[2.8-7.7]	0.9	[0.3-2.3]
People can reduce their chances of getting HIV by using a condom every time they have sexual intercourse																
TRUE	82.9	[78.3-86.6]	93.6	[89.9-96.0]	-	-	93.5	[90.4-95.7]	99.4	[98.1-99.8]	94.4	[91.0-96.6]	98.6	[96.7-99.4]	98.3	[96.7-99.1]
FALSE	17.1	[13.4-21.7]	6.4	[4.0-10.1]	-	-	6.5	[4.3-9.6]	0.6	[0.2-1.9]	5.6	[3.4-9.0]	1.4	[0.6-3.3]	1.7	[0.9-3.3]
A healthy looking person can have HIV																
TRUE	86.8	[82.7-90.1]	87.6	[83.2-91.0]	62.9	[57.8-67.7]	85.8	[81.4-89.4]	92.7	[89.5-95.0]	92.9	[89.0-95.5]	92.8	[89.1-95.3]	95.6	[93.4-97.0]
FALSE	13.2	[9.9-17.3]	12.4	[9.0-16.8]	37.1	[32.3-42.2]	14.2	[10.6-18.6]	7.3	[5.0-10.5]	7.1	[4.5-11.0]	7.2	[4.7-10.9]	4.4	[3.0-6.6]
A person can get HIV from mosquito bites																
TRUE	25.7	[21.1-31.0]	29.1	[24.1-34.6]	1.1	[0.5-2.5]	15.5	[11.9-19.9]	10.7	[8.0-14.1]	15.8	[11.7-21.0]	29.5	[24.6-34.9]	30.8	[26.0-36.0]
FALSE	74.3	[69.0-78.9]	70.9	[65.4-75.9]	98.9	[97.5-99.5]	84.5	[80.1-88.1]	89.3	[85.9-92.0]	84.2	[79.0-88.3]	70.5	[65.1-75.4]	69.2	[64.0-74.0]
A person can get HIV by sharing a meal, food, or utensils with someone who is infected with HIV																
TRUE	24.6	[20.1-29.6]	28.2	[23.1-33.8]	4.2	[2.7-6.5]	29.4	[24.4-35.0]	10.1	[7.5-13.3]	31.0	[25.7-36.8]	21.2	[16.9-26.1]	33.9	[28.9-39.2]
FALSE	75.4	[70.4-79.9]	71.8	[66.2-76.9]	95.8	[93.5-97.3]	70.6	[65.0-75.6]	89.9	[86.7-92.5]	69.0	[63.2-74.3]	78.8	[73.9-83.1]	66.1	[60.8-71.1]

*Correct knowledge is derived from correct responses to following items in Table 17

3.6 Self-disclosure of HIV status

Table 18 below presents the results of self-disclosure of HIV status. In terms of having disclosed HIV positive status; study participants were asked if they found themselves HIV positive would they disclose to family, friends, male/female sex partner(s). In each category, we asked study participants to report if they would disclose to "all of them"; to "only some of them"; and "none of them".

MSM sampled across study regions indicated that they would disclose their HIV positive to family, friends, and male/female sex partner(s), all respectively, if they found themselves HIV positive. Region specific estimates differed across each one of the type of person. With regards to disclosure to all in the family, regionally specific estimates varied from 40.6% amongst MSM in the Western region to only 5.7% amongst MSM in the Ashanti region. In terms of disclosure to all friends, this ranged from 27.0% amongst MSM in Northern Ghana to only 3.0% amongst MSM in the Central region. Concerning disclosure to all female sexual partners, this ranged from 36.9% and 36.6% amongst MSM in Western and Northern Ghana respectively to 7.3% amongst MSM in the Central region. The possible disclosure to all male sexual partners ranged from 42.0% amongst MSM in the Western region to 8.7% amongst MSM in the Central region.

