

**Botswana**  
**Pre Exposure Prophylaxis**  
**Feasibility & Implementation**  
**Technical Report**

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## Introduction

Without successfully improving its HIV prevention efforts, it is unlikely that Botswana will be able to reach its National HIV response targets by 2020. In addition to causing thousands more HIV infections, this would further threaten the economic sustainability of providing public ART over the next decade.<sup>1</sup> In response, the country has embarked on providing strategic investment for expanding effective HIV prevention methods, such as adopting the “Treat All” Strategy. However, worrying trends of increases in HIV incidence among young people remain and were demonstrated across research studies in both 2015 and 2016, indicating programmatic weaknesses for the most vulnerable populations.<sup>2,3</sup> High rates of transactional sex among youth and continued participation in multiple concurrent sexual partnerships among the general population, have also continued unabated for many years.<sup>4,5</sup> There are still few sustainable behaviour change programmes in place, and most other HIV prevention programmes, such as Safe Male Circumcision (SMC) and the Prevention of Mother to Child Transmission (PMTCT) are yet to be fully integrated into the primary care settings. More recent HIV initiatives, led primarily by development partners, to shift HIV testing and ART demand creation towards community based models, are in their infancy with secured future funding uncertain. Therefore, providing effective combination HIV prevention methods now requires an integrated approach within a well-coordinated plan that can be prioritized and actioned as a matter of urgency. Introducing a financially sustainable model for the use of Pre-Exposure Prophylaxis (PrEP), for those at greatest risk for HIV infection, presents a unique opportunity to leverage PrEP implementation to broadly accelerate sexual health promotion and improve effective combination HIV prevention.

As a global leader in HIV treatment and research, Botswana was among the first countries in the world to conduct clinical trials to determine the efficacy of PrEP in the general population. As early as 2005, the study known as TDF2, was conducted by the Center for Disease Control (CDC) and enrolled over 1200 men and women in Francistown and Gaborone. Although the seminal research study was stopped early due to low retention rates and logistic limitations, the final data analysis demonstrated a PrEP efficacy of 62.2% (95% confidence interval 21.5-83.4, P=0.03).<sup>6</sup> Since then, numerous research studies including iPrEX<sup>7</sup>, Partners PrEP<sup>8</sup>, Proud<sup>9</sup> and IPERGAY<sup>10</sup> among others, have provided additional evidence supporting the successful use of PrEP to varying degrees. In September 2015, the WHO recommended the use of PrEP for all people at high-risk of HIV infection, which was operationally defined as those populations with an estimated HIV incidence greater than three.<sup>11</sup> For the first time in June of 2016, the Botswana HIV & TB Treatment Guidelines recommended the provision of PrEP for high-risk populations within the private sector with consideration of PrEP within the public sector in 2017.

Beginning in 2016, the Department of HIV/AIDS Prevention and Care (DHAPC) with support from UNAIDS, undertook a series of stakeholder meetings, economic modelling, focus group

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<sup>1</sup> MoHW, *Botswana Investment Case 2016*

<sup>2</sup> NACA, MoHW, Borquez, A. et al. (2016). *Incidence Patterns Model; Pilot Implementation in Botswana: A Pilot Study*

<sup>3</sup> Gaolathe, T. et al. (2016). *Botswana's Progress Toward Achieving the 2020 UNAIDS 90-90-90 Antiretroviral Therapy and Virological Suppression Goals: A Population Based Survey*. The Lancet. Doi: 10.1016/S1473-3099(13)70363-3

<sup>4</sup> Ministry of Basic Education. (2016). *Second Botswana Youth Risk Behavioural and Biological Surveillance Survey Report*

<sup>5</sup> BAIS, IV, 2013

<sup>6</sup> Thigpen M., Kebaabetswe P., Paxton, L., et. al. Antiretroviral Preexposure Prophylaxis for Heterosexual HIV transmission in Botswana, *NEJM*, 367;5, August 2, 2012.

<sup>7</sup> Grant, Robert M. et al, *Preexposure Chemoprophylaxis for HIV Prevention in Men Who Have Sex With Men (iPrEX)*. (2010). New England Journal of Medicine

<sup>8</sup> Baeten, Jared M. et al, *Antiretroviral Prophylaxis for HIV Prevention in Heterosexual Men and Women (Partners PrEP)*. (2012). New England Journal of Medicine

<sup>9</sup> Lazarus, L. et al. *Establishing a Community-Based Participatory Research Partnership Among People Who Use Drugs in Ottawa: The Proud Cohort Study*. Harm Reduction Journal

<sup>10</sup> Molina, JM. et al, *On-Demand Preexposure Prophylaxis in men at High Risk for HIV-1 Infection*. New England Journal of Medicine

<sup>11</sup> WHO. (2015). *WHO Expands Recommendation on oral Pre-Exposure Prophylaxis of HIV Infection (PrEP)*.

discussions (FGDs) and one-on-one interviews to consider the feasibility and estimated costs of PrEP implementation within the public sector. This report presents the results of this work, identifying key challenges and opportunities for how PrEP implementation could be incorporated into an integrated HIV prevention package through 2020 and in the longer term through 2025. The report includes the final recommendations of the PrEP Technical Working Group (PrEP-TWG) to leverage PrEP implementation to maximize and strengthen Botswana's National HIV prevention efforts overall.

## SECTION 1

### Methodology

Under the direction of the DHAPC, the PrEP-TWG was established in 2016. The group included broad representation from key populations, development partners, HIV advocates, government, and civil society with the aim of overseeing the development of the operational feasibility and implementation research report (*see Annex 1: PrEP TWG membership*). Three PrEP-TWG meetings were held between November 2016 and March 2017, to consider the latest PrEP research, strategies and emerging global approaches. An inception report and subsequent summaries of the results of the economic modelling, FGDs, one-on-one key stakeholder interviews and questionnaires tracking baseline knowledge of PrEP, were also shared with the PrEP-TWG for review and discussion.

The first of these meetings was held on 25 November 2016, followed by an extensive desk review of PrEP research and the status of current international demonstration projects. The study methodology was approved on 9 December 2016. The PrEP-TWG reviewed and discussed the inputs for completion of economic modelling, the development of a questionnaire to establish baseline knowledge of PrEP, and the discussion guide for three FGDs (which included female sex workers (FSW), men who have sex with men (MSM) and youth (both female and male). Although there was not a separate FGD to consider PrEP implementation in prisons or in cases of domestic violence or in sero-discordant couples, these sub-populations were included in many of the PrEP-TWG discussions. The economic modelling also included cases of discordancy. An operational research protocol was developed and approved by the Health Research Unit at the Ministry of Health and Wellness to proceed with the study. (*See: The 2017 PrEP Operational Research Data Supplement for FGD question guides, FGD summaries and modelling inputs*)



PrEP TWG March 2017

## Study Objectives

### **1. Complete economic modelling to determine the impact and cost-effectiveness of PrEP implementation for key populations nationally and within six selected districts in Botswana.**

Impact scenarios were estimated for FSW, MSM, sero-discordant couples (SDC) and young women and adolescent girls (YWAG) between the ages of 15 and 24, nationally and within the districts of Gaborone, Francistown, Ngamiland, Serowe-Palapye, Selibe Phikwe, Chobe. Utilizing the Spectrum Model (version 5.56), baseline data inputs from the 2016 Botswana Investment Case were revised and updated from more recently published research, consultations with the DHAPC and the PrEP-TWG, to specifically determine:

- The impact of PrEP in the population based upon the expected number of new HIV infections in the absence of PrEP.
- The effectiveness of PrEP, based upon the estimated biological efficacy and the degree of adherence. For this analysis three cost-effectiveness scenarios were included:
  - 51% based on a recent meta-analysis study.<sup>12</sup>
  - 62% based on the TDF2 Study.<sup>13</sup>
  - 73% based on the Partners PrEP Study.<sup>14</sup>
- The cost-effectiveness of PrEP based upon the cost per person per year of PrEP.
- The number of people needed to be placed on PrEP and costs required to avert a new HIV infection from occurring.

<sup>12</sup> Fonner VA, Dalglish SL, Kennedy CE, Baggaley R, O'Reilly KR, Koechlin FM *et al.* Effectiveness and safety of oral HIV pre-exposure prophylaxis (PrEP) for all populations: A systematic review and meta-analysis *AIDS* 2016.

<sup>13</sup> Thigpen M., Kebaabetse P., Paxton, L., *et. al.* Antiretroviral Preexposure Prophylaxis for Heterosexual HIV transmission in Botswana, *NEJM*, 367;5, August 2, 2012.

<sup>14</sup> Baeten J Antiretroviral Pre-Exposure Prophylaxis for HIV-1 prevention among heterosexual African men and women: the Partners PrEP Study. Sixth International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention, Rome, abstract MOAX0106, 2011

## **2. Provide broad stakeholder input on PrEP implementation by holding focus group discussions of key populations and key stakeholder interviews.**

Interviews and FGDs collected both qualitative and quantitative data. A list of key stakeholders for one-on-one interviews was compiled in collaboration with the DHAPC (see *Annex 2: Key Stakeholder Interviews*).

Qualitative data was obtained from the following broad PrEP discussion topics:

- Background Knowledge & Established Opinions on PrEP
- Disclosure & Stigma
- Behaviour & Disinhibition
- Messaging and IEC

Interviews and FGDs were purposive and iteratively explored each topic area until the divergent and unique responses were exhausted. Quantitative data was collected on data collection sheets for summary and analysis. Participants of FGDs completed consent forms for their participation and their identities were anonymized. Responses to questionnaires were up-loaded to an online Monkey Survey database for electronic analysis. Each FGD had between 12-15 participants who were paid a small stipend (BWP 30.00) to cover their transportation costs. The FGDs and one-on-one interviews were conducted for approximately 90-120 minutes.

## **3. Identify key challenges and opportunities to make feasible recommendations to safely implement PrEP in the public health sector in short and long term.**

Based upon all discussions held within the PrEP-TWG meetings, the FGDs and one-on-one key stakeholder interviews, challenges, opportunities and recommendations were identified, compiled and included within this report.

### **Study limitations:**

The methodology of the study was structured to serve as the initial step in determining the best options for safe, cost-effective and feasible PrEP implementation for the Botswana Ministry of Health and Wellness. However, a comprehensive analysis of real world costs for both the short and longer term PrEP implementation strategies - beyond those available within Spectrum - was outside the scope of this report. Upon the final decision of how PrEP implementation will proceed, further costing exercises should be completed.

