

## Is HIV self-testing an innovative approach in support of pre-exposure prophylaxis among key populations in Kisangani (DRC)? A pilot study with a mixed approach.

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### RESUME

**Introduction :** La prophylaxie pré-exposition au VIH (PrEP) est très efficace pour prévenir l'acquisition du VIH, mais elle nécessite un test de dépistage du VIH à intervalles réguliers. Cette étude vise à évaluer l'impact de l'autotest du VIH sur les attitudes à l'égard de la PrEP, l'adhésion à la PrEP et les comportements sexuels parmi les populations clés à Kisangani. **Méthodes :** Nous avons mené une étude quantitative et qualitative. La composante quantitative comprenait une étude d'intervention avec 116 sujets après randomisation pour évaluer les connaissances des populations clés sur le VIH, l'autodiagnostic et la PrEP. Les populations clés du groupe A ont reçu une formation rapide basée sur l'éducation par les pairs sur la PrEP et l'autotest (Intervention), et celles du groupe B n'en ont pas reçu. Une analyse bivariée a été réalisée pour tester l'effet de la formation rapide par les pairs sur l'amélioration des connaissances en matière de prévention combinée. La composante qualitative était une étude exploratoire qualitative visant à déterminer comment l'utilisation de l'autotest influence l'observance de la PrEP et le comportement sexuel. Quatorze groupes de discussion ont été organisés dans quatre catégories de population clés.

**Résultats :** Globalement, la connaissance des méthodes de transmission et de prévention du VIH avant le test était de 7,7% et 21,5% respectivement parmi les répondants. Dans les deux groupes, aucune catégorie ne connaissait la prévention combinée. Après une formation rapide par les binômes du groupe d'intervention, nous avons constaté une nette amélioration des connaissances sur le VIH, l'autotest et la PrEP dans le groupe d'intervention. Les entretiens en focus group ont montré que la majorité des populations clés est favorable à l'utilisation de l'autotest pour soutenir l'adhésion à la PrEP. Dans la majorité des cas, les populations clés qui ont opté pour la PrEP ont tendance à augmenter le nombre de partenaires sexuels et à ne pas utiliser de préservatifs. **Conclusion :** L'adoption d'interventions de prévention combinées est faible en raison des faibles connaissances des populations clés sur le VIH, l'autodiagnostic et la PrEP. Notre intervention en termes de briefing et de formation rapide par les pairs sur la stratégie de prévention combinée a permis d'améliorer significativement leurs connaissances. En RDC, la mise en œuvre de l'autotest pour soutenir l'efficacité de la PrEP auprès des populations clés est faisable et acceptable pour elles.

**Mots-clés :** Autotest, VIH, PrEP, population clé, Kisangani

### SUMMARY

**Introduction:** HIV pre-exposure prophylaxis (PrEP) has been demonstrated to be highly effective in the prevention of HIV acquisition; however, it necessitates regular HIV testing. The objective of this study is to evaluate the impact of HIV self-testing on attitudes towards PrEP, PrEP adherence, and sexual behaviors among key populations in Kisangani. **Methodology:** A mixed-methods approach was employed, integrating both quantitative and qualitative data collection methods. The quantitative component entailed an intervention study with 116 subjects who were randomly assigned to assess the knowledge of key populations regarding HIV, self-testing, and PrEP. The subjects in Group A were administered training based on peer education regarding PrEP and self-testing (Intervention), while those in Group B were not. A bivariate analysis was conducted to assess the impact of rapid peer training on enhancing knowledge regarding combination prevention. The qualitative component entailed an exploratory study that sought to ascertain the influence of self-test use on PrEP compliance and sexual behavior. A total of fourteen focus groups were conducted, with participants from four key population categories. **Results:** The survey revealed that 7.7% of respondents reported knowledge of pre-test HIV transmission prevention methods, while 21.5% reported knowledge of pre-test HIV transmission prevention methods. In both groups, no category demonstrated awareness of combined prevention strategies. Following a brief training intervention, significant enhancements in knowledge regarding HIV, self-testing, and PrEP were observed among the intervention group. Focus group interviews revealed that the majority of key populations expressed support for the implementation of self-testing to enhance adherence to PrEP. In the majority of cases, individuals who have chosen to utilize PrEP tend to increase the number of sexual partners and forgo the use of condoms. **Conclusion:** The utilization of combination prevention interventions remains limited due to the inadequate awareness among key populations regarding HIV, self-testing, and PrEP. The intervention, which entailed the dissemination of information and the administration of rapid training by peers on the combined prevention strategy, resulted in a substantial enhancement of their knowledge. In the Democratic Republic of the Congo (DRC), the implementation of self-testing to support the effectiveness of pre-exposure prophylaxis (PrEP) among key populations is both feasible and acceptable to them. **Keywords:** Self-testing, HIV, PrEP, key population, Kisangani.