Table 18. Self-disclosure of HIV status among MSM by region in Ghana, 2017

	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
Variable	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
If you yourself got infected with the virus that causes AIDS, would you tell your family																
Yes, all of them	31.1	[26.3-36.3]	5.7	[3.8-8.5]	24.6	[20.6-29.1]	7.7	[5.3-10.9]	25.6	[21.7-30.0]	35.5	[30.6-40.7]	13.2	[10.3-16.8]	40.6	[35.5-45.8]
Yes, but only some of them	30.3	[25.8-35.3]	49.5	[44.1-54.9]	63.3	[58.4-68.0]	49.8	[44.3-55.2]	45.6	[41.0-50.3]	29.8	[25.0-35.1]	36.4	[31.6-41.4]	28.5	[23.9-33.6]
No, none of them	36.2	[31.3-41.4]	44.0	[38.7-49.5]	12.1	[9.2-15.7]	39.4	[34.3-44.8]	26.3	[22.5-30.5]	21.0	[16.6-26.3]	35.2	[30.4-40.2]	30.4	[25.8-35.4]
Don't know/Not sure	2.1	[1.0-4.5]	0.7	[0.2-2.2]	-	-	2.7	[1.3-5.8]	2.0	[1.0-3.6]	5.9	[3.8-8.8]	4.4	[2.5-7.7]	0.6	[0.2-1.6]
No response	0.2	[0.1-0.9]	-	-	-	-	0.4	[0.1-1.7]	0.5	[0.2-1.6]	7.8	[5.0-12.0]	10.8	[8.2-14.2]	-	-
If you yourself got infected with HIV, would you tell friends																
Yes, all of them	15.4	[11.7-19.9]	5.9	[3.7-9.4]	3.1	[1.6-5.9]	3.0	[1.8-5.2]	7.3	[5.1-10.1]	27.0	[22.5-32.1]	6.2	[4.4-8.7]	12.2	[9.0-16.4]
Yes, but only some of them	22.5	[18.5-27.1]	31.8	[26.9-37.1]	8.8	[6.4-12.0]	37.8	[32.6-43.4]	25.0	[21.2-29.2]	23.0	[18.9-27.7]	19.6	[15.7-24.1]	20.3	[16.1-25.3]
No, none of them	61.1	[55.8-66.1]	62.1	[56.6-67.2]	88.1	[84.3-91.1]	56.4	[50.9-61.8]	65.5	[61.0-69.8]	36.3	[31.0-42.0]	59.5	[54.4-64.5]	66.8	[61.4-71.8]
Don't know/Not sure	1.0	[0.3-3.0]	0.2	[0.0-1.4]	-	-	2.5	[1.1-5.6]	1.5	[0.7-3.0]	5.9	[4.0-8.5]	3.9	[2.1-7.2]	0.7	[0.3-1.7]
No response	0.1	[0.0-0.7]	-	-	-	-	0.2	[0.1-0.9]	0.7	[0.3-2.0]	7.7	[5.0-11.9]	10.8	[8.2-14.2]	-	-
If you yourself got infected with HIV, would you tell your female sexual partner																
Yes, all of them	27.2	[21.7-33.5]	16.8	[12.8-21.7]	23.1	[17.8-29.3]	7.3	[5.1-10.2]	16.7	[12.9-21.3]	36.6	[31.4-42.1]	27.1	[21.1-34.0]	36.9	[31.2-43.0]
Yes, but only some of them	19.3	[14.8-24.7]	32.4	[27.2-38.1]	34.3	[28.0-41.3]	40.0	[34.7-45.6]	21.9	[17.7-26.7]	19.1	[15.3-23.6]	10.2	[7.1-14.4]	17.1	[12.7-22.6]
No, none of them	49.3	[43.0-55.6]	47.6	[42.0-53.3]	37.8	[31.3-44.9]	48.5	[43.1-54.0]	58.5	[53.2-63.7]	29.7	[24.6-35.4]	35	[28.5-42.0]	43.8	[37.9-49.9]
Don't know/Not sure	3.3	[1.6-6.6]	0.9	[0.3-2.3]	2.5	[0.8-7.6]	2.9	[1.4-6.0]	2.0	[1.0-3.9]	5.7	[3.5-9.2]	8.2	[4.5-14.3]	2.2	[0.9-5.1]
No response	1.0	[0.2-4.4]	2.3	[1.0-5.4]	2.3	[0.9-5.7]	1.3	[0.3-4.4]	0.9	[0.3-2.6]	8.9	[5.8-13.3]	19.6	[14.9-25.3]	-	-
If you yourself got infected with HIV, would you tell your male sexual partner																
Yes, all of them	35.8	[30.8-41.1]	23.3	[18.9-28.3]	38.4	[33.7-43.3]	8.7	[6.4-11.8]	25.9	[21.8-30.5]	38.0	[32.9-43.4]	36.2	[31.4-41.3]	42.0	[36.9-47.4]
Yes, but only some of them	22.5	[18.6-27.0]	36.9	[31.7-42.3]	32.8	[28.2-37.8]	44.3	[38.9-49.9]	24.2	[20.4-28.3]	20.0	[16.1-24.6]	15.0	[11.7-19.0]	22.2	[17.9-27.3]
No, none of them	40.6	[35.5-45.9]	39.4	[34.3-44.8]	28.8	[24.4-33.6]	44.4	[39.1-49.8]	47.5	[42.8-52.2]	27.5	[22.6-33.0]	33.8	[29.2-38.8]	35.1	[30.3-40.3]
Don't know/Not sure	1.0	[0.5-2.2]	0.4	[0.1-1.7]	-	-	2.4	[1.0-5.6]	1.9	[1.0-3.8]	6.4	[4.1-9.7]	3.9	[2.1-7.3]	0.6	[0.2-1.7]
No response	0.1	[0.0-0.7]	-	-	-	-	0.1	[0.0-1.0]	0.5	[0.2-1.6]	8.2	[5.3-12.3]	11.1	[8.4-14.5]	-	-

3.7 Experiences of respondents treatment by healthcare providers during last visit for treatment of STIs

Table 19 shows region specific estimates of respondents' experiences of how they were treated by healthcare providers during the last visit for treatment of STIs. Region specific estimates show differences across regions with regards to level of comfortability with treatment by a healthcare provider during last visit for STI infection and/or experiences with negative or discriminatory manner in which counsellors or healthcare provider treated study participants. In the Volta region, 64.9% of MSM sampled reported feeling very comfortable with the treatment by a healthcare provider during the last visit for STI infection, followed by 58.9% of MSM sampled in the Brong-Ahafo region reporting the same level of comfortability; and 49.5% reporting the same in the Central region of Ghana.

With regards to negative or discriminatory manner in which healthcare provider treated MSM, 3.4% in the Greater Accra region reported that they felt discriminated against whilst 2.3% reported the same in the Brong-Ahafo region and 2.2% in Northern Ghana.

