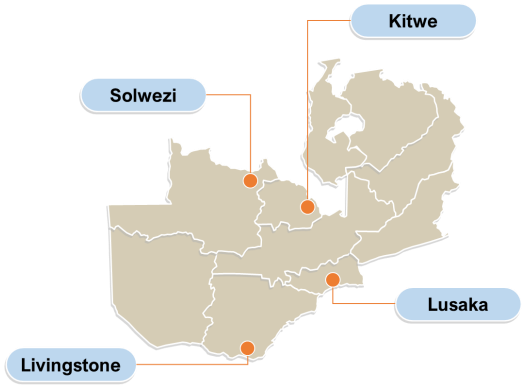
# BIOBEHAVIORAL SURVEY AMONG MEN WHO HAVE SEX WITH MEN IN ZAMBIA

## BACKGROUND

From May to November 2021, a biobehavioral survey (BBS) among men who have sex with men (MSM) was conducted in four cities in Zambia. The BBS estimated the prevalence of HIV, HIV recency, active syphilis, hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV viral load suppression (VLS), as well as progress towards the UNAIDS 95-95-95 targets. The population size of MSM was also estimated. In collaboration with the Zambia National HIV/AIDS/STI/TB Council (NAC) and the Tropical Diseases Research Centre (TDRC), the BBS was led by ICAP at Columbia University with support from the United States Centers for Disease Control and Prevention (CDC).

**Figure 1. Survey sites in Zambia**




Survey sites were selected based on those expected to have larger populations of MSM and transgender women.[1]

## SURVEY METHODS

### Eligibility Criteria

- Biologically male at birth
- Age ≥16 years
- Self-reported anal or oral sex with biological male in past 6 months
- Lived in surveyed city for past 3 months
- Speaks English, Bemba, Kaonde, Lozi, Nyanja, or Tonga
- Capable and willing to provide verbal informed consent
- In possession of valid survey coupon

### Survey Components

- Interviewer-administered survey questionnaire
- Rapid testing for HIV, HBV, HCV, syphilis
- Laboratory-based testing for HIV viral load, recent HIV infection, and active syphilis and for confirmation of HIV, HCV, and syphilis

### RECRUITMENT

Recruitment was conducted using respondent-driven sampling (RDS). Up to 8 seeds per site were identified through formative assessments and through community mobilizers working with key -population (KP) partners. Individually coded referral coupons were used by the seeds, and later, by other enrolled participants.

### SURVEY PROCEDURES

Population size estimation was conducted using the three-source capture-recapture (3-SCR) and successive sampling population size estimation (SS-PSE) methods. For the BBS, verbal informed consent was obtained by staff trained in human subjects protection and good clinical practice. Trained staff conducted tablet-administered,[2] in-person interviews using an adapted standardized questionnaire.[3] Consenting participants received rapid testing for HIV, HBV, HCV, and syphilis with immediate return of results. Referrals for care at KP -friendly clinics were provided to those testing positive for any infection or who reported symptoms of sexually transmitted infections. HIV-negative individuals were referred for HIV pre-exposure prophylaxis (PrEP) services. Laboratory-based testing was conducted at TDRC in Ndola for active syphilis, HIV viral load, and HIV recency per the recent infection testing algorithm (RITA). Confirmatory testing was also conducted for HIV, HCV, and syphilis. Participants were given their test results for HIV viral load. HIV recency results were not returned since results would not inform diagnosis or clinical care. This survey was approved by ethical review boards at ICAP at Columbia University, TDRC, and CDC.

## ANALYSIS

Indicators were estimated using R (version 4.0.5, RDS package version 0.9-3) with bootstrap variance estimation of 95% confidence intervals. SAS (version 9.4) was used for indicator validation and sensitivity analyses using Taylor series variance estimation.

Population size estimation was conducted with R (version 4.0.5) using the 3-SCR and SS-PSE methods. 3-SCR estimates with 95% credible intervals were calculated using Bayesian nonparametric latent-class models in the shinyrecap package.[4] Size estimation was based on the number of participants overlapping across three capture events (each of two community-based events timed one week apart and the RDS survey sample). SS-PSE was computed with the Gile's estimator in the sspse package (version 0.6) using RDS recruitment histories and self-reported network sizes; measurement errors were estimated using imputed visibility.