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## INTRODUCTION

HIV/AIDS remains a major public health problem. The new global AIDS strategy (2021-2026) aims to reduce the inequalities that drive the AIDS epidemic and put people at the center of efforts to ensure that the world can end AIDS as a public health threat by 2030 [1]

Inequalities in the response to HIV remain marked and persistent, hindering progress towards the eradication of AIDS. The majority of people newly infected with HIV who do not have access to vital HIV services belong to key population groups and live in vulnerable contexts, where inadequate political will, funding and policies prevent them from accessing health care [1].

Key populations – including men who have sex with men (MSM), people who inject drugs (PWID), individuals living in prisons or other closed facilities, sex workers (SW), and transgender people (TG) – are at a higher risk of contracting HIV. According to the 2021 UNAIDS report, the risk of acquiring HIV is 35 times greater among individuals who inject drugs, 26 times greater among sex workers, and 25 times greater among men who have sex with men [2]. No single HIV prevention measure can stop the epidemic. Combined prevention means combining structural, behavioral and biomedical interventions. A combination of interventions is necessary for an effective response to HIV in key populations. This includes the strategic use of antiretroviral therapy (ART) for treatment as well as prevention, the use of rapid diagnostic tests (RDTs), and pre- and post-exposure options prophylaxis [3].

HIV pre-exposure prophylaxis (PrEP) is highly effective in preventing HIV acquisition but requires regular HIV testing at set intervals [3]. A study conducted in Miami-Dade County, Florida, showed that distributing self-test kits allowed PrEP users to involve their social and sexual networks in HIV testing and PrEP information [4].

Studies in several sub-Saharan African countries have shown that HIV self-testing and PrEP are complementary tools that

empower key populations to take control of their HIV protection. An implementation study in Kenya revealed that administering PrEP every six months, alongside self-testing, cut the number of PrEP clinic visits in half without compromising HIV testing, retention, or adherence [5].

Studies in Uganda and Zambia indicated that most participants showed strong interest in daily oral PrEP and preferred HIV self-testing over standard testing services while on PrEP [6]. Another study in Uganda, which focused on female sex workers, utilized self-testing but did not incorporate daily oral PrEP as a protective measure against HIV. This suggests a need to explore alternative methods to encourage PrEP usage and self-testing [7,8].

In the Democratic Republic of the Congo (DRC), acknowledging the role that key populations play in driving the HIV epidemic, the national program to combat HIV/AIDS has recognized these groups as top priorities within its Strategic Plan (Plan stratégique d'extension des interventions en faveur des populations 2021-2023). Self-testing and PrEP are among the preventive interventions to be provided to key populations. There is a lack of comprehensive combined HIV prevention programmes for key populations and young people in Kisangani. HIV prevalence among sex workers is very high at 9.5% [9]. Key populations have limited access to prevention and care services, due to the inadequacy of care facilities for them. Stigma and poor access to combined prevention services by key populations are major challenges and obstacles to combat HIV in this population group [10-13].

Several studies on the acceptability and feasibility of self-testing have been carried out in the DRC [14,15] and knowledge of PrEP prescriptions [16] but these studies did not assess the contribution of self-testing to the efficacy of PrEP. To fill this gap, this study aims to assess the impact of HIV self-testing on attitudes towards PrEP, PrEP adherence, and sexual behaviors among key populations in Kisangani.