Table 19. Treatment by healthcare provider during last visit to treat STI

	Greater Accra		Ashanti		Brong-Ahafo		Central		Ëastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Level of comfrotability with treatment by a healthcare provider during las visit for STI infection																
Very comfortable	45.4	[40.3-50.7]	46.7	[41.4-52.1]	58.9	[53.9-63.7]	49.5	[44.1-54.9]	47.9	[43.3-52.6]	24.1	[20.0-28.7]	64.9	[59.9-69.7]	38.2	[33.3-43.5]
2. Somewhat comfortable	8.7	[6.0-12.4]	1.7	[0.8-3.6]	1.3	[0.6-2.7]	2.1	[0.9-4.8]	8.6	[6.4-11.4]	6.6	[4.6-9.4]	1.2	[0.6-2.6]	3.7	[2.0-6.7]
Not comfortable	2.1	[1.1-3.7]	0.9	[0.4-2.1]	3.2	[1.8-5.6]	0.4	[0.1-1.1]	0.3	[0.0-2.3]	3.8	[1.8-7.6]	1.6	[0.6-4.5]	0	
Don't know	32.5	[27.8-37.7]	21.2	[16.9-26.3]	33.6	[29.0-38.5]	5.7	[3.6-8.7]	9.2	[6.8-12.3]	24.4	[20.1-29.3]	6.1	[4.1-9.1]	33.3	[28.5-38.5]
Decline to answer	11.3	[8.2-15.2]	29.4	[24.6-34.7]	3	[1.8-5.2]	42.4	[37.2-47.8]	34	[29.7-38.5]	41.2	[35.7-46.9]	26.1	[21.8-30.9]	24.7	[20.5-29.4]
Negative or discriminatory manner in which counselor of health care provider treated respondent																
Yes	3.4	[2.0-5.8]	0.2	[0.0-1.2]	2.3	[1.2-4.2]	1.1	[0.5-2.4]	0.3	[0.0-2.3]	2.2	[1.1-4.3]	0.2	[0.0-1.3]	0.3	[0.1-1.2]
No	50.9	[45.6-56.1]	54.5	[49.0-60.0]	61.4	[56.5-66.1]	52.6	[47.2-58.0]	56.6	[52.0-61.2]	33.6	[28.7-38.8]	64.7	[59.7-69.4]	48.1	[42.9-53.4]
Don't know	34.6	[29.7-39.9]	17	[13.0-22.0]	33.8	[29.3-38.6]	3.6	[2.3-5.6]	7.3	[5.3-10.1]	22.2	[18.0-26.9]	10.3	[7.6-13.7]	30.7	[26.0-35.8]
Decline to answer	11.1	[8.1-14.9]	28.2	[23.4-33.4]	2.5	[1.4-4.6]	42.7	[37.4-48.1]	35.7	[31.3-40.3]	42.1	[36.6-47.7]	24.9	[20.8-29.6]	20.9	[17.0-25.4]

3.8 Refusal of services because of sexual orientation

Region specific estimates show that in all sectors (i.e. education, healthcare etc.) MSM reported not having experienced refusal of services because of sexual orientation. Table 20 presents the results of having been refused services because of sexual orientation.

Concerning having refused healthcare services because of MSM status, Region specific estimates show that 89.1% of MSM in the Volta region reported no experiences of having been refused healthcare services, followed by 97.7% of MSM in the Greater Accra region, 98.0% in Northern Ghana, 98.5% in the Western region, 98.8% in the Ashanti region, 99.5% in the Brong-Ahafo region and 99.7% in the Eastern region with 100.0% of MSM.

With regards to refusal of educational services, region specific estimates ranged from 87.7% to 99.8% who reported not having experienced refusal in the education service because of MSM status.

Table 20. Refused services because of sexual orientation

	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
Variable	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Refused healthcare services because of being MSM																
None	97.7	[96.1-98.7]	98.8	[95.6-99.7]	99.5	[98.5-99.9]	100.0		99.7	[98.9-99.9]	98.0	[96.6-98.8]	89.1	[85.4-91.9]	98.5	[95.5-99.5]
Discriminated	2.3	[1.3-3.9]	1.2	[0.3-4.4]	0.5	[0.1-1.5]	-	-	0.3	[0.1-1.1]	2.0	[1.2-3.4]	10.9	[8.1-14.6]	1.5	[0.5-4.5]
Refused education services because of being MSM																
None	92.9	[89.3-95.3]	99.8	[98.6-100.0]	99.6	[98.5-99.9]	99.7	[98.4-99.9]	98.4	[96.8-99.2]	96.8	[94.9-98.0]	87.7	[84.0-90.7]	98.3	[95.4-99.4]
Discriminated	7.1	[4.7-10.7]	0.2	[0.0-1.4]	0.4	[0.1-1.5]	0.3	[0.1-1.6]	1.6	[0.8-3.2]	3.2	[2.0-5.1]	12.3	[9.3-16.0]	1.7	[0.6-4.6]
Refused employment because of being MSM																
None	93.8	[90.8-95.8]	99.2	[97.5-99.8]	99.8	[98.9-99.9]	99.6	[98.6-99.9]	98.8	[97.0-99.5]	96.3	[94.2-97.7]	89.0	[85.6-91.7]	98.7	[97.1-99.4]
Discriminated	6.2	[4.2-9.2]	0.8	[0.2-2.5]	0.2	[0.1-1.1]	0.4	[0.1-1.4]	1.2	[0.5-3.0]	3.7	[2.3-5.8]	11.0	[8.3-14.4]	1.3	[0.6-2.9]
Refused restaurant service because of being MSM																
None	97.5	[95.9-98.5]	100.0	[99.8-100.0]	99.7	[98.9-99.9]	99.7	[98.7-99.9]	99.3	[98.3-99.7]	97.7	[96.3-98.5]	88.5	[84.8-91.4]	98.8	[95.4-99.7]
Discriminated	2.5	[1.5-4.1]	0	[0.0-0.2]	0.3	[0.1-1.1]	0.3	[0.1-1.3]	0.7	[0.3-1.7]	2.3	[1.5-3.7]	11.5	[8.6-15.2]	1.2	[0.3-4.6]
Refused religious/church service because of being MSM																
None	97.4	[95.1-98.6]	100.00	-	99.6	[98.5-99.9]	100	-	99.2	[98.0-99.7]	98.7	[97.5-99.4]	88.1	[84.4-91.1]	99.6	[98.6-99.9]
Discriminated	2.6	[1.4-4.9]	0	-	0.4	[0.1-1.5]	0	-	0.8	[0.3-2.0]	1.3	[0.6-2.5]	11.9	[8.9-15.6]	0.4	[0.1-1.4]
Refused housing service because of being MSM																
None	93.5	[90.4-95.7]	99.6	[98.2-99.9]	99.7	[98.9-99.9]	99.7	[98.4-99.9]	98.3	[96.5-99.2]	98.8	[97.6-99.4]	87.9	[84.1-90.8]	99.4	[95.9-99.9]
Discriminated	6.5	[4.3-9.6]	0.4	[0.1-1.8]	0.3	[0.1-1.1]	0.3	[0.1-1.6]	1.7	[0.8-3.5]	1.2	[0.6-2.4]	12.1	[9.2-15.9]	0.6	[0.1-4.1]
Refused police service because of being MSM																
None	98.5	[96.6-99.3]	99.4	[98.1-99.8]	99.9	[99.4-100.0]	99.4	[98.5-99.8]	99.4	[98.4-99.8]	97.9	[95.8-99.0]	89.0	[85.4-91.9]	99.6	[98.1-99.9]
Discriminated	1.5	[0.7-3.4]	0.6	[0.2-1.9]	0.1	[0.0-0.6]	0.6	[0.2-1.5]	0.6	[0.2-1.6]	2.1	[1.0-4.2]	11.0	[8.1-14.6]	0.4	[0.1-1.9]
Other discrimination because of being MSM																
None	97.4	[95.4-98.6]	99.7	[98.9-99.9]	99.8	[99.2-100.0]	99.4	[98.0-99.8]	99.8	[99.1-99.9]	96.8	[93.7-98.4]	88.2	[84.4-91.1]	99.3	[96.4-99.9]
Discriminated	2.6	[1.4-4.6]	0.3	[0.1-1.1]	0.2	[0.0-0.8]	0.6	[0.2-2.0]	0.2	[0.1-0.9]	3.2	[1.6-6.3]	11.8	[8.9-15.6]	0.7	[0.1-3.6]