It was assumed that the national number of key populations derived from Spectrum is distributed to each district in proportion to the national estimate. This is a gross approximation of the number of key populations by district.

Additional investigations are also needed to explore how PrEP use could be implemented for other vulnerable populations such as prisoners and non-nationals.



## SECTION 2

### Results:

#### Major Challenges to PrEP Implementation:

##### 1. Poor baseline knowledge and understanding about PrEP use

Across all key populations, including the youth (and even among many of the PrEP-TWG members), baseline knowledge gaps were large and varied widely. There was also poor knowledge of the specific needs of key populations and what might be required to initiate PrEP clinically or programmatically. Areas of particular concern include:

- Less than 20% of young people within FGDs understood PrEP was only to be used by HIV negative populations.
- Over 80% of MSM believe that PrEP could be given after an HIV positive diagnosis.
- There was general confusion about how PrEP differed from Post-Exposure Prophylaxis (PEP), particularly among young people, 90% of whom believed PrEP could be administered after a rape.
- Less than 30% of MSM understood that there could be side effects to PrEP.
- Most respondents did not understand which medical interventions were required to initiate PrEP or that PrEP required on-going medical follow up.

The baseline questionnaire results further confirmed that in order to successfully implement PrEP within the public sector, a comprehensive public health, information, education and communication campaign would be required. (See Annex 3: Results from PrEP FGDs)

##### 2. Safety and efficacy of PrEP requires on-going medical interventions and strict adherence

Safe initiation of PrEP requires engagement with the health sector for medical services including physical examination, routine HIV and pregnancy screening, counselling and laboratories. Although more recently there have been studies looking at the efficacy of “PrEP on Demand” for MSM populations,<sup>15</sup> it is unclear how these interventions can be safely targeted for youth (who admittedly and historically are less adherent to ART) or females (who require longer lead in time for adequate concentrations of PrEP to be found in vaginal mucosa<sup>16</sup>). There are also growing concerns regarding the development of HIV drug resistance (HIV-DR) with sub-optimal adherence and the recent reports of two cases of HIV infection that resulted despite therapeutic levels of Truvada.<sup>17</sup>

The following concerns were also highlighted in the FGDs:

- Although over 80% of FSW in Botswana believed they would adequately adhere to PrEP, 70% of MSM and only 55% of young people believed that they would adequately adhere.
- Maintaining adequate adherence to PrEP particularly amongst young people will require innovative tools for service delivery and strong on-going monitoring, surveillance and tracking of patients and their outcomes.

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<sup>15</sup> Molina, JM. et al, *On-Demand Preexposure Prophylaxis in men at High Risk for HIV-1 Infection*. New England Journal of Medicine

<sup>16</sup> Van Damme L, et. al. *Pre-Exposure Prophylaxis for HIV infection among African Women*. N Engl J Med 2012;367:411-22

<sup>17</sup> Hoornenborg E, de Bree GJ *Acute infection with a wild-type HIV-1 virus in a PrEP user with high TDF levels*. Conference on Retroviruses and Opportunistic Infections (CROI 2017), Seattle, abstract 953, 2017.



- More than 50% of FSW responded that the need for quarterly HIV testing might make PrEP use more difficult for their population, especially if it required interacting with the public health sector.
- Over 40% of FSW responded that the need for monthly medication pick-ups and the possibility of developing side effects might make PrEP use more difficult.
- FSW also expressed concern regarding the high rate of alcohol use among their population and what effect this would have on adherence and toxicities to PrEP.
- The uncertainty of developing side effects to PrEP and long-term toxicities to Truvada were cited as possible obstacles to PrEP implementation.

### 3. Demand creation and service delivery must be tailored for the unique considerations of each high-risk group.

In Botswana's generalized HIV epidemic it may not be feasible (or ethical) to design a "one size fits all" approach for successful PrEP implementation or to even limit PrEP availability to only those classically considered 'Key Populations.' The FGDs highlighted the unique requirements of each high-risk group and acknowledged that high-risk sexual encounters were taking place in sub-populations other than those generally defined as 'Key Populations' (i.e., MSM, FSW and YWAD). For example, the results of 2016 Incidence Patterns Model Study reported, *"... a high proportion of new infections are expected to occur among sero-concordant negative unions as a result of transmission from concurrent partnerships confirming that reliance on one partner's negative status is risky and that prevention methods including condoms, microbicides and Pre-Exposure Prophylaxis are needed among this group and should be made available on the basis of personal choice."*

The following were additional comments shared in this regard:

- There are at least two very different MSM populations – younger and older men – each with very different behaviours and access to medical interventions. Although both MSM groups maintain a high degree of secrecy about their sexual preferences, younger MSM are more likely to "come out" and are more familiar and engaged with community groups specifically targeted for their health needs, such as Men for Health and Legabibo. Older MSM (>40 years) however, rarely participate with these organizations or seek medical services (such as HIV testing) within the community health structures. Therefore, PrEP demand creation for MSM will need to address these two sub-populations differently.
- Both FSW and MSM reported high incidence of health care provider stigma and discrimination when seeking medical services within the public sector. Both groups also reported that some health care providers were not adequately trained to treat or even discuss their sexual health needs. As a result, both groups preferred that availability to PrEP be placed outside the public health care delivery system, such as within NGOs or the private healthcare sector.
- Whereas, some MSM, understood that PrEP (according to research studies) could safely allow less consistent use of condoms and were positive about this possibility, FSW were highly concerned that PrEP would cause their clients to demand sex without condom use, ultimately causing a rise in sexually transmitted infections (STIs). Something already observed in 'real world' PrEP research studies.<sup>18</sup>
- Although no study has been designed to reliably estimate the prevalence of transactional sexual activity in Botswana - particularly among the youth - it is generally accepted that a substantial portion of young people are engaged in sexual relationships for monetary gain. Repeatedly participants of the PrEP TWGs and the participants in the FGDs pointed

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<sup>18</sup> Marcus J., et al. Preexposure Prophylaxis for HIV Prevention in a Large Integrated Health Care System. J Acquir Immune Defic Syndr, 2016;73(5):540-546

to high prevalence of transactional sex among young women and the need to consider how PrEP could be successfully implemented in this population group.

- In 2016, The Second Botswana Youth Risk Behavioural and Biological Surveillance Survey reported that 58.4% adolescents reported having gone hungry in the past 30 days and 13.3% reported always being hungry, making a significant proportion of youth vulnerable to engaging in transactional sex.<sup>19</sup>
- Youth also expressed their concerns that health care providers would disapprove of them requesting PrEP in public health facilities and emphasized the need for public facilities to become youth friendly so young people can openly request and receive all HIV prevention services without stigma or fear.
- Many millennials experience sexual identity much differently than the generations before them, often rejecting conventional labelling of sexual behaviour as being, “gay, straight or bi,” further complicating how outreach to high risk populations should be designed.

Tailoring demand creation and service delivery for high-risk populations in Botswana will require multiple service entry points. Additionally, a significant proportion of health care providers within the public sector must be trained to provide for the sexual health needs of patients across a continuum of sexual behaviours. Ensuring that individuals who engage in high-risk sexual behaviours have access to information to fully understand their own HIV risk profile, will also be critical to ensure safe and equitable PrEP implementation and limit sexual disinhibition.

Additional concerns also focused on the lack of a legal framework and criminalization of certain high-risk sexual behaviours, making it difficult to reach populations that would most benefit from PrEP. While it was agreed that it would be a mistake to make the implementation of PrEP contingent on reversing these legal barriers, it was agreed that continuing to raise the legal concerns of MSM, FSW, youth, non-nationals and prisoners - to ensure their optimal health under the law and remove structural barriers to treatment access - should be sought across all HIV prevention strategies.

#### 4. Public healthcare facilities may not have the human resource capacity to safely provide and monitor PrEP.

The issue of how already over-burdened public health care facilities could manage the medical requirements to safely initiate and monitor PrEP for HIV negative populations was repeatedly raised in all FGDs and most key stakeholder interviews.

Because it is unclear what the actual demand for PrEP will be from various high-risk populations, it is unclear whether public health facilities will be able to cope with PrEP demand. Initial modelling exercises using UNAIDS Fast Track targets of 20% by 2025, estimate approximately 11,000 people might be eligible for PrEP during the first year of implementation rising to approximately 19,000 annually by 2025. There are no Botswana specific data available to estimate how PrEP uptake will progress. However, some studies have suggested that uptake is relatively slow and depends on sexual practices (e.g. condomless receptive anal sex) and whether information about PrEP is reaching populations that can benefit the most. The characteristics of the health care system and the service delivery models were also cited as determinants of uptake.<sup>20,21</sup> It is also uncertain whether there will be sufficient funds available

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<sup>19</sup> NACA, Incidence Patterns Model, 2016

<sup>20</sup> Eaton, L. A., Driffin, D., Bauermeister, J., Smith, H and Conway-Washington, C. 2015. Minimal Awareness and Stalled Uptake of Pre-Exposure Prophylaxis (PrEP) Among at Risk, HIV-Negative, Black Men Who Have Sex with Men. *AIDS Patient Care STDS*. Aug 1; 29(8): 423–430. doi: [10.1089/apc.2014.0303](https://doi.org/10.1089/apc.2014.0303)

<sup>21</sup> Grant, R. M., Anderson, P. L., et.,al. 2014. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: a cohort study. *Lancet Infect Dis* 2014; 14: 820–29. [http://dx.doi.org/10.1016/S1473-3099\(14\)70847-3](http://dx.doi.org/10.1016/S1473-3099(14)70847-3)

or the capacity to train all public health care facilities promptly about how PrEP should be administered. Unlike Safe Male Circumcision (SMC), which targets all uncircumcised men in a public health approach, PrEP is not recommended for 'everyone' but should be determined on a case-by-case basis – either through self-selection or healthcare provider recommendation – based upon an individual's level of sexual risk.

Furthermore, because the availability of PrEP would fall outside of safe pregnancy planning, positioning PrEP within SRH/HIV integrated services would risk missing MSM, FSW, victims of sexual violence, among others at high-risk. While there are a few public health facilities which currently welcome MSM to obtain safe medical care (such as isolated facilities in Mahalapye, Francistown and Gaborone), it will take both time and significant financial investment to capacitate all public health facilities to safely administer PrEP to high-risk populations.