## METHODS

### Study Site

This study was conducted in Kisangani, the capital of the Tshopo province in northeastern DRC. The estimated HIV prevalence is 0.4% in the general population [8], 5.5% in pregnant women based on a serosurveillance survey conducted in 2017, 9.5% among female professionals [9]. The city contains various categories of key populations supported by local NGOs for HIV prevention and care. These NGOs include “Progrès Santé Sans Prix” (PSSP) and “Association Bien-Être Familial et Naissance Désirable” (ABF ND), which receive funding from external donors.

### Study design

We conducted a mixed quantitative and qualitative study. The quantitative component involved an intervention study to assess key populations' knowledge of HIV, self-testing and PrEP. The qualitative component involved an exploratory qualitative study to determine how the use of the self-test influences compliance with PrEP and sexual behaviors.

### Quantitative component

**Study period:** This study covers the period from June 30 to July 30, 2023.

### Study population:

This study was carried out among key populations in Kisangani. According to the WHO, key populations are men who have sex with men (MSM), injecting drug users (PWID), people living in prisons or other closed facilities, Female sex workers (FSWs) and transgender people (TG) [10]. For this study, four categories of key populations were targeted, including three among mobile populations (FSWs, MSM and PWID) and one in prison settings, namely the inmates of Kisangani Central Prison.

### Sampling

#### Sample size

$$n = \frac{(Z\alpha^2 \times p \times q)}{d^2}$$

$n$  is the minimum sample size,  $\alpha$  the 1st species error,  $Z\alpha$  the confidence coefficient (1.96), for a risk of error  $\alpha = 10\%$ ,  $p$  is the proportion of acceptability of the self-test

50% [10],  $q$  is the difference of  $p$  ( $1-p$ ) and  $d$  the desired degree of precision at 5%. We have calculated the sample size with the proportion  $p$  50%.

$$n = \frac{(1,96^2 \times 0,5 \times 0,5)}{0,1^2} = 96$$

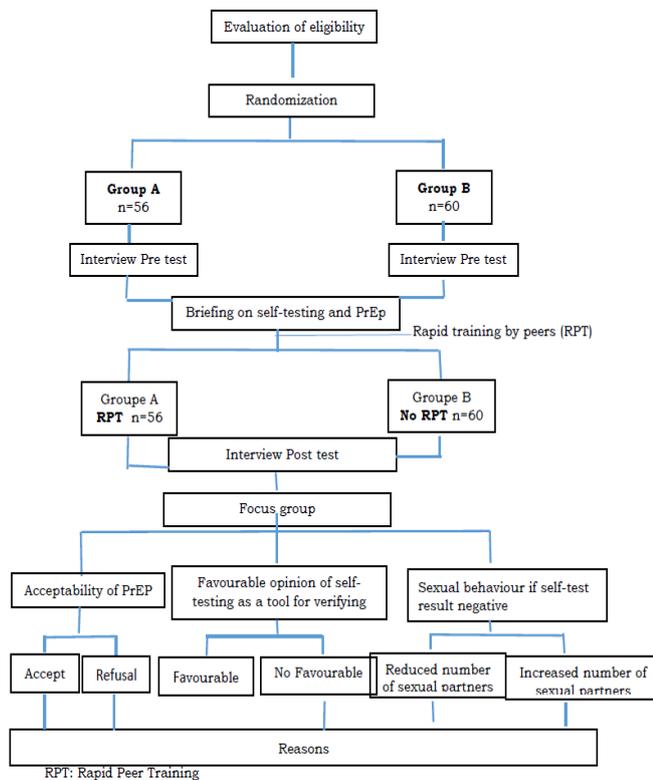
Anticipating a 20% non-response rate, the minimum sample size was 115. Based on the results of the mapping of key populations in Kisangani, FSW represented 36%, MSM 29.3%, PWID 13.8% and prisoners 20.6%. We included subjects in the study until reaching the minimum sample size proportionally to the demographic weight of each category [11] specifically 42 FSW, 34 MSM, 16 PWID and 24 prisoners, for a total of 116 key populations surveyed

### Inclusion criteria

The inclusion criteria for this study were (i) to be a member of one of the key target population categories; (ii) to be at least 18 years old; (iii) to agree to complete the blood or saliva self-testing process; (iv) to have given consent to participate in the study.