3.9 Physical violence experienced by MSM in Ghana in the last 12 months

The majority of MSM reported across all study regions that there were no times in the last 12 months that they had experienced physical violence. With regards to experiences of physical violence we asked participants if they had been spat on in the last 12 months because of suspicion of their sexual orientation as gay. Region specific estimates for having been spat on indicate, across regions that the overwhelming majority of MSM did not experience having been spat on. With estimates ranging from 86.6% in the Volta region to 100.0% in the Brong-Ahafo region for not being spat on because of sexual orientation. Concerning having been slapped in the last 12 months because of gay/bisexual sexual orientation, estimates range from 87.4% in the Volta region to 100.0% in the Brong-Ahafo region of MSM indicating that they have not been slapped. Similarly with regards to number of times having been sexually coerced in the last 12 months, the majority of MSM reported not having been sexually coerced. Estimates ranged from 87.2% in the Volta region to 100.0% in the Brong-Ahafo region.

Table 21. Experiences of physical violence in the last 12 months

Variable	Greater Accra		Ashanti		Brong-Ahafo		Central		Eastern		Northern		Volta		Western	
	N=546		N=511		N=504		N=503		N=501		N=510		N=505		N=515	
	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI	Adjusted%	95%CI
Number of times in the last 12 months have been spat on because of gay/bisexual identification																
No times	91.9	[88.7-94.2]	96.4	[93.1-98.2]	100.0		99.0	[97.7-99.5]	98.4	[96.8-99.2]	90.2	[86.6-93.0]	86.6	[82.6-89.8]	98.3	[96.1-99.3]
Öne or more times	6.5	[4.5-9.4]	3.6	[1.8-6.9]	-	-	0.4	[0.1-1.6]	1.4	[0.6-3.0]	7.8	[5.5-10.9]	0.6	[0.2-1.6]	1.5	[0.6-3.8]
Decline to answer	1.6	[0.6-3.9]	-	-	-	-	0.7	[0.3-1.7]	0.2	[0.0-0.9]	2.0	[0.8-5.0]	12.8	[9.7-16.7]	0.2	[0.0-1.4]
Number of times in the last 12 months have been slapped because of gay/bisexual sexual identification																
No times	93.1	[90.1-95.2]	97.4	[94.8-98.8]	100.0		99.0	[97.9-99.5]	98.5	[96.9-99.3]	88.7	[84.7-91.7]	87.4	[83.7-90.4]	98.5	[97.0-99.3]
Öne or more times	5.6	[3.8-8.2]	2.6	[1.2-5.2]	-	-	0.6	[0.3-1.5]	1.2	[0.5-2.5]	8.9	[6.4-12.3]	0.5	[0.2-1.5]	1.3	[0.6-2.8]
Decline to answer	1.3	[0.4-3.8]	-	[0.0-0.1]	-	-	0.4	[0.1-1.3]	0.3	[0.0-2.3]	2.4	[1.0-5.6]	12.1	[9.1-15.8]	0.2	[0.0-1.4]
Number of times in the last 12 months, being sexually coerced																
No times	92.8	[89.6-95.1]	93.2	[90.3-95.2]	100.0		99.2	[98.1-99.7]	98.4	[96.8-99.2]	91.9	[88.3-94.5]	87.2	[83.4-90.2]	98.8	[97.3-99.5]
Öne or more times	5.9	[4.0-8.7]	6.8	[4.8-9.7]	-	-	0.1	[0.0-0.6]	1.6	[0.8-3.2]	5.9	[3.9-8.8]	1.0	[0.4-2.4]	0.9	[0.4-2.5]
Decline to answer	1.3	[0.4-3.8]	-	[0.0-0.1]	-	-	0.7	[0.2-1.9]	-	-	2.2	[0.9-5.3]	11.8	[8.9-15.5]	0.2	[0.0-1.3]