## SURVEY RECRUITMENT

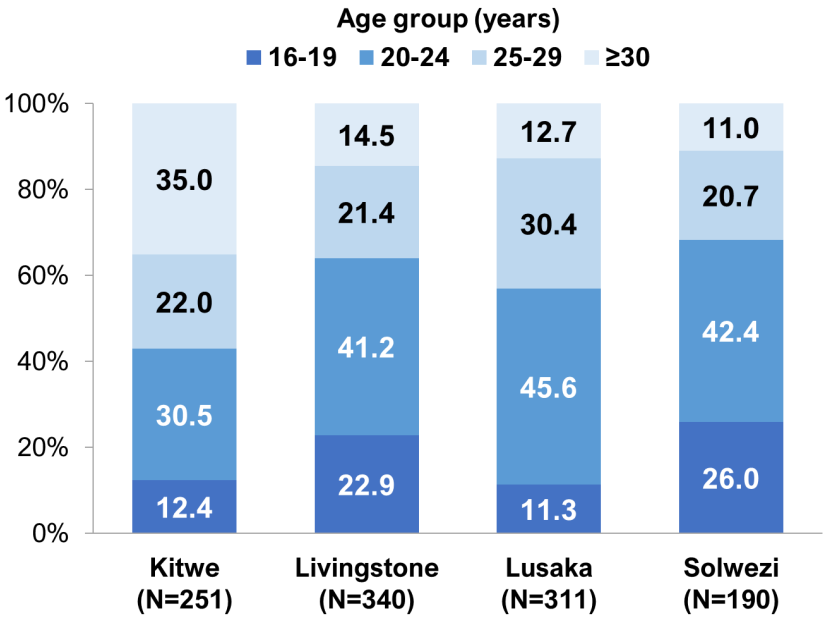
**Table 1. Recruitment and enrollment indicators, by site**

| Site | Seeds | Screened | Eligible | Enrolled | Tested for biomarkers | Coupon return rate |
|---|---|---|---|---|---|---|
| **Kitwe** | 6 | 368 | 351 | 350 | 348 | 39.1% |
| **Livingstone** | 6 | 531 | 466 | 466 | 465 | 44.1% |
| **Lusaka** | 8 | 517 | 457 | 457 | 456 | 38.9% |
| **Solwezi** | 6 | 373 | 300 | 300 | 300 | 44.6% |

When asked their gender identity, one quarter to one third (Kitwe: 27.7%; Livingstone: 24.5%; Lusaka: 29.8%; Solwezi: 35.3%) were transgender women (TGW) and small proportions (Kitwe: 0.6%; Livingstone: 2.6%; Lusaka: 2.2%; Solwezi: 1.3%) were non-binary. Findings among TGW and non-binary gender persons will be presented separately since they are a different population.

## DEMOGRAPHICS

**Figure 2. Age group distribution among MSM, by site**




N: denominator, total number of MSM who were interviewed.

The majority of MSM was younger than 30 years of age at all sites [Figure 2]. There were more MSM in the older age range in Kitwe than in other sites: 35.0% of MSM were aged 30 years and older in Kitwe, while MSM aged 20 to 24 years comprised more than two-fifths of the site sample in Livingstone (41.2%), Lusaka (45.6%), and Solwezi (42.4%).

# POPULATION SIZE ESTIMATES

The consensus population size estimates were calculated for all survey sites and were inclusive of all gender identities (MSM, TGW, non-binary) [Table 2]. Estimates met the minimum 1% of the adult male population benchmark.[5]

**Table 2. Consensus population size estimates, by site**

| Site | Estimate (median) | 95% Credible intervals | Percent of district population[6, a] |
|---|---|---|---|
| **Kitwe** | 2,200 | 1,500 – 2,800 | 1.0 |
| **Livingstone** | 1,000 | 300 – 2,100 | 1.7 |
| **Lusaka** | 7,900 | 3,900 – 13,100 | 1.1 |
| **Solwezi** | 1,000 | 200 – 2,100 | 2.1 |

[a] District population estimates were used since estimates for smaller catchment areas were not available.
Estimates and credible intervals are rounded to the nearest fifty.
95% credible intervals indicate the interval within which the true population parameter falls with 95% probability, given the evidence provided by the observed data.

# KEY FINDINGS

## HIV PREVALENCE

HIV prevalence among MSM was highest in Lusaka (22.9%), lowest in Solwezi (5.9%), and similar in Kitwe (9.4%) and Livingstone (10.9%) [Table 3].