Additional concerns were also raised:

- Weak monitoring and evaluation systems both electronically and paper-based at the national and district levels, will make it difficult to document the impact and outcome of PrEP pilot or demonstration initiatives, as well as documenting adherence, defaulting, toxicities, HIV drug resistance and lost-to-follow rates.
- Overwhelmingly, FSW and MSM responded that they would prefer to receive PrEP and sexual health services outside of the public health facilities, either within the private sector (FSW 71%, MSM 46%) or through NGOs (MSM 31%).
- Different PrEP service delivery models are being implemented globally such as PrEP initiation by nurses, in specified clinics, student health centers and local pharmacies. However it is questionable whether the MoHW has the capacity to coordinate such efforts and manage the M&E requirements.

## 5. Poor Use of NGOs & the Private Health Sector

Many representatives from NGOs expressed enthusiasm to participate in PrEP roll-out. Most reported that they continue to struggle financially to sustain their organizations in order to serve populations at high-risk for HIV. It was also reported that due to funding award structures within PEPFAR and the Global Fund, many NGOs, such as Men for Health, Legabibo, Sisonke, Kagisano Women's Shelter, BOFWA and Nkaikela Youth Groups (among others) have been funded to offer particular services often outside their original mandates, diminishing their effectiveness among key populations within their own communities.

Complicating their efforts to broaden their HIV services, many NGOs also reported that the MoHW has required them to pass regulatory requirements and inspections that take months to schedule and complete – even to perform simple tasks such as rapid HIV testing. This has limited NGOs' ability to expand their services and make an impact in the very communities they were established to serve. Female sex workers offered to assist with reaching young women at high-risk who are participating in transactional sex with education and counselling services. Young people also expressed their interest to become peer educators to make sure that young people understand how PrEP could protect them.

In regard to the private sector, little has been done to involve private practice physicians into the National HIV response since the programme known as the Public-Private-Partnership (PPP), which delivered ART to stable HIV patients was dissolved in 2014. However, there are many private practice physicians who are highly experienced in delivering HIV care within the community and could again be utilized to assist the Government in PrEP implementation. Discussions with medical aids originally involved in the PPP scheme offered the possibility of their involvement in HIV prevention and PrEP as part of wellness services overall.

## 6. Off-Patent Use of Truvada (TRU)

Gilead Sciences Inc. has submitted their originator patent for the use of Truvada (TRU) (Emtricitabine and Tenofovir) in Botswana. To what extent this will impact the use of generic TDF/FTC or 3TC in the country will need to be determined by the Drug Regulatory Unit (DRU) within MoHW. There are currently no companies, including generic companies, that have submitted registration for TDF/FTC or TDF/3TC use as PrEP. This means that for now, all generic use of TDF/FTC or TDF/3TC would be 'off-label' use. Utilizing originator drugs versus generic formulations may have a significant effect on PrEP costs. It is also important to appreciate that medical providers who prescribe PrEP would do so without the authority of DRU or drug manufacturers.

Although there are a number of new medications under development for PrEP use, it may be 2-3 years before these drugs will be made widely available. In the meantime, optimizing the costs and use of either generic or non-generic TRU formulations for PrEP will need to be prioritized.

## 7. Costs of PrEP Implementation

No detailed costing study for PrEP has been conducted in Botswana to date. A recent costing study in Zimbabwe completed by the Clinton Health Access Initiative (CHAI)<sup>22</sup> estimates the costs to be approximately \$160 per person year on PrEP. The components of the unit cost were ART (51%), personnel (21%), laboratory (24%), health systems (1%), adherence support (2%) and demand creation (1%).

Until basic data is collected on PrEP demand and initial operational outcomes, it will be difficult to reliably cost any proposed National model, outside of Spectrum. Currently in the U.K. PrEP is offered online and the public is expected to be financially responsible for obtaining it on their own.<sup>23</sup> While discussions are taking place in Botswana to implement a National health insurance scheme, questions remain such as, *who will ultimately be responsible for paying for sexual health commodities and HIV prevention now and in the future? Would PrEP become part the Essential Health Services package?* It is remarkable to note that all FGD participants felt it was the responsibility of the government to finance their HIV prevention. Costs for providing ART to non-infected persons will likely be significant.

The following concerns regarding costs for PrEP were also raised:

- Only 25% of Young People and FSW in the FGDs expressed that they would be willing to pay any amount at all for PrEP. All of the MSM respondents believed that PrEP should be provided free by the government.
- The on-going issue of providing ART, PMTCT and PrEP to non-nationals remains an important issue particularly as it relates to FSW, who according to research estimates represent over a third of all FSW at 34.5%.<sup>24</sup> Although the BBSS Report did not specify the HIV prevalence of non-national female sex workers, it is likely that their HIV prevalence would be higher than the national FSW HIV prevalence of 61.9%.<sup>25</sup> Testing non-national FSW for HIV and either placing them on ART or providing PrEP, might prove to be cost-effective in Botswana and further economic analysis should be completed in this regard.
- Only 17% of FSW respondents in FDGs felt that non-national sex workers should also receive PrEP free of charge.

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<sup>22</sup> CHAI. 2017. Costing the inclusion of oral PrEP in the Zimbabwe public sector HIV prevention package: preliminary results.

<sup>23</sup> Buying PrEP online: Safe use and NHS monitoring, 2016 ([www.i-base.info](http://www.i-base.info))

<sup>24</sup> MoHW, 2012, Biological and Behavioural Surveillance Survey.

<sup>25</sup> MoHW, 2012 Mapping, size estimation and biological and behavioural surveillance survey (BBSS) of HIV/STI among select high-risk sub-populations in Botswana: Technical Report.

## PrEP Opportunities:

- There is high acceptability for the implementation of PrEP across all high-risk groups and an enthusiasm to become involved in the programme implementation. If this willingness to assist with can be effectively channelled, the MoHW will be able to benefit from involvement and acceptability of PrEP within the community and accelerate PrEP literacy and successful implementation.
- There is a high preference for involvement of the private health sector and NGOs. This has led to the development of an innovative partnering model which includes NGOs, private sector MDs and MoHW. Importantly, this model would not only serve to decongest public health facilities of well patients but also serve to financially sustain NGOs into the future and expand community involvement in the delivery of health services.
- All key populations (FSW, MSM, Youth) expressed a willingness to participate in demand creation exercises, aspects of service delivery and assist with community education regarding safe PrEP use with trainer of trainers models. This is an untapped resource that is often more skilled and effective at reaching their peer groups than imposed upon health initiatives created by those considered as 'outsiders'.
- The use of effective social media and various forms of public health messaging among young people and within other key/high-risk populations can be designed and piloted by key populations themselves to promote participation and community buy-in.
- By providing ART to HIV negatives, it is possible that the stigma associated with taking antiretrovirals for HIV positives may decrease over time.
- Implementation of PrEP can be used to further engage communities about health, nutrition and wellness, further sensitizing them on sexual health and HIV prevention methods overall.



PrEP TWG Novemebr 2016

## **Proposed Short Term PrEP Public Private Partnership /NGO/Government of Botswana (PrEP –NGO/PPP/GoB) Model for PrEP implementation**

The proposed PrEP NGO/PPP/GoB Model was conceived by the PrEP TWG and structured to improve service delivery options and efficacies by engaging motivated private practice practitioners through their medical aids, community NGOs, and the MoHW. Outsourcing service delivery would prevent delays in providing PrEP to communities in the short-term and assist with the development of long-term planning and economic analysis. The proposed pilot model was agreed upon by the PrEP TWG as follows:

- The short term (2018-2019) PrEP NGO/PPP/GoB pilot would begin in 2-4 districts (including Gaborone and Francistown) with a minimum of 4 private practice MDs in each area affiliated with a well-established medical aid scheme.
- A minimum package of HIV prevention services would be developed at every level of service delivery to provide wellness and HIV prevention services to FSW, MSM, Youth (ages 18-24) and those self-identifying as participating in high risk HIV behaviours.
- A bottom up approach would be utilized to maximize efficiencies and involve community input and participation.

### **Service Delivery Roles**

#### **1. Local NGOs**

*Demand creation, routine and on-going HIV Testing & Counselling, Pregnancy testing, M&E, patient tracking, PrEP distribution, additional health prevention services (i.e., screening for Diabetes, Hypertension, Cancers and smoking cessation, nutrition and exercise)*

#### **2. Private Practice MDs**

*All high level medical management required, such as PrEP initiation, toxicity management and initiation of ART when required.*

#### **3. Medical Aid Schemes**

*Identify experienced MDs willing to serve Key and High-Risk populations, train providers in the appropriate management of sexual health needs, monitor patient and MD outcomes, and administer billing and the funding to MDs and NGOs. Curriculum development and training tools would also be developed in collaboration with medical aids and development partners so that a Trainer of Trainers model can eventually be used within the public sector.*