4. RESULTS OF THE SIZE ESTIMATION STUDY

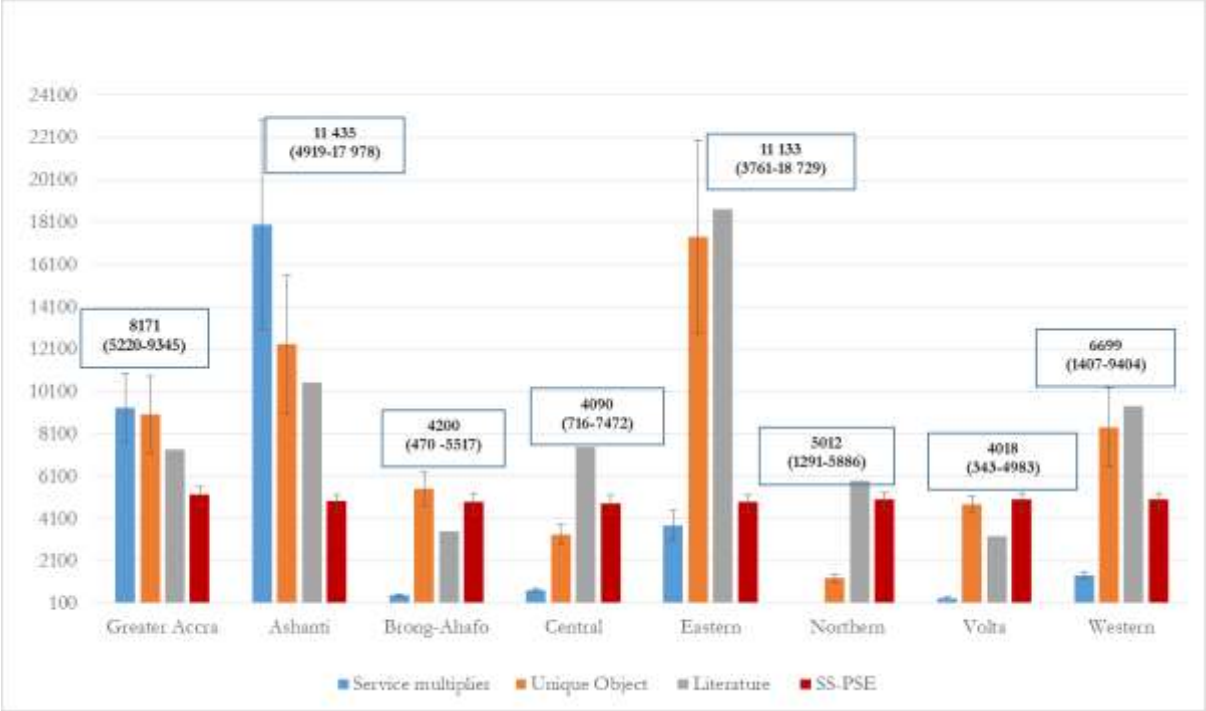
The overall size estimate of MSM in Ghana is 54,756 with plausibility bounds of 18,126 – 79,313. This represents 0.72% (0.24% to 1.04%) of the adult male population aged 18 years and above in Ghana. Region specific estimates range from a size estimate of 4,018 (0.62% of adult male population) in Volta to 11,435 (0.78% of the adult male population) of MSM in the Ashanti region of Ghana.

Table 22. Overall size estimates and plausibility bounds based on the triangulation of estimates from the different size estimation methods

Region	Size Estimate	Lower Plausibility bound	Upper Plausibility bound	Population of adult males 18+years	MSM as % of adult males	lower % of MSM to adult males	Upper% of MSM to adult males
Greater Accra	8 171	5 220	9 345	1 443 229	0.57%	0.36%	0.65%
Ashanti	11 435	4 919	17 978	1 471 247	0.78%	0.33%	1.22%
Brong-Ahafo	4 200	470	5 517	689 205	0.61%	0.07%	0.80%
Central	4 090	716	7 472	622 767	0.66%	0.11%	1.20%
Eastern	11 133	3 761	18 729	809 433	1.38%	0.46%	2.31%
Northern	5 012	1 291	5 886	1 156 732	0.43%	0.11%	0.51%
Volta	4 018	343	4 983	643 635	0.62%	0.05%	0.77%
Western	6 699	1 407	9 404	783 835	0.85%	0.18%	1.20%
National Size	**54 759**	**18 126**	**79 313**	**7 620 083**	0.72%	0.24%	1.04%

Size estimates varies by regions and methods. Figure 2 shows the region specific size estimates from the different size estimation methods. Service multiplier generated an estimate of 34,018 (CI: 26,358-41683); Unique object 62,076(CI: 48,671-75,495); Literature review 66,139 (CI: 39,711-31265) and RDSAnalyst SS PSE 39,711 (CI: 31,711-42,460).

Figure 3: Population size estimate for the study regions based on multipliers methods (including unique object, service multiplier); SS-PSE (RDS-Analyst) approach; and literature on the prevalence of MSM



5. DISCUSSION

5.1 Summary of main findings

To date, the GMS II is the largest IBBSS using RDS to be conducted amongst MSM in Ghana. The GMS II surveyed 4,095 MSM across all the 10 regions of Ghana: Greater Accra region (Accra and Tema); Eastern region (Koforidua); Brong-Ahafo (Sunyani); Western region (Takoradi); Central region (Cape Coast); Ashanti region (Kumasi);Volta region (Ho); Northern Ghana (WA, Tamale, Bolgatanga).