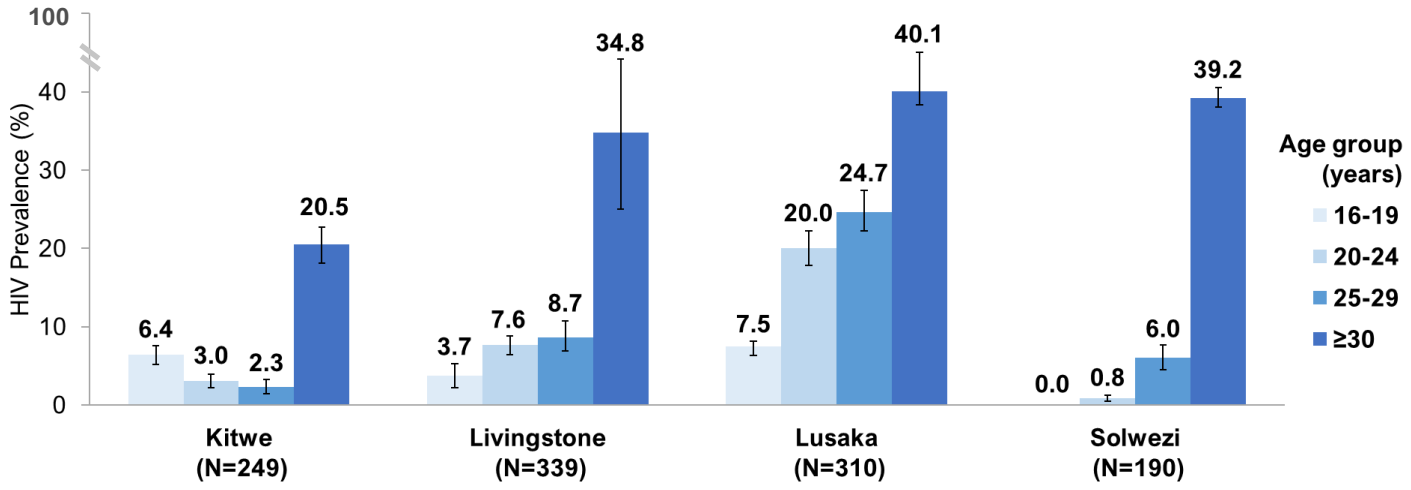
HIV prevalence among MSM increased with age group, with the highest prevalence among those aged 30 years and older across all sites (range: 20.5%–40.1%) [Figure 3].

**Table 3. HIV prevalence among MSM, by site**

| | % | 95% CI | n | N |
|---|---|---|---|---|
| **Kitwe** | 9.4 | 8.1 – 10.7 | 34 | 249 |
| **Livingstone** | 10.9 | 10.0 – 11.8 | 35 | 339 |
| **Lusaka** | 22.9 | 20.5 – 25.1 | 69 | 310 |
| **Solwezi** | 5.9 | 5.0 – 6.8 | 9 | 190 |

n: numerator, estimated outcome.
N: denominator, total number of MSM who tested for HIV.
95% CI (confidence interval): the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys of the same design.

**Figure 3. HIV prevalence among MSM, by age group and site**



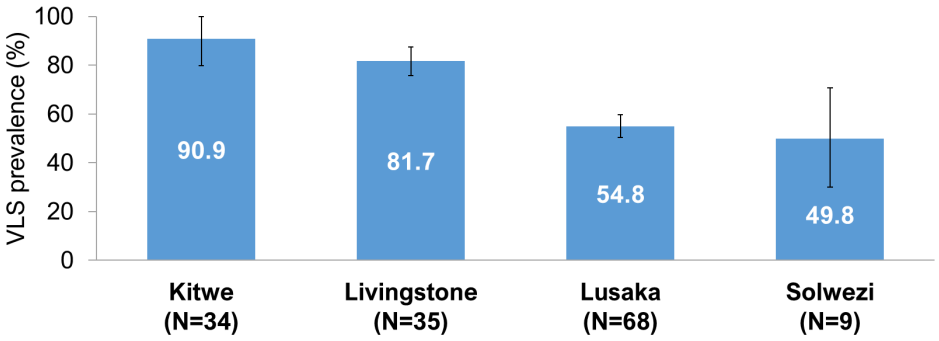

N: denominator, total number of MSM who tested for HIV.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

## POPULATION HIV VIRAL LOAD SUPPRESSION

Population viral load suppression (VLS) prevalence among MSM living with HIV was highest in Kitwe (90.9%), followed by Livingstone (81.7%), Lusaka (54.8%), and Solwezi (49.8%) [Figure 4].