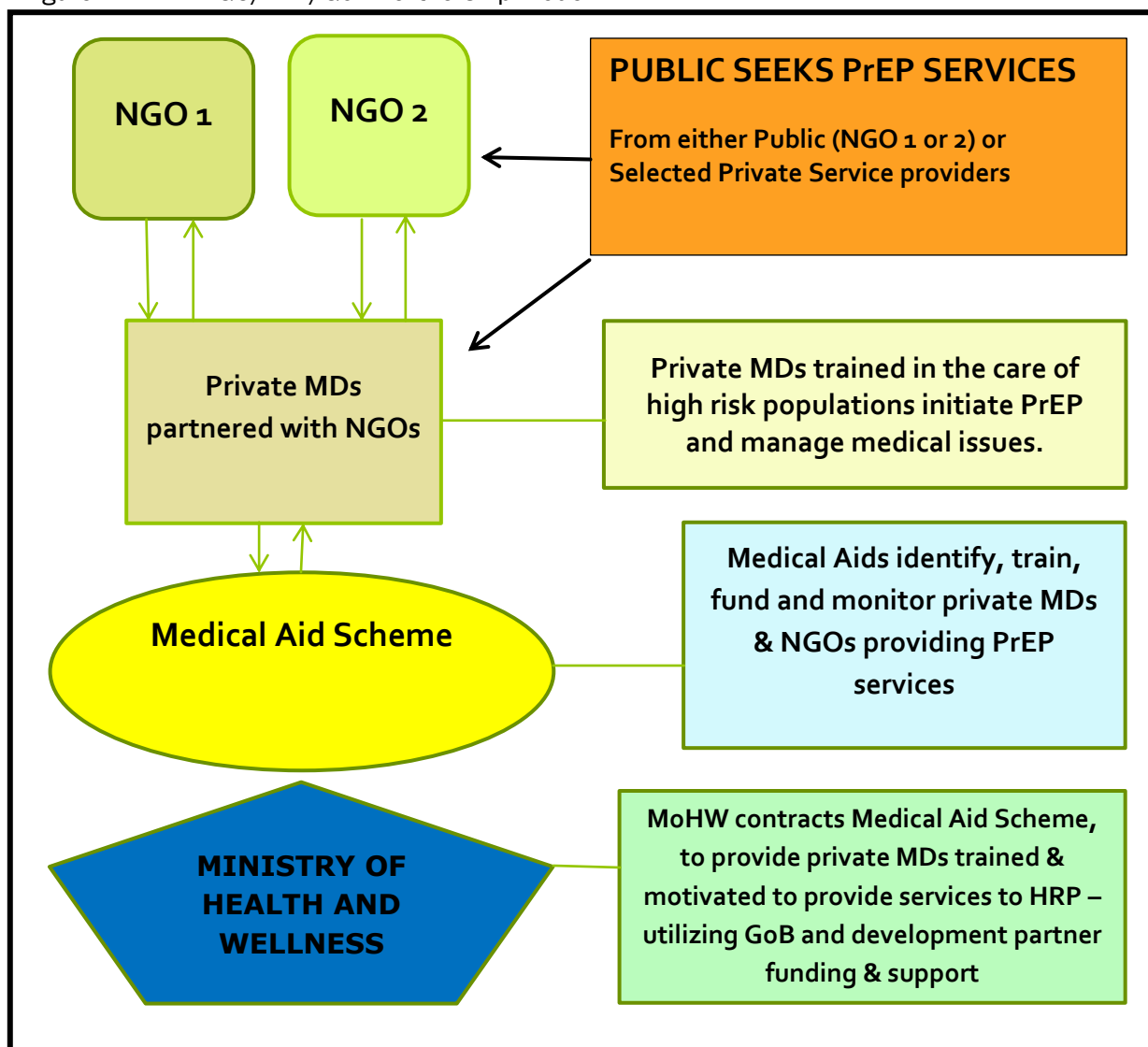
#### **4. Ministry of Health & Wellness (GoB)**

*Provides all commodities including drugs and contracts medical aid scheme(s) to provide these health services on a per person basis. Funds available from development partners would be coordinated through MoHW and be used for direct purchase of drugs, commodities and training support.*

#### **5. High-Risk Populations**

*Would be free to seek services from NGOs or approach designated private practice MDs to initiate PrEP as desired. This would maximize PrEP access and equitably provide services to all populations who engage in high-risk sexual behaviours.*

Figure 1: PrEP NGO/PPP/GoB Partnership Model



#### Advantages of PrEP NGO/PPP/GoB model over Public facilities:

1. Efficiencies in service delivery and swift implementation
2. Decreased waiting time to see doctors and collect medications
3. Decreased training costs
4. Decreased experiences of stigma and discrimination.
5. Decongestion of public health care facilities with well patients
6. Improved and individualized patient care
7. Long term capacity and sustainability of NGOs as community health service providers
8. Cost savings



## Cost Estimates from Spectrum Modelling:

The Goals model within Spectrum was used to explore the long-term impacts of PrEP. A simple modes of transmission type model was constructed using information from the Botswana Incidence Patterns Model<sup>26</sup> which examine the expected impact and cost for target population groups.

This analysis uses a simple PrEP model that can be applied to any location. It captures the main effects of PrEP given an estimate of new infections in the absence of PrEP. The model does not include secondary infections averted that occur when a person who is not infected because of PrEP use does not pass that infection to another partner. This dynamic is not very important in the short-term (five years) but grows in importance over longer time periods. The cost-effectiveness analysis does not account for treatment costs avoided.

### Incidence Estimates:

With high ART coverage of more than 70% of all people living with HIV in Botswana<sup>27</sup>, incidence has declined significantly during recent years. The estimated Spectrum incidence is highest among female sex workers and men who have sex with men. Young women appear to have higher incidence in the younger cohorts, as well as males 20-24 years of age.

Table 1: HIV incidence (percentage) by selected population group, 2017

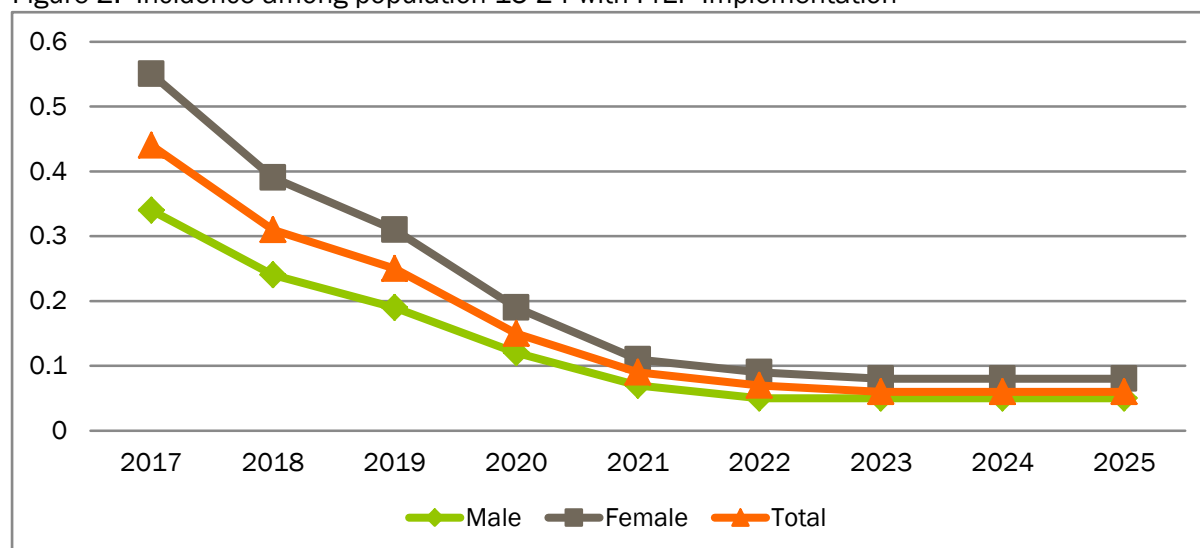
Population	Male	Female	Total
15+	.46	.54	.50
15-24	.34	.55	.44
15-19	.16	.34	.25
20-24	.52	.77	.64
15-49	.50	.61	.55
FSW		3.91	3.91
MSM	3.49		3.49

Source: Spectrum Version 5.56

<sup>26</sup> Ministry of Health and Welfare. 2016. Incidence patterns model implementation in Botswana. MoH&W. Gaborone

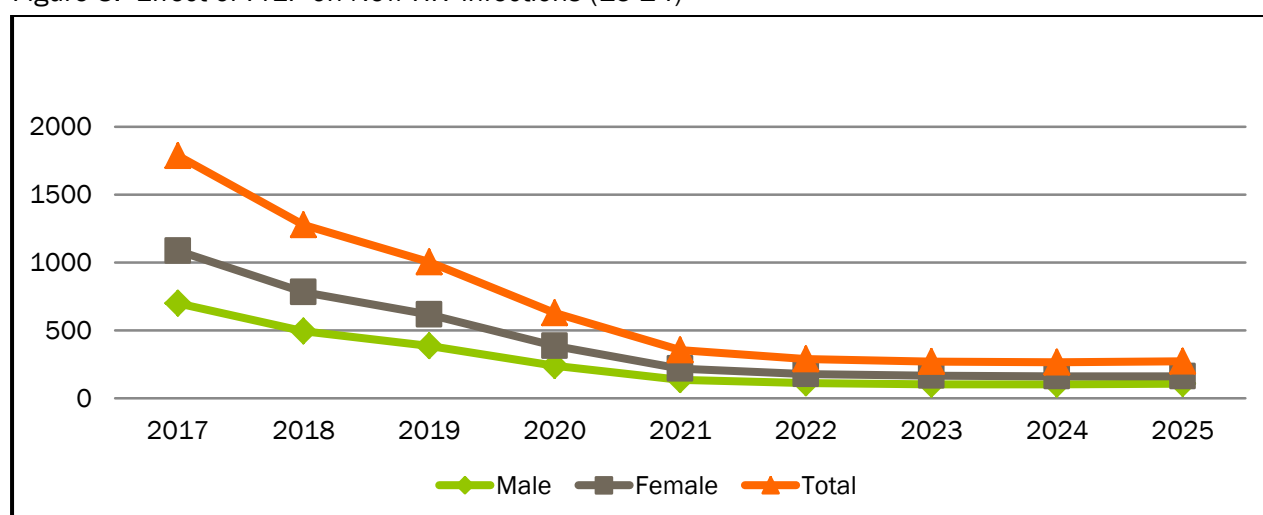
<sup>27</sup> MoHW, March 2017, ART Programme

Figure 2: Incidence among population 15-24 with PrEP Implementation



Source: Spectrum Ver. 5.56

Figure 3: Effect of PrEP on New HIV infections (15-24)



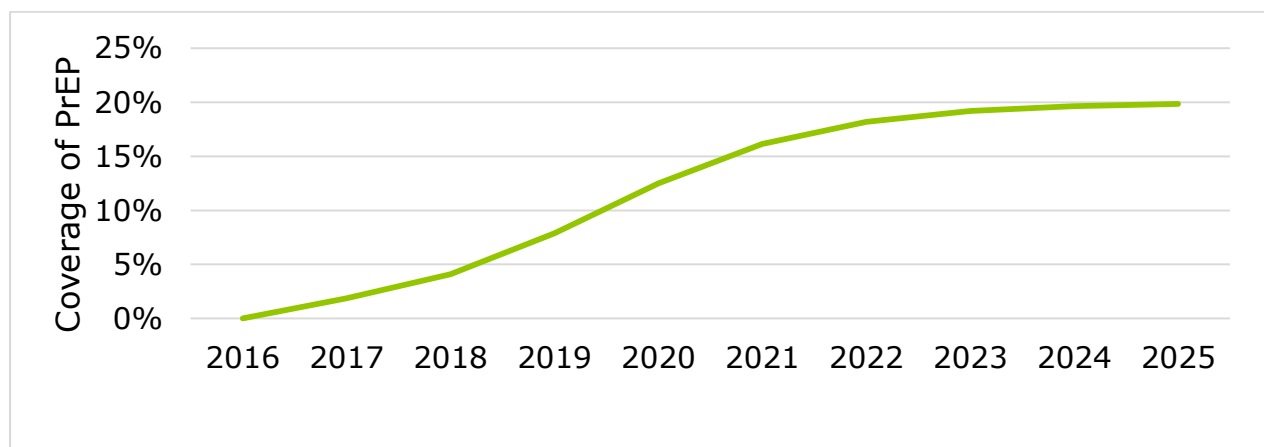
Source: Spectrum Ver. 5.56

It is important to note, that incidence rates from the 2016 Incidence Patterns Model Study, which used a different methodology, were estimated much higher at 2.69% (95% confidence interval 2.33-3.08) for never married young women under 25 years. Sex workers were also reported to have higher incidence at 5.3% (95% confidence interval 4.84-5.83%). However, MSM had lower incidence estimates at 1.48% (95% confidence interval 1.33-1.65%).