The main findings of the GMS II are outlined below:

1. MSM recruited into the study across study regions, were predominantly young, identified as bisexual (51.2%) and have obtained a secondary school educational level. A little over half (51.2%) are bisexuals and use mainly oil based lubricants

2. The GMS II found an aggregate HIV prevalence of 18.1% amongst MSM in Ghana. Those testing positive for syphilis, was low and HBV results showed a 7.0% prevalence. An aggregate HSV-2 estimate also showed a prevalence of 67.0%.

3. MSM HIV prevalence differed across study regions. HIV prevalence estimates ranged from lowest 4.0% in the Brong-Ahafo region; 4.3% in Northern Ghana; 9.0% in the Eastern region; 14.0% in the Volta region; 10.1% in the Central region; 10.0% in the Western region; 25.4% in the Ashanti region and the highest estimated HIV prevalence of 42.2% amongst MSM in the Greater Accra region.

4. Unrecognized HIV status was low with 26.6% of HIV positive MSM ever receiving an HIV test and 24.3% receiving HIV test in the last 12 months.

5. Estimates of transactional sex, buying and selling sex with male and female partners in the last six months were high across study regions. Estimates for selling sex to men in the last 6 months ranged from 13.7% of MSM in the Volta region to 47.8% of MSM in the Central region.

6. With regards to condom use, estimates suggest that MSM make use of condoms inconsistently, with simple majorities of MSM reporting to always making use of

condoms during sex with men and women. Regardless, condoms were found to be easily accessible.

7. Self-reported alcohol use revealed across study regions that most MSM abstained from using alcohol.

8. Of note is that across study regions, the overwhelming majority of MSM reported to never have experienced refusal of services because of sexual orientation; to not have experienced any uncomfortability when accessing healthcare; to not have experienced physical violence because of sexual orientation in the last 12 months.

9. The overall size estimate of MSM in Ghana is 54,756 with plausibility bounds of 18 126 - 79 313. This represents 0.72% (0.24% to 1.04%) of adult male population aged 18 years and above in Ghana. Region specific estimates range from a size estimate of 4,018 (0.62% of adult male population) in Volta to 11,435 (0.78% of adult male population) of MSM in the Ashanti region of Ghana.

10.

5.1.1 Discussion of main findings

5.1.2 Socio-demographic characteristics

In each of the study regions, MSM were predominantly young. Globally, HIV bio-behavioral surveys conducted amongst MSM show that study samples tended to be young with a mean age of 25 years (Beyrer et al., 2012; Cloete et al., 2014). In the GMS I, MSM sampled were found to be predominantly young, under age 35 (GAC, 2013). In the GMS II, two – thirds of the study sample were found to be between the ages of 18-24, and almost 30.0% between the ages of 25-34 years old. Of note, compared to the other regions, we were able to recruit over 10 percent of MSM who are 35 and older from the Northern parts of Ghana compared to the other regions.

With regards to educational level, across study regions, the majority of MSM reported to have completed secondary school. MSM who reported having completed tertiary or higher education were consistently low across study regions, with 16.8% of MSM recruited in the Greater Accra region reporting a completed tertiary or higher educational level.

Research has shown that bisexuality amongst MSM is common in African contexts (Beyrer et al., 2012; Cloete et al., 2014; Nyoni & Ross, 2013; Solomon SS et al., 2009). In fact, research has illustrated that bisexual behavior is common in Botswana, Kenya, Malawi, Namibia, Nigeria and Senegal (Baral et al., 2012; Baral et al., 2009; Beyrer et al., 2012; Sanders et al., 2007; Sheehy et al., 2014) with some MSM also having concurrent male and female sex partners (Beyrer et al. 2010 cited in Sheehy et al. 2014). The majority of MSM are married to other women, or in a long-term relationship with, a woman with the sole purpose to conceal their true sexual orientation (Beyrer et al., 2012). Research conducted in other settings shows that the link between male and female sexual networks has implications for transmission from a higher prevalence population to the general population, further showing how varied sexual networks of bisexually active MSM can play a role in HIV transmission (Hightow-Weidman et al., 2011).

5.1.3 HIV & STI prevalence

Studies have shown that HIV prevalence amongst MSM significantly exceeds HIV prevalence in the general population, even in the context of generalized epidemics

(Baral S., 2007; Beyrer et al., 2012). MSM HIV prevalence rates reported in bio-behavioral surveys in southern Africa show that HIV prevalence rates in several studies have been measured above 10–50% throughout the African continent, even in West Africa where the HIV epidemic has remained relatively low amongst the general population (Unaids, 2010). This was an indication that HIV in lower-prevalence countries are likely more concentrated amongst high risk populations including MSM (Unaids, 2010).

Although HIV infection in Africa is spread largely through heterosexual sex, the contexts in which the HIV transmission is occurring are increasingly diverse (Beyrer, 2007). The first seroprevalence study of MSM in Africa was conducted in Senegal in 2005 (Wade et al., 2005). The study found a HIV prevalence of 21.5 percent amongst MSM, compared to an HIV prevalence of 0.2 percent amongst adult males overall (Wade et al., 2005, cited in Cloete et al. 2014). Similarly, HIV prevalence studies amongst MSM conducted by the International AIDS Vaccine Initiative (IAVI) in Kenya found an HIV prevalence of over 40 percent, compared to an HIV prevalence of 6.1 percent amongst Kenyan adults aged 15 to 49 years (Johnson, 2007).