VLS is defined as HIV RNA <1,000 copies per mL of plasma.

**Figure 4. Population VLS prevalence among MSM living with HIV, by site**



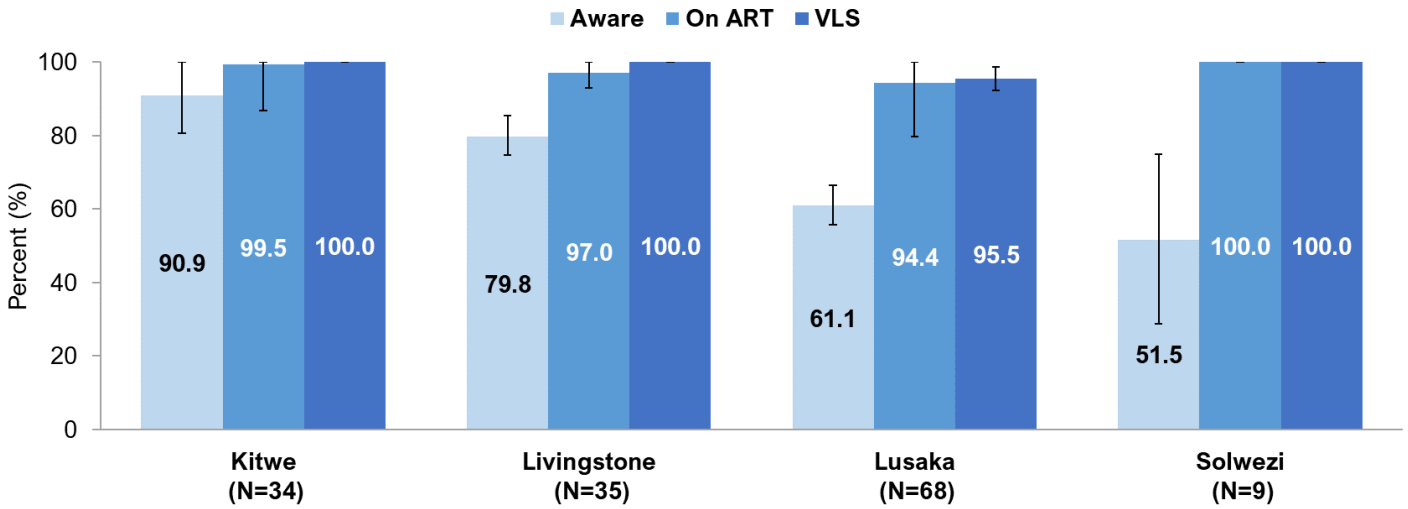

N: denominator, total number of MSM who tested positive for HIV.
Error bars represent 95% confidence intervals (CI), the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

## PROGRESS TOWARDS UNAIDS 95-95-95 TARGETS

The UNAIDS 2025 targets aim for 95% of all people living with HIV (PLHIV) to be aware of their HIV status; 95% of PLHIV who are aware of their HIV status to receive antiretroviral therapy (ART); and 95% of PLHIV who are on ART to achieve viral suppression.[7] Awareness of HIV-positive status and on ART status were based upon self-report or having a HIV viral load <200 copies/mL.

- **Aware of HIV Status:** Across the four sites, the percentages of MSM living with HIV who were aware of their HIV status ranged from 51.5% to 90.9% [Figure 5].
- **On ART:** Across the four sites, nearly all MSM who were aware of their HIV-positive status were on ART, percentages ranging from 94.4% to 100.0% [Figure 5].
- **Viral Suppression:** In Kitwe, Livingstone, and Solwezi, all MSM (100%) living with HIV who were on ART had achieved viral suppression [Figure 5]. In Lusaka, 95.5% of MSM on ART had achieved viral suppression.