## PrEP Costs Estimates

This analysis assumed that the coverage of PrEP will increase from 0% in 2016 to the UNAIDS Fast-Track target of 20% by 2025 as shown below.

Figure 4: Botswana Fast-Track target 2016-2015



Source: Spectrum v.5.56

The PrEP costing results are from three scenarios based on sensitivity analysis using different assumptions for the effectiveness of PrEP: 51% (Fonner, et al), 62% (Botswana TDF 2 study), and 75% (Partners PrEP). Table 2 below displays the results and cumulative costs for PrEP from 2017-2015, including the total amount of infections averted. *(For additional information see Annex 3).*

Table 2: Sensitivity analysis using varying PrEP effectiveness 2017-2020

Indicator	Effectiveness =51%	Effectiveness =62%	Effectiveness =75%
Infections averted	2,170	2,637	3,190
Total cost	\$49 million	\$ 49 million	\$ 49 million
Cost per infection averted	\$22,600	\$18,600	\$15,400

Depending on the effectiveness of PrEP and the population treated, the estimated costs range from approximately \$6,500 to \$68,000 per infection averted, as displayed in Table 3. In these scenarios below, FSWs are the most cost-effective group to use PrEP, while the highest cost per infection averted is for young women and adolescents. This is due to the lower incidence of this group, so more young women and adolescents need to be treated to avert one HIV infection. If the effectiveness of PrEP was lower than 51%, the cost per infection averted would be even higher. It is also important to note that if the incidence rate of young women under 25 years of age is higher than those estimated in Spectrum, then the costs per infection averted would be lower. Further modelling exercises with additional assumptions would improve these cost estimates.

Table 3: Cost (USD) per infection averted for different levels of PrEP effectiveness

Group	Effectiveness = 51%	Effectiveness = 62%	Effectiveness = 75%
<b>FSW</b>	\$12,719	\$7,847	\$6,487
<b>MSM</b>	\$24,681	\$15,227	\$12,587
<b>YWAG</b>	\$68,323	\$42,151	\$34,845

Source: Spectrum Ver 5.56

Table 4: Infections averted per group 2017-2025

	Effectiveness=51%	Effectiveness=62%	Effectiveness=75%
FSW	444	539	655
MSM	117	141	171
SDC	778	945	1,143
Young women	832	1,011	1,223

Source: Spectrum Ver 5.56

It was not possible to reliably estimate costs for sero-discordant couples because that would require data on ART coverage and viral load non-suppression rates of HIV positive partners, which is currently unknown. Additionally, the numbers of person years required - given coverage targets over the period 2017-2025 - is low and zero in some districts. These estimates question whether there is a role for PrEP in this population because the SDC identified will have the HIV positive partner immediately initiated on ART with the Treat All Strategy with viral suppression expected within 4-6 weeks. In Botswana, PrEP therefore has a limited short term role for the HIV negative partner until viral suppression is confirmed in the HIV positive on ART. In Kenya, the cost of delivering PrEP to the HIV uninfected person until their HIV infected partner achieves viral suppression with ART was estimated at \$445 per person per year.<sup>28</sup>

### Preliminary Estimated Costs:

For the purposes of this report, the annual per person costs include: 4 visits, 4 HIV Tests, generic use of TDF/FTC, personnel /administrative costs, adherence support and demand creation with a 10% contingency. Costs for private sector and NGOs were derived from discussions with key stakeholders. Cost estimates for the public sector were based on costing exercises completed as part of the 2016 Investment Case analysis.

<sup>28</sup> Irungu, E., Sharma, M., Heffron, R., Mugo, N., et.al., 2016. The incremental cost of delivering PrEP as a bridge to ART to HIV sero-discordant couples in public HIV care clinics in Kenya.

Table 5: Comparison of Estimated Per Person PrEP Costs

Service Delivered	Public	Private + NGO	Cost difference (BWP)
Initial Intake	250.00	P200.00 (Private MD)	50.00
Quarterly Visits (3) include HIV testing	600.00	300.00 (NGO)	300.00
Routine Laboratory	380.00	380.00	0
Drugs	580.00	580.00	0
Other (adherence support, tracking & demand creation)	200.00	100.00 (NGO)	100.00
10% Contingency	201.00	156.00	(45.00)
<b>Total Annual Costs per person (BWP):</b>	<b>2,211.00</b>	<b>1,716.00</b>	<b>(22% decrease overall)</b>

Source: Spectrum Ver. 5.56

Adopting the proposed cost sharing scheme suggests a possible 22% decrease in costs from a PrEP NGO/PPP model versus a PrEP delivery in the public sector. It is important to note that not only would this be a cost saving in real terms but would also decongest public health care facilities from serving well (HIV negative) patients. The PrEP NGP/PPP model provides flexibility and could be structured so that the medical aid schemes could contract NGOs for additional wellness services such as blood pressure checks and monitoring, diabetes screenings, smoking cessation and weight loss. An important added advantage of the NGO/PPP model is that it would contribute to the long term financial sustainability of the NGOs that have the capacity to provide health service delivery. Patient care and satisfaction would also improve by developing cadres of health care personnel specifically trained to address the sexual health needs of patients at high risk of HIV acquisition.

Costs for the pilot would be further decreased by capitalizing upon existing development partner support for PrEP programmes. For example, monies set aside in COP17 to purchase PrEP commodities for young women could defer overall commodities costs. Costs for treating women could be reduced by their participation in research studies offering long acting PrEP formulations.

## SECTION 3

### Recommendations

1. In the short term, a 2-3 year PrEP pilot project should be launched in 2018 utilizing the Public-Private-Partnership model, which includes NGOs, medical aids, private practice physicians and the MoHW. Simultaneously, preparations and policy decisions for a full national roll-out of PrEP as one component of combination HIV prevention methods should also move forward. This would include updating combination HIV prevention IEC materials, integrating PrEP into various health education curriculums, developing PrEP training modules, incorporating M&E indicators for PrEP, providing youth friendly PrEP services and securing long-term PrEP financing.

2. A PrEP national coordinating mechanism should be put in place at MoHW, in order to maximize the effectiveness of PrEP implementation and leverage its use to reinvigorate combination HIV prevention methods overall. Such a structure would be responsible for aligning development and funding partner's financial and technical support plans, improve efficiencies and maximize programmatic opportunities.

This is particularly important as the CDC COP17 plans take effect, which will offer PrEP to young women and the Botswana Harvard Partnership begins to conduct clinical research on long-acting PrEP with Cabotegravir for women. Both of these important initiatives should be well coordinated with MoHW for alignment with national PrEP implementation plans and data sharing agreements.

3. Involve representatives from all key populations to participate at all levels of planning and implementation. By involving the existing community organizations that already provide services to high-risk groups, demand creation can be most effectively targeted. This is particularly important for youth. From the beginning of PrEP implementation, their active participation should advise on incorporating the use of social media (Facebook, Twitter, SMS, Instagram, etc.) and other emerging technologies.
4. Provide funds for the development of HIV prevention apps that would not only include information on where to access PrEP, but also where the closest HIV testing centers, places for SMC and initiation of contraception, PMTCT and ART are located.
5. Ensure strong and harmonized monitoring and evaluation systems are in place so that real-world data can be used to inform further policy decisions regarding PrEP use, costs and inform the National PrEP roll-out strategy.
6. Ensure the proper registration for the use of Truvada as PrEP both in its generic and non-generic formulations.
7. Commission a comprehensive real-world costing and strategy for PrEP implementation using the PPP/NGO/MOHW model.
8. Broaden the populations eligible for PrEP to include both prisoners and non-nationals.



*Youth PrEP TWG 2017*

## SECTION 4

### Conclusion:

The critical importance of ensuring the financial sustainability of the National HIV Response cannot be over emphasized. All HIV prevention efforts at the national, district and community levels should therefore be aligned and prioritized to effectively deliver all available combination prevention modalities to those at greatest risk. As the first country in Africa to launch a public antiretroviral treatment programme in 2002, Botswana has played an important role in the global fight against HIV. The country now has an opportunity to again take a global lead by improving the delivery of sexual health services at the community level in partnership with the private sector and Government with the implementation of PrEP. By linking strong political will with available development partner funding and capitalizing upon the enthusiasm of community organizations over the next few years, it is possible that the country's combination HIV prevention efforts - in conjunction with Treat All - will succeed in achieving epidemiological control of HIV. These efforts will also move Botswana closer to integrating HIV prevention, treatment and care services across differentiated service delivery models that are both innovative and cost-effective.

Just as the adoption of the Treat All Strategy and the use of integrase inhibitors was made foremost as a strategic investment to control the HIV epidemic, so too must the adoption of PrEP now be considered. This will require further economic analysis and cost projections based upon the real-world implementation results from country based operational data. The case for safely piloting PrEP in Botswana makes rational and financial sense, so that country specific data can inform wider implementation policies and planning and ensure the financial sustainability in the long-term. The country can simply not afford to adopt a poorly coordinated HIV prevention programme at this point in time with decreases in development partner support already underway. All new HIV initiatives must be prioritized based upon their financial implications. Deciding whether the government should be solely financially responsible for providing all the available HIV prevention services (to nationals and non-nationals) must also continue to be discussed and debated, especially in light of other equally pressing and critical health care priorities. Implementation of PrEP in Botswana must therefore be strategically and equitably designed to fit into the country's essential health service package and be driven by the economic priorities of the national health care system to protect lives and safeguard the most vulnerable populations.

Finally, in the particularly complicated world of sexuality in Botswana, a wider view is required to see the interconnectedness of the rise of transactional sex and HIV infection among youth. Educating the general population about what actually constitutes high-risk sexual behaviours, rather than labelling PrEP eligibility based upon the assumed sexual identity, may prove more effective in preventing HIV infection overall. Although challenging, the implementation of PrEP will provide a unique opportunity for such discussions to take place at the national and local levels so that the country can find its own unique and life-saving solutions to gain control of its HIV epidemic.