Studies of MSM and HIV have been conducted in Burkina Faso, Gambia and Senegal in West Africa, resulting in the issue being mainstreamed in HIV management in the West African region (Cloete et al., 2014; Niang et al., 2003). Several recent studies on MSM and HIV suggest that unprotected anal sex between men may play a more important role in the HIV epidemics in southern Africa than is commonly thought. A study of MSM in Zambia found an HIV prevalence of 33.0% (Zulu, Bulawo, & Zulu, 2006); a study of MSM conducted in Mombasa, Kenya, found an HIV prevalence of 43.0% (Sanders et al., 2007); and a study of 463 MSM conducted in Dakar, Senegal found an HIV prevalence of 22.0% (Wade et al., 2005). A survey of predominantly young MSM in Malawi, Namibia and Botswana that used snowball sampling, found an HIV prevalence of 17.4% in a relatively young sample with only 24.0% of participants being aware of their HIV status (Baral et al., 2009).

The GMS I which collected data from 1 302 MSM in five regions in 2011, documented an aggregate HIV prevalence of 17.5% amongst MSM in Ghana. In the GMS I HIV prevalence estimates were found to be highest amongst MSM in Accra/Tema at 34.3%, compared to 4.7%, 13.6%, and 11.3% in Cape Coast/Takoradi, Kumasi and Koforidua, respectively (Aberle-Grasse et al., 2013). Comparing GMS I and GMS II HIV prevalence,

there was prevalence increases in Greater Accra, and Ashanti regions with marginal declines in Eastern and stable in Western and central regions

Table 23. Comparison of HIV prevalence estimates amongst MSM in the GMS I & GMS II

Region	GMS I HIV prevalence estimates	GMS II HIV prevalence estimates
Greater Accra	34.3%	42.2%
Ashanti	13.7%	25.4%
Brong-Ahafo		4.0%
Central	10.4%	10.1%
Eastern	11.3%	9.0%
Northern Ghana		4.3%
Volta		14.0%
Western	10.4%	10.0%

The prevalence of syphilis amongst MSM in this study was low with aggregate estimates showing 7.3% of MSM testing positive for Hepatitis B and 67.9% testing positive for HSV-2. Research has shown that MSM and bisexual men are at greater risk for STIs compared to heterosexual populations, including HSV-2 (Xu, Sternberg, & Markowitz, 2010). According to Lama et al. (2006) HSV-2 prevalence has been found amongst MSM groups in developed countries. Several studies have also found that HIV-infected MSM have a higher prevalence of co-infection with other STIs than HIV-negative MSM (Mayer et al., 2012; M. Pando et al., 2009; M. A. Pando et al., 2012). Celum, Robinson, and Cohen (2005) indicated that STIs especially, HSV-2 increase the chances of acquisition and transmission of HIV by increasing susceptibility to and infectiousness of HIV.

Whilst the prevalence of syphilis ranged from 3.0% in Cape Coast/Takoradi to 4.9% in Kumasi and HBV prevalence ranges from 7.4% in Accra/Tema to 13.5% in Kumasi, HSV-2 prevalence is very high in Accra/Tema relative to the other sites (GAC 2013). HSV-2 prevalence ranges from 27.1% in Cape Coast/Takoradi to 45.9% in Accra/Tema (GAC, 2013).

5.1.4 Behavioral risks

5.1.4.1 HIV testing history

HIV testing remains the cornerstone of any HIV prevention effort. The GMS I found a low rate of HIV testing amongst MSM (Aberle-Grasse et al., 2013). In Accra 39.9% reported ever having tested for HIV, compared to 26.2% (Cape Coast/Takoradi), in Kumasi, 43.2%, and in Koforidua 32.9% reported having tested for HIV (Aberle-Grasse et al., 2013). The GMS II revealed that HIV testing estimates differed per study region, with estimates ranging from 20.0% to 69.0%. Taking into consideration that MSM are a key population, these HIV testing estimates reported in the GMS II are low across the study regions. A study by Baral et al. (2009) found that the number of HIV positive MSM who knew their HIV status was only 4.7% in Malawi, 17.4% in Botswana and 59.2% in Namibia (Baral et al. 2009). In addition, 79.3% MSM reported having tested for HIV in the last 12 months.

5.1.4.2 Sexual practices and sexual behaviors

Individual-level risks for HIV acquisition in MSM have been well documented, and include unprotected receptive anal intercourse, high frequency of male partners, high number of lifetime male partners, injection drug use, high viral load in the index partner, (German et al., 2011; Rosenberg, Sullivan, DiNenno, Salazar, & Sanchez, 2011). Beyrer et al. (2012) however points out that that recent data suggest individual-level risks might be insufficient to explain the high transmission dynamics evident in MSM outbreaks, and that biological, couple, network-level, and community-level drivers might be crucial to understand why HIV transmission rates remain so high in MSM populations. Across study the regions, MSM were mostly single, young, preferred receptive anal intercourse with close to a third engaged in transactional sex. MSM who engage in transactional sex may have differential power dynamics due to social or economic position, which could result in physical or sexual violence or abuse, inability to negotiate condom use, substance use and abuse, and/or psychological distress (Biello et al. 2013).

5.1.4.3 Condom use and accessibility

Across study regions MSM found condoms to be easily accessibility and affordable. Similar estimates were found in the GMS I. Similarly condom breakage was found to be common in the GMS II, across study regions. In the GMS I condom breakage ranged from 33.8% to 52.4% (GAC, 2013).

5.1.4.4 Alcohol use amongst MSM

Lane and colleagues (2008) relate that studies that have explored the relationship between alcohol consumption and HIV in the African region have focused only on heterosexual transmission, with the exception of one study of MSM in Senegal (Wade et al., 2005), which did not find a significant association between alcohol and HIV infection. In addition, the study findings on alcohol and drug use suggest widespread alcohol consumption in MSM, with over 50.0% of MSM reporting alcohol use in the previous 12 months in each region (GAC, 2016).