**Figure 5. 95-95-95 targets among MSM living with HIV, by site**

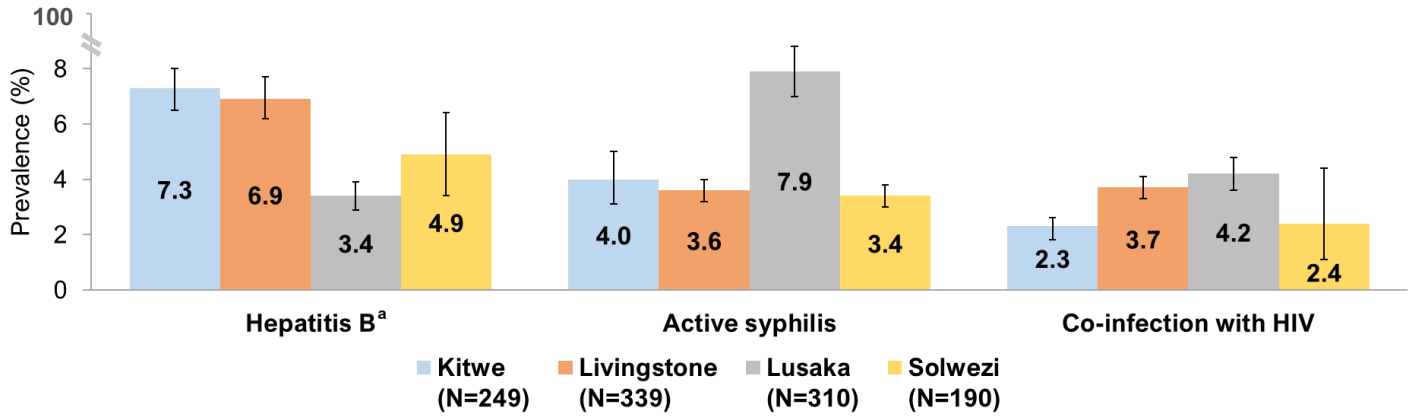



Conditional percentages are shown.
N: denominator, total number of MSM who tested positive for HIV.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.
Viral load suppression is defined as an HIV VL of <1,000 copies/mL.

## HEPATITIS B, HEPATITIS C, ACTIVE SYPHILIS, AND CO-INFECTION WITH HIV

- **Hepatitis B:** The prevalence of hepatitis B among MSM was highest in Kitwe (7.3%) and lowest in Lusaka (3.4%) [Figure 6]. Hepatitis B infection was defined as testing positive for hepatitis B surface antigen (HBsAg), which indicates having either an acute or chronic infection.
- **Hepatitis C:** Across the four sites, the prevalence of hepatitis C among MSM was 0.0%. Hepatitis C infection was defined as detectable hepatitis C virus by polymerase chain reaction (PCR) testing.
- **Active syphilis:** Across the four sites, the prevalence of active syphilis among MSM was highest in Lusaka (7.9%) and lowest in Solwezi (3.4%) [Figure 6]. Active syphilis was defined as testing antibody-positive for both non-Treponemal and *Treponema pallidum* antigens.
- **Co-infection with HIV:** The prevalence of co-infection with HIV was highest in Lusaka (4.2%) [Figure 6]. Co-infection with HIV was defined as testing HIV-positive and testing positive for either hepatitis B infection or active syphilis.

**Figure 6. Prevalence of HBV, active syphilis, and co-infection with HIV among MSM, by site**




[a] Testing hepatitis B antigen.
N: denominator, total number of MSM who tested for biomarkers.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

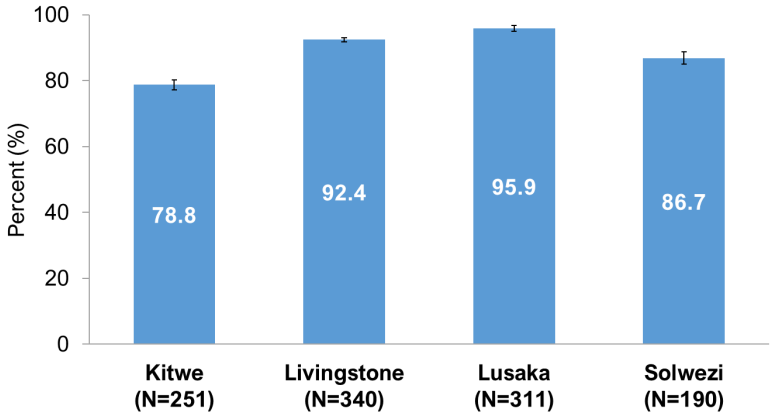
## HIV TESTING

The percentage of MSM who had ever tested for HIV was highest in Lusaka (95.9%) and lowest in Kitwe (78.8%) [Figure 7].

Among those who had never tested for HIV, the two most common reasons were not feeling at risk for HIV and fear of receiving a positive result.