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## ANNEX 1

### Pre-Exposure Prophylaxis Technical Working Group Attendees

Name	Institution/Organization
1. Maina Kiranga	USAID
2. Edgar Calderon	USAID
3. Emily Tabacchi	USAID
4. Gang Sun	UNAIDS
5. Heston Phillips	UNAIDS
6. Kelebone Malope	UNAIDS
7. Nadine Schuepp	UNAIDS
8. Mpho Mmelesi	UNAIDS
9. Mavis Bengtsson	UNDP
10. Mareledi Segotso	UNFPA
11. Matsae Balosang	UNFPA
12. Kefilwe Koogotsitse	UNFPA
13. Lucy Sejo Maribe	WHO
14. Tebogo Madidimalo	WHO
15. Siphewe Lexi Ratladi	NACA
16. Bagadzi Witness	NACA
17. Victor Danke	NACA
18. Kebabonye Thamuku	NACA
19. Chanana Gaboiphiwe	NACA
20. Nokuthula Majingo	MOH&W
21. Dinah Ramaabya	MOH&W (DHAPC)
22. Bornapate Nkomo	MOH&W (DHAPC)
23. Max Kapanda	MOH&W (DHAPC)
24. Eldah Dintwa	MOH&W (DHAPC)
25. Elizabeth Koko	MOH&W (DHAPC)
26. Jonathan Moalosi	MOH&W (DHAPC)
27. Esther Mmatli	MOH&W (DHAPC / HTS)

28. Stalin J. Makathayi	MOH&W / CHBC
29. Gosatla Rabatheng-Gaealafiwe	MOH&W / DPH / SRHD
30. Pontsho Pono	MOH&W (ARV)
31. Segametsi Segesebe	BOFWA
32. Segolame Ramotlhowa	BOFWA
33. Rodgers Bande	BONELA
34. Nana Gleeson	BONELA
35. Pampiri Goleseone	Tebelopele
36. Oabona Sepora	Pilot Mathambo Centre for Men's Health (PMCfMH)
37. Marques Koosaete	PMCfMH
38. Ava Avalos	Careena Centre for Health
39. G. Morineau	FHI360
40. Wame Dikobe	FHI360
41. Thatayotlhe Junior Molefe	Men for Health & Gender Justice
42. Topo Basaako	Men for Health & Gender Justice
43. Kagiso Osupleng	
44. Tosh Lecorengbeka	Sisonke Gender Justice
45. Ontlametse Raleru	Nkaikela Youth Group
46. Wame Mosime	ITPC
47. Frank Murangeni	ACHAP
48. Reson Marima	BUMMHI
49. Kaelo Seatla	PMH-IDCC
50. Mosharaf Miazi	BEDAP
51. Tendani Gaolathe	BHP
52. Pamela Smith Lawrence	UB
53. Amon Marwiro	Jhpiego
54. Tebogo R. Kamodi	Jhpiego
55. Kebotsemang Ditsela	Statistics Botswana
56. Gontse Luza	Kagisano Society Women's Shelter (KSWs)

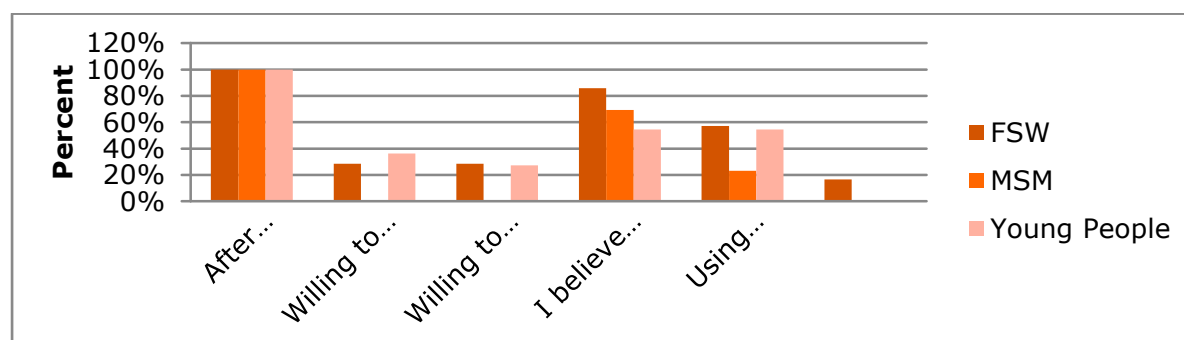
## ANNEX 2

### Pre-Exposure Prophylaxis Key Stake-Holder Interviews

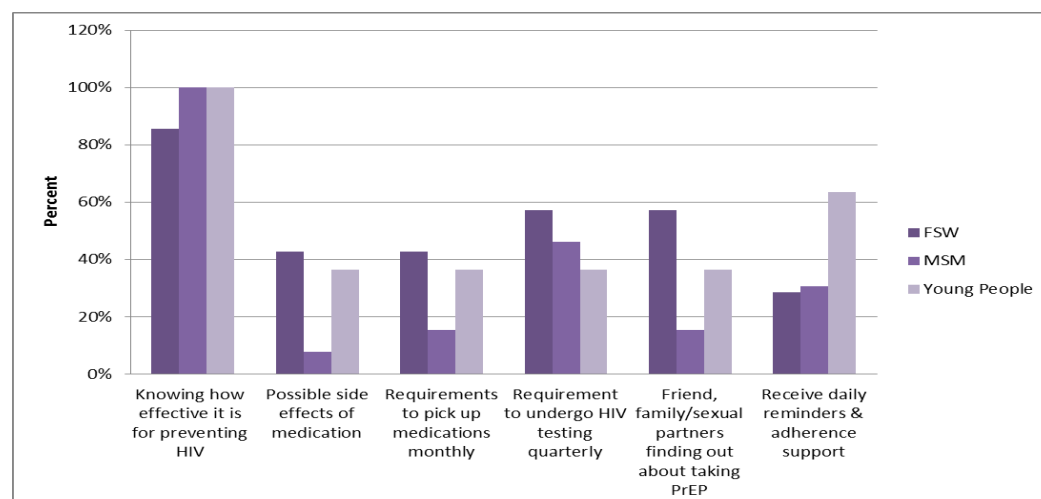
Name	Institution/Organization
1. Haruna Jibril	MoHW
2. Joseph Kefas	MoHW, NACA
3. Chipo Petlo	MoHW, DHAPC
4. Elizabeth Koko	MoHW, DHAPC
5. Dinah Ramaabya	MoHW, DHAPC
6. Bornapate Nkomo	MOH&W (DHAPC)
7. Cindy Kelemi	BONELA
8. Wame Dikobo	FHI 360 Linkages
9. Wame Mosime	ITPC
10. Kennedy Mupeli	CEYOH0 AVAC Fellow 2017
12. Thatayotlhe Junior Malefe	Men for Health
13. Kagiso Osupleng	Men for Health
14. Segamefsi Segesebe/Segolame Ramotlhwa	BOFWA
15. Tosh Lecorengbeka	Sisonke Gender Justice
16. Ontlametse Raleru	Nkaikela Youth Group
17. Duncan Thela	AFA
18. Mma Masidiso	AFA

### Annex 3 Selected FGD questions.

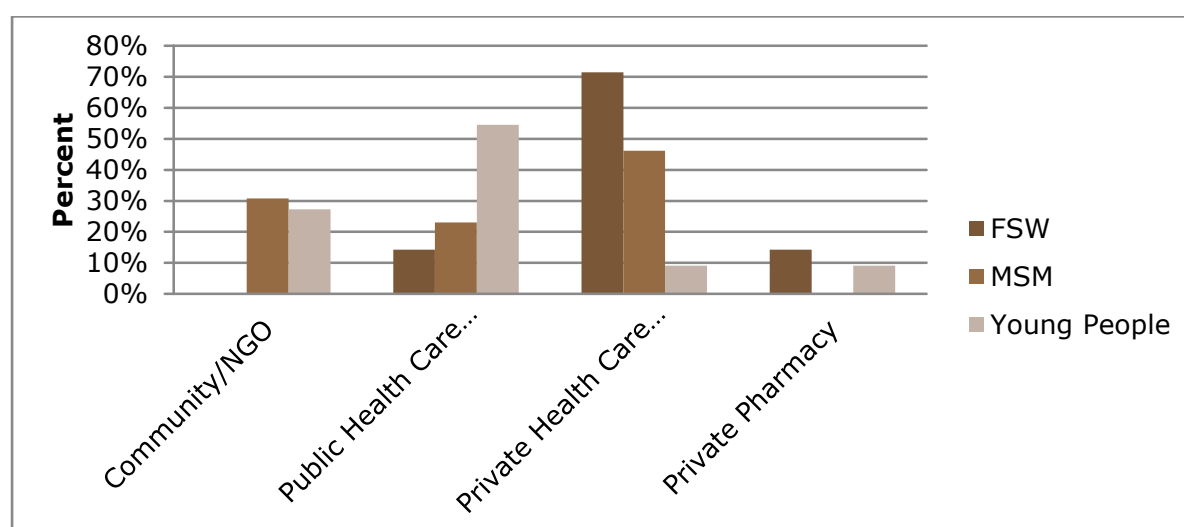
#### Q1: Views and attitudes regarding PrEP after FGD