In the GMS II however across study regions, the majority of MSM reported to abstain from using alcohol.

5.1.5 Experiences of respondents treatment by healthcare providers

Key populations such as MSM are often reluctant to seek out healthcare services because of previous experiences of stigma and discrimination. A lack of MSM-friendly clinics, combined with previous experiences of discrimination, may deter MSM from HIV testing. Public sector clinics and hospitals are often perceived not to be MSM-friendly. Healthcare providers are often not well versed to provide specific and tailored HIV prevention to MSM.

In a study conducted to assess the barriers, motivators, and facilitators to engagement in HIV Care amongst HIV-Infected Ghanaian MSM, common barriers were fear of being seen in a HIV-related health facility, financial difficulties, and health system challenges (Ogunbajo et al., 2017). Whilst major motivators for engagement in care included social support, fear of mortality from HI and knowledge of effectiveness of HIV treatment (Ogunbajo et al., 2017). Kushwaha et al. (2017) also found that MSM in Ghana are exposed to negative health care climates and healthcare spaces that are unsupportive of MSM's autonomy undermine the uptake of prevention measures such as condoms, HIV testing, and accurate sexual health education.

More often than not, when MSM access healthcare services they are often discriminated against. However, overall, MSM in the GMS II reported that they were treated well by healthcare providers when they accessed services. Ghana has a strong MSM friendly health care provider network where NGOs who work with MSM refer them to Key population friendlily facilities for services and care. Over 50% of the participants have received services for MSM friendly NGOs

5.1.6 Physical violence experienced by MSM in Ghana

Key populations such as MSM are often subjected to violence on a daily basis. In particular in contexts where MSM behaviors are criminalized. The GMS II found that the overwhelming majority of MSM reported to not have experienced physical violence. This is contrary to the GMS I study findings, where almost a quarter or more MSM in all study regions have experienced some type of physical violence (GAC, 2013). Prevalence of self-reported physical violence for being MSM were lower across all sites, compared to experiences of physical violence, ranging from 13.9% in Accra/Tema to 2.8% in Koforidua (GAC, 2013, 2016).

5.1.7 Study limitations

The results of the study should be interpreted in the light of its methodological and analytical limitations. As with all RDS studies, the sample is composed of connected social networks rather than individuals of the population with an equal probability of being sampled. All efforts are made to identify and stimulate recruitment through diverse social networks in the population; however, it can happen that recruitment chains over- or under-represent particular social networks of MSM, and RDS analysis may fail to adequately adjust for all of the biases inherent in RDS recruitment methods. The study also relied on self-reported information, and consequently under- and over-reporting on sensitive topics such as sexual behaviors, drug use, HIV status and experiences of sexual violence might have occurred.

Despite several measures we put in place to screen for being MSM, reports of masking (i.e. study participants who fake eligibility) were received at study sites.

6. CONCLUSIONS

In conclusion, heteronormativity, homophobia and the persistent stigmatization of same sex sexualities contribute to a context of HIV risk for men in same sex relationships. Due to homophobia and the persistent stigmatization of same sex sexualities men tend to hide their same sex relationships, and engage in clandestine sex, whilst still fulfilling their prescribed gender roles. The secretive nature of these relationships puts both men and women at an increased risk for HIV transmission and infection. Hence structural interventions are needed to change both the social climate of HIV/AIDS and sexual politics around same sex sexualities.

The prevalence of HIV infection amongst MSM in developing countries is sometimes not closely related to the overall HIV prevalence in the general population, and estimates of HIV prevalence amongst MSM may exceed the estimated HIV prevalence amongst adults in the general population (Girault et al., 2004; Wade et al., 2005; van Griensven et al., 2005, Beyrer, 2007).

The GMS II has demonstrated that there is an urgent need for management of HIV amongst MSM in Ghana. MSM in the GMS II are disproportionately affected by HIV in each of the eight study regions.

The IBBSS provides valuable information to the GAC to advocate for improved programmes for the health of MSM.

7. LESSONS LEARNT

Important lessons were learnt in the GMS II. These lessons might prove essential for future HIV prevalence surveys to be conducted amongst MSM in Ghana. In the first instance, study leaders realized the importance of collaborating with MSM stakeholders and service providers. In fact, the guiding principle since inception was that MSM should be included in all processes of research, from the planning, implementation and dissemination phases.

The pre-surveillance formative research was extensive. In this phase of the study, study leaders and fieldwork staff obtained buy-in from MSM stakeholders. Through a collaborative and respectful attitude, team leaders and study staff obtained trust from the MSM community. The study team did not only inform MSM stakeholders of the study, but engaged in efforts that decreased distance between the researchers and the community. Of note, the Scientific Advisory Committee was integral to mobilization of the MSM community during the implementation of the IBBSS.

In one town, however, Wa, we were unable to collaborate with a MSM stakeholder because there were no services available for MSM. However given that this study was implemented in WA, we "uncovered" a sizable proportion of MSM living in this town. Consequently there is a possibility that a local NGO will establish MSM specific services for this population in this area.

The use of a biometric system was introduced in this study. This proved to be advantageous in prevention of duplicate recruits.

A staggered approach was followed with regards to implementation of the IBBSS. This assisted with monitoring and supervision of the study in each of the regions that was operational at a specific time. Because we used a web-based data management system where the data was available immediately, study leaders should have started with data cleaning as soon as the study site closed.

In this study, the importance of formative research before the implementation of the IBBSS using RDS was realized. Formative findings highlighted the most appropriate operational times; incentive distribution and location of the interview sites in each of the study regions. Onsite training was found to be more helpful instead of moving from theory to fieldwork implementation. Supervision was and coordination was increased,

in terms of making use of a local platform for communication amongst team members, in addition to weekly updates with the Project Manager.

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