Five individuals tested as recently infected with HIV. Participants were classified as having a recent HIV infection if the HIV-1 rapid test for recent infection (RTRI) result indicated recent infection and HIV viral load was ≥1000 copies/mL.

**Figure 7. Percentage of MSM having ever tested for HIV, by site**

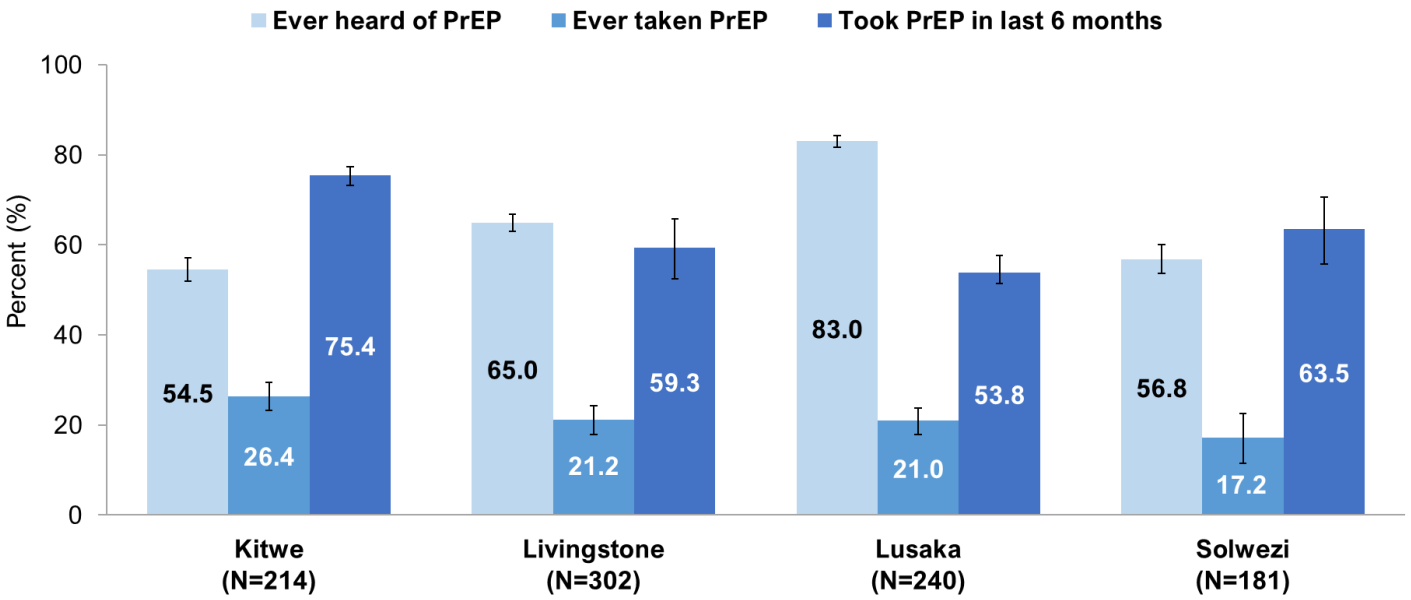



N: denominator, total number of MSM who were interviewed.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

## EXPERIENCE WITH HIV PRE-EXPOSURE PROPHYLAXIS (PrEP)

Among MSM who were HIV negative across all sites, 54.5% to 83.0% had heard of PrEP [Figure 8]. Among MSM who had heard of PrEP, 17.2% to 26.4% had taken PrEP. Among MSM who had ever taken PrEP, 53.8% to 75.4% had taken PrEP in the prior 6 months. Among HIV-negative MSM who had never taken PrEP, the main reasons were not feeling at risk (Kitwe: 26.9%, Lusaka: 26.1%, Solwezi: 36.9%) and not knowing where to get PrEP (Livingstone: 18.8%).