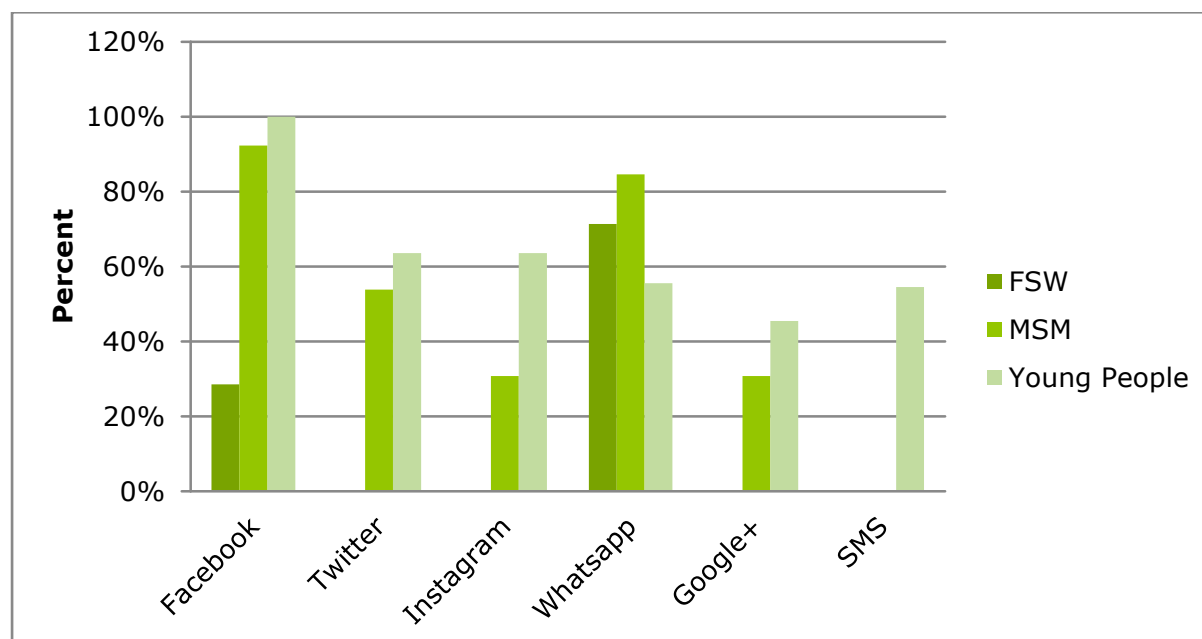
#### Q2: Issues that might influence individuals to take PrEP



#### Q4: Preferred service delivery points for PrEP

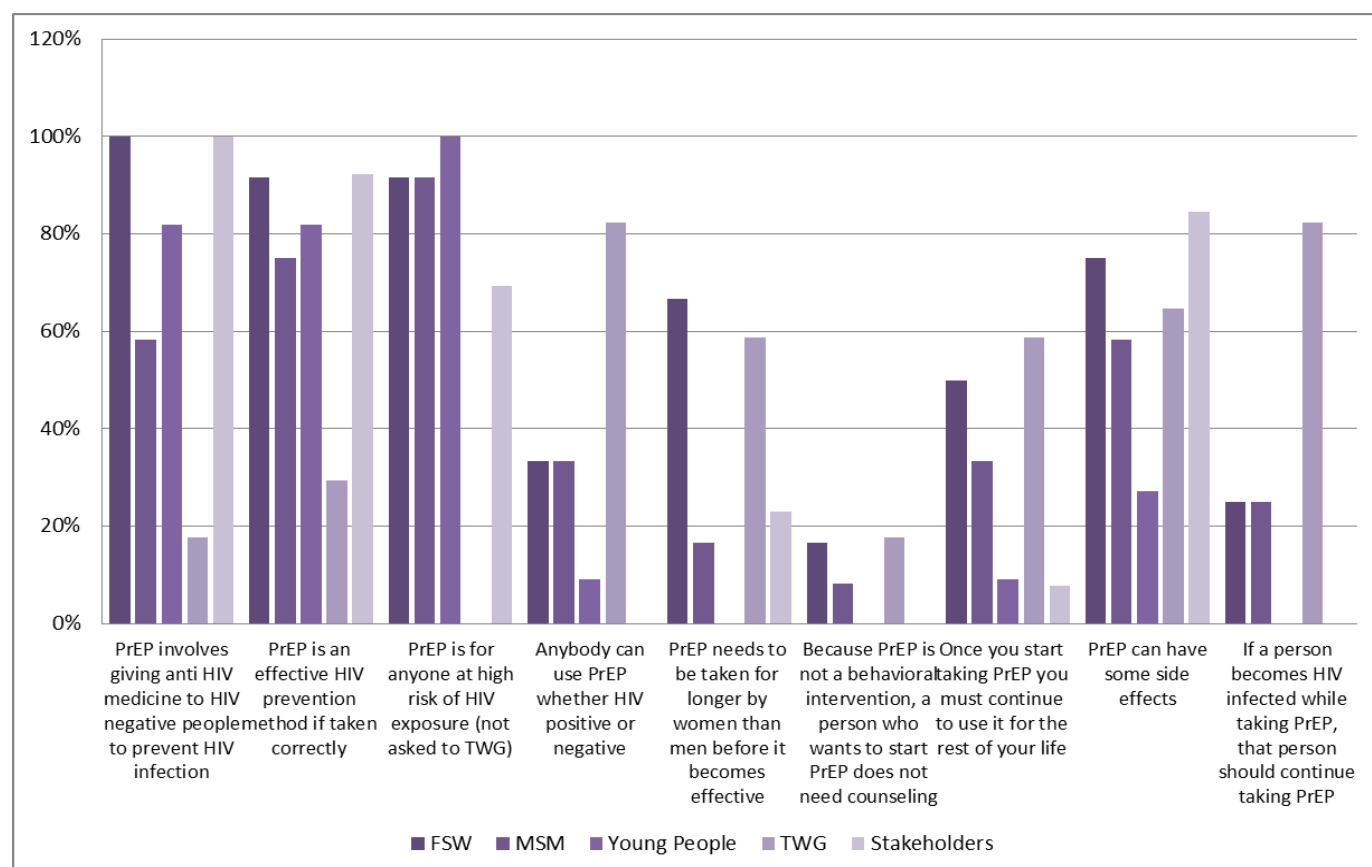


**Q7: Which social media would you use to receive public health messages?**

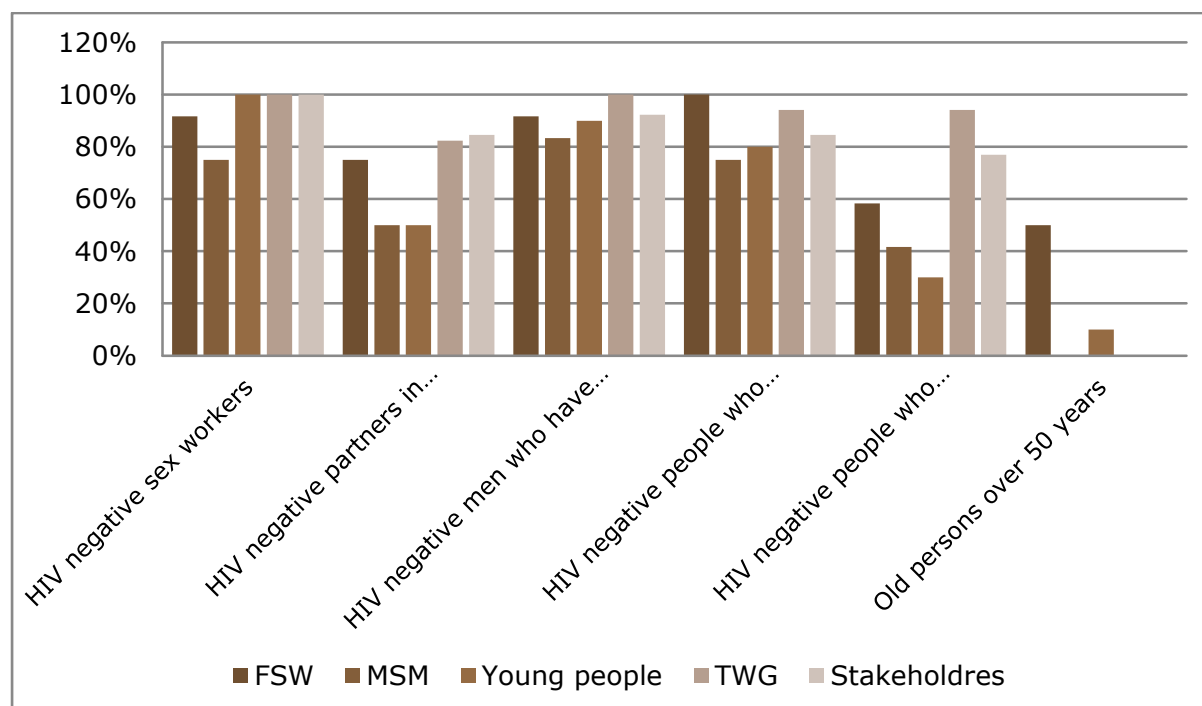


**KNOWLEDGE QUESTIONS**

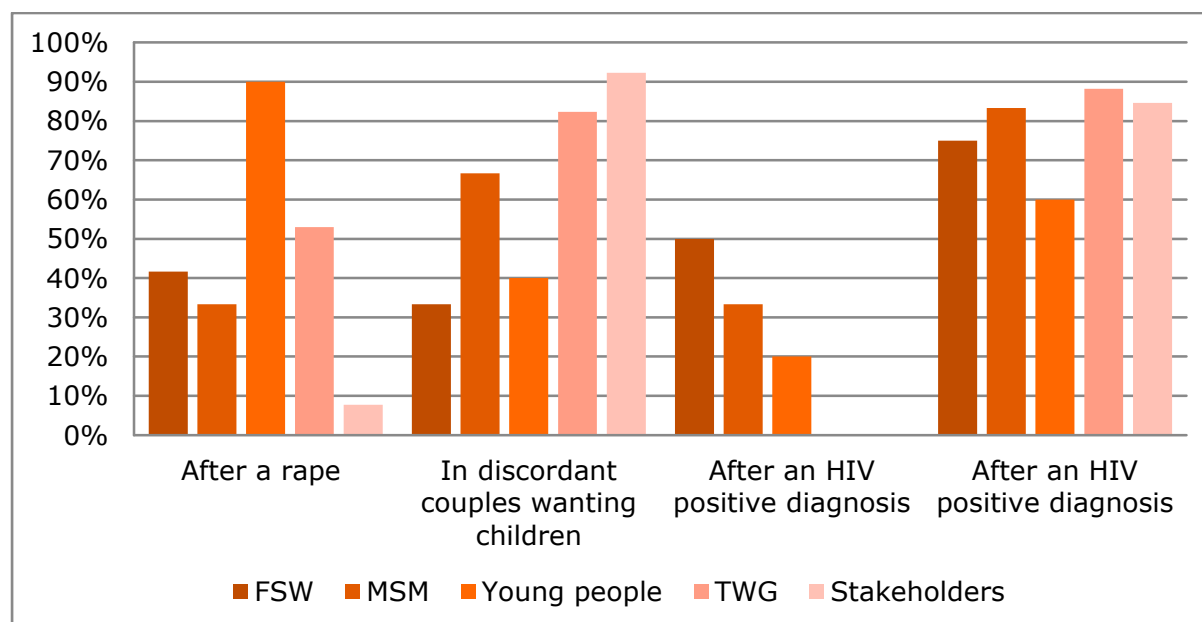
**Q1: General knowledge about PrEP**



## Q2: Which HIV negative populations are eligible for PrEP in Botswana



## Q3: PrEP may be recommended in the following cases





## ANNEX 4:

### Inputs for Spectrum Modelling

**Population size.** The population 15-49 and the female population 15-24 for each district and for Botswana is from 2011 census as reported by Statistics Botswana (<http://botswana.opendataforafrica.org/PHCDB2016/population-housing-census-of-botswana>). The national number of sex workers (FSW) and men who have sex with men (MSM) is from the Goals model used for the Investment Case Analysis and relies on estimates from the 2012 BBSS. The proportion of the HIV-positive population living in sero-discordant partnerships is estimated from prevalence based on a regression equation derived from data from Demographic and Health Surveys ( $44.081 * e^{-0.047 \times \text{prevalence}}$ ). Direct estimates of FSW and MSM key population sizes by district are available for Gabarone and Francis Town from the 2012 BBSS. For the other districts we assumed that the proportion of the national number of FSW and MSM is equal to the proportion of the total population 15-49 in the district.