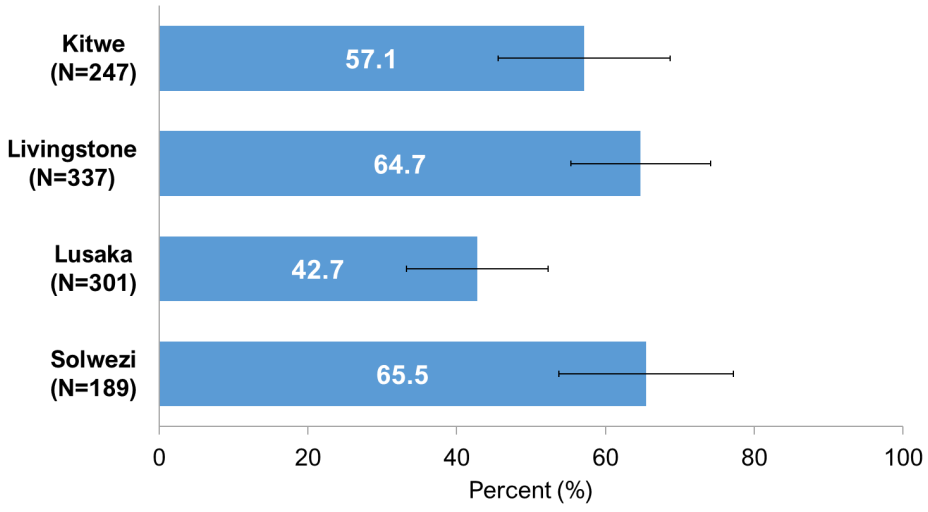
**Figure 8. Experience with PrEP among MSM who self-reported being HIV negative, by site**




Conditional percentages are shown.
N: denominator, total number of MSM who self-reported being HIV-negative.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

## CONDOM USE

**Figure 9. Condom use at last sex with the main male partner among MSM, by site**




In Kitwe, Livingstone, and Solwezi, more than half of MSM used a condom at last sex with their main male partner, ranging from 57.1% to 65.5% [Figure 9]. Only 42.7% of MSM in Lusaka used a condom at last sex with their main male partner.

N: denominator, total number of MSM who were interviewed.
Error bars represent 95% confidence intervals, the interval within which the true population parameter is expected to fall 95% of the time from repeated surveys with the same design.

## CONTACT WITH PEER EDUCATORS OR OUTREACH WORKERS ABOUT HIV

Across all sites, the majority of MSM who had ever tested for HIV (range: 67.7%–83.4%), who had ever heard of PrEP (range: 71.3%–84.1%), and who had ever taken PrEP (range: 63.9%–82.2%) had a peer educator or outreach worker speak with them about HIV. The proportion of MSM who had engaged with a peer educator or outreach worker in the past six months varied (range: 37.5%–50.6%).

The majority of MSM who self-reported being HIV-negative indicated they were willing to take PrEP (range: 64.2%–78.7%) and had a peer educator or outreach worker speak with them about HIV (range: 67.4%–82.6%). In contrast, a lower percentage of MSM who never tested for HIV and never heard of PrEP had a peer educator or outreach worker speak with them about HIV (range: 31.5%–68.5%).

# CONCLUSIONS

- HIV prevalence varied among MSM across the four sites (range: 5.9%–22.9%) and was highest in Lusaka (22.9%). HIV prevalence increased with age group across all sites and was highest among MSM 30 years of age and older (range: 20.5%–40.1%).
- Findings highlight successes and gaps in the progress towards the UNAIDS 95-95-95 targets.
  - ◊ The first 95 target, the percentage of HIV-positive MSM aware of their HIV status, was less than 95% across the four sites (range: 51.5%–90.9%).
  - ◊ The second 95 target, ART coverage, was high among HIV-positive MSM aware of their HIV status across the four sites (range: 94.4%–100.0%).
  - ◊ The third 95 target, the prevalence of viral load suppression, was high among HIV-positive MSM who reported being on ART across the four sites (range: 95.5%–100.0%).
- PrEP awareness and use varied among MSM. Among HIV-negative MSM across all sites, more than half (range: 54.5%–83.0%) were aware of PrEP. However, up to a quarter (range: 17.2%–26.4%) had ever taken PrEP.
- Active syphilis prevalence was highest among MSM in Lusaka (7.9%), more than three times the active syphilis prevalence among men (2.5%) aged 15-59 years in Lusaka region.[8]
- Prevalence of hepatitis B among MSM was higher in Kitwe (7.3%) and Livingstone (6.9%), when compared with the national prevalence (5.6%) among adults aged 15-59 years.[8]

# REFERENCES

[1] Population Council, *Key Populations Formative Findings. Final Power Point*. 2016.
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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the funding agencies. The results presented should be treated with caution due to the nature of estimating key population indicators. This work has been supported by the President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Centers for Disease Control and Prevention (CDC) under the terms of Cooperative Agreement Number U2GGH002056.