**Prevalence.** Prevalence among adults 15-49 for each district in 2016 is from the Botswana District Estimates spreadsheet (Botswana District estimates August 23 2016.xlsx). These estimates are derived by averaging or fitting a trend line to district prevalence from three national surveys: BAIS II (2004), BAIS III (2008) and BAIS IV (2013). National prevalence for young women and girls is from the 2016 UNAIDS estimate produced using the Spectrum model. Prevalence among female sex workers and MSM is from the Goals model application for Botswana which is informed by the 2012 BBSS

**Incidence.** Incidence among all adults 15-49 in each district is from the Botswana Districts Estimates spreadsheet. This spreadsheet allocates the national estimate of new infections to the districts on the basis of the number of people living with HIV in each district in 2016. Incidence among young women and girls is from the UNAIDS 2016 Spectrum file.

**New infections by population group.** The national number of new infections among young women and girls is from the UNAIDS 2016 Spectrum file. New infections among female sex workers and MSM are taken from the Botswana Goals file. New infections by district are estimated as the national number of new infections in each population group multiplied by the proportion of the national adult (15-49) population in each district and multiplied by the ratio of incidence in the district to national incidence. For sero-discordant couples, studies have reported transmission rates of 2% to 20%. For this analysis we assume annual incidence of 10% when the infected partner is not virally suppressed on ART and 0% when the infected partner is virally suppressed.

**Effectiveness of PrEP.** Almost twenty studies have investigated the effectiveness of PrEP in preventing HIV infections. A recent meta-analysis of study results reported an overall effectiveness of 51% (CI: 27 – 67). Adherence is a key determinant of effectiveness. Studies with high adherence levels had effectiveness of 70% (CI: 55 – 70). Adherence in studies has generally been poor for young women and girls and high for MSM in developed countries. For this analysis we have used 51% with a range of 27% to 67% for all populations but could include different effectiveness levels by population group if desired.

**Cost.** The cost of PrEP includes the drug plus tests and service delivery. For the purposes of this analysis we have used a cost per person-year of PrEP of \$200 with a range from \$150 to \$250. This includes the costs of drugs (about \$67 per person-year in Botswana) as well as estimates of the costs of facilities, testing and personnel.

**PrEP coverage.** For this analysis we have assumed that the coverage of PrEP increases from 0% in 2016 to the Fast-Track target of 20% by 2025 as shown in Figure 1.

## Annex 5

### Modelling Results and Cost Estimates by District

Results for PrEP effectiveness =51%

**Table 1. Results: 2017-2025 for PrEP effectiveness=51%**

	Gabarone	Ngamiland	Serowe-Palapye	Selibe-Pikwe	Chobe	Francis Town	Total	Botswana
<b>Infections Averted</b>								
FSW	54	32	34	22	7	34	184	444
MSM	14	8	9	6	2	9	48	116
SDC	84	51	30	17	1	28	211	778
YWAG	93	60	65	35	12	58	323	832
Young men	39	25	28	95	5	25	217	832
Total	285	177	166	175	27	155	983	2,169
<b>Person-years of PrEP</b>								
FSW	2,327	2,174	2,135	720	334	1,438	9,127	28,219
MSM	565	1,104	1,085	366	170	440	3,730	14,337
SDC	41	25	15	9	0	14	104	381
YWAG	28,149	21,687	21,753	6,203	2,892	13,729	94,414	284,148
Young men	31,176	18,999	19,016	5,326	2,508	11,889	88,915	248,806
Total	62,259	43,989	44,004	12,623	5,904	27,510	196,289	327,085
<b>Person-years of PrEP per infection averted</b>								
FSW	43	68	62	33	46	42	50	64
MSM	40	132	120	64	89	49	77	123
SDC	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
YWAG	303	364	333	177	247	235	293	342
Young men	789	750	685	56	504	478	409	299
Total	219	249	265	72	221	178	200	151
<b>Cost (Thousands of US\$)</b>								
FSW	\$ 349	\$ 326	\$ 320	\$ 108	\$ 50	\$ 216	\$ 1,369	\$ 4,233
MSM	\$ 85	\$ 166	\$ 163	\$ 55	\$ 25	\$ 66	\$ 559	\$ 2,151
SDC	\$ 6	\$ 4	\$ 2	\$ 1	\$ 0	\$ 2	\$ 16	\$ 57
YWAG	\$ 4,222	\$ 3,253	\$ 3,263	\$ 931	\$ 434	\$ 2,059	\$ 14,162	\$ 42,622
Young men	\$ 4,676	\$ 2,850	\$ 2,852	\$ 799	\$ 376	\$ 1,783	\$ 13,337	\$ 37,321
Total	\$ 4,662	\$ 3,749	\$ 3,748	\$ 1,095	\$ 509	\$ 2,343	\$ 16,106	\$ 49,063
<b>Cost per Infection Averted</b>								
FSW	\$ 6,438	\$ 10,177	\$ 9,309	\$ 4,951	\$ 6,906	\$ 6,297	\$ 7,442	\$ 9,539
MSM	\$ 5,972	\$ 19,749	\$ 18,065	\$ 9,608	\$ 13,401	\$ 7,364	\$ 11,616	\$ 18,511
SDC	\$ 74	\$ 74	\$ 74	\$ 74	\$	\$ 74	\$ 74	\$ 74
YWAG	\$ 45,503	\$ 54,669	\$ 50,007	\$ 26,596	\$ 37,098	\$ 35,235	\$ 43,890	\$ 51,242
Young men	\$ 118,414	\$ 112,535	\$ 102,719	\$ 8,427	\$ 75,601	\$ 71,700	\$ 61,393	\$ 44,869
Total	\$ 16,385	\$ 21,238	\$ 22,556	\$ 6,265	\$ 19,029	\$ 15,158	\$ 16,380	\$ 22,618

## Annex 6

### PrEP Annual Cost (in thousands of USD) for selected districts and Botswana, 2017-2019

<b>Gabarone</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$3,731	\$1,175	\$113	\$64,324	\$140,794
<b>2018</b>	\$8,868	\$2,651	\$243	\$142,092	\$311,036
<b>2019</b>	\$18,545	\$5,252	\$458	\$275,762	\$604,346

<b>Ngamiland</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$6,127	\$13,802	\$74	\$27,885	\$22,570
<b>2018</b>	\$6,776	\$14,783	\$74	\$39,043	\$27,802
<b>2019</b>	\$7,949	\$16,506	\$74	\$40,382	\$29,444

<b>Serowe-Palapye</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$5,605	\$12,625	\$74	\$25,507	\$22,973
<b>2018</b>	\$6,198	\$13,522	\$74	\$35,713	\$28,966
<b>2019</b>	\$7,271	\$15,099	\$74	\$36,938	\$30,782

<b>Selibe-Pikwe</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$1,520	\$760	\$23	\$14,176	\$28,588
<b>2018</b>	\$3,414	\$1,715	\$50	\$31,314	\$63,167
<b>2019</b>	\$6,735	\$3,397	\$95	\$60,772	\$122,713

<b>Chobe</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$706	\$353	\$1	\$6,608	\$13,393
<b>2018</b>	\$1,586	\$797	\$3	\$14,597	\$29,583
<b>2019</b>	\$3,129	\$1,578	\$5	\$28,329	\$57,456

<b>Francis Town</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$3,037	\$915	\$38	\$31,371	\$62,482
<b>2018</b>	\$6,820	\$2,065	\$81	\$69,299	\$137,973
<b>2019</b>	\$13,455	\$4,090	\$153	\$134,490	\$267,885

<b>Botswana</b>					
	<b>FSW</b>	<b>MSM</b>	<b>SDC</b>	<b>YWAG</b>	<b>Total</b>
<b>2017</b>	\$59,607	\$29,795	\$1,047	\$649,307	\$1,309,643
<b>2018</b>	\$133,859	\$67,236	\$2,253	\$1,434,310	\$2,891,463
<b>2019</b>	\$264,093	\$133,200	\$4,245	\$2,783,610	\$5,612,958

## ANNEX 7

### List of Abbreviations

AIDS	acquired immunodeficiency syndrome
ART	antiretroviral therapy
CAB	cabotegravir
CTX	cotrimoxazole
CrCl	creatinine clearance
DHAPC	department of HIV/AIDS Prevention & Care
FBC	full blood count
FDC(s)	fixed-dose combination(s)
FDG	focused group discussions
FSW(s)	female sex worker(s)
HCW	healthcare worker
HIV	human immunodeficiency virus, type 1 (HIV-1)
HIV-DR	HIV drug resistance
IEC	information, education, communication
IPERGAY	intermittent pre-exposure prophylaxis
iPrEX	Spanish: Iniciativa Profilaxis Pre-Exposicion
mg	milligram
mL	milliliter
mmol	millimole
mos	months
MoHW	Botswana Ministry of Health and Wellness
MSM	men who have sex with men
NNRTI	non-nucleoside reverse transcriptase inhibitor
NRTI	nucleoside reverse transcriptase inhibitor
OD	once daily
OI	opportunistic infection
PI	protease inhibitor
PMTCT	prevention of mother-to-child transmission (of HIV)
PrEP	pre-expose prophylaxis
PrEP TWG	PrEP technical working group
SMC	safe male circumcision
STI	sexually transmitted infection
TDF	Tenofovir
TRU	Truvada
UNAIDS	The Joint United Nations Programme of HIV and AIDS
WHO	World Health Organization
YWAG	Young Women and Adolescent Girls