### Sampling technique

This was Respondent Driven Sampling (RDS). As these key populations operate in a network, we contacted people in the network at the key populations' friendly centers. The first people contacted (seeds) took part in the survey and, by snowballing, they then recruited other people from their network until they reached a larger number of network members to take part in the survey. The decision to close the RDS site was based on two criteria: reaching convergence and the minimum sample size. Prisoners were sensitized by health care providers from the Kisangani central prison medical center. Awareness-raising was carried out by prisoner educator pairs trained in the fight against HIV. The latter were recruited consecutively until the minimum expected sample size was reached.



After assessing study eligibility, we randomly assigned participants to two groups, A and B (randomization).

### Randomization and Group Allocation

Participants were randomly assigned to either the intervention or control group based on their order of enrollment. To ensure that the randomization was balanced across key populations, the study was conducted separately within each key population group (SW, MSM, and PWID). For each group, participants were assigned to either the intervention (group A) or control group (group B) using an alternating randomization method. Specifically, even-numbered participants (based on their order of enrollment within each population group) were assigned to the intervention group, while odd-numbered participants were assigned to the control group. This process was repeated independently for each key population group, ensuring that the allocation was balanced and group specific. We then administered a pre-test survey to assess key populations' knowledge of HIV prevention, self-testing and PrEP.

### Intervention

We began by rapid training based on peer education in the combined prevention

strategy, focusing on self-testing, condoms and PrEP.

Intervention Group A: The participants were given a one-day rapid training based on peer education (RPT), which consisted of capacity-building on the routes of contamination, the prevention methods for HIV, combined prevention with a focus on self-testing, the use of condoms and PrEP, as well as awareness-raising on the adoption of these methods for their prevention against HIV; while those in Group B did not.

We then administered a post-test survey to both groups to assess the improvement in knowledge about self-testing and PrEP.

### Data collection

These were guided interviews using a questionnaire to collect socio-demographic parameters, knowledge about HIV, self-testing and PrEP before and after briefing.

### Statistical analysis

For quantitative data, all data were recorded on paper, then encoded on an Excel mask, and finally analyzed on Stata 13. Descriptive statistics were described from estimating proportions, means with standard deviations. The variable of interest was knowledge of HIV self-testing, Self-testing and PrEP defined as a dichotomous variable (correct/correct). The corresponding endpoint was the proportion of participants aware of self-testing for HIV and PrEP. We performed a bivariate analysis using Pearson's Chi-square ( $\chi^2$ ) to assess key populations' knowledge of self-testing and PrEP before and after rapid peer training in the intervention group.

### Qualitative component:

#### *Study population, recruitment and interviews*

The study took place between July 30 and August 15, 2023, in Kisangani. In this qualitative strand, we enrolled the four population categories that participated in the quantitative strand of the study to form different focus groups based on those categories: FSWs, MSM, PWID, and prisoners. In total, we established 14 groups, consisting of 5 groups of 8-10 people for FSWs, 4 groups of 8 people for MSM, 2 groups of 8 people for PWID, one group of 8 people for male prisoners, and one group of 8

people for female prisoners. We drafted a focus group guide based on the following three axes: i) Preexposure Prophylaxis ii) Acceptability of HIV self-testing as a technology supporting PrEP iii) Changing sexual behavior while using HIV self-testing and PrEP.

#### *Focus group data*

We used the theory of planned behavior model to identify beliefs that could relate to the acceptability of PrEP and self-testing. Ajzen's theory of planned behavior posits that intention results from three conceptual determinants: attitude toward behavior, perceived social norm, and perceived behavioral control. This theory aims to explain behavior through attitudes, self-efficacy, and social norms [12]. Intention represents the motivation or will to engage in a specific behavior and is defined as the perception of the likelihood of a behavior [13]. Data were collected using a focus group guide. At the beginning of each focus group discussion, participants' socio-demographic characteristics were gathered on an anonymous data sheet, and they received introductory information about the study, self-testing, and PrEP. Our team of two coders (the first author and another member) developed an initial framework of codes from the focus group discussion guide. The sessions were conducted in the local languages, Swahili and Lingala, to ensure that everyone could understand and express themselves easily. Focus group discussions lasted between 30 and 45 minutes. To maintain anonymity, each participant was assigned a code based on their category (e.g., FSW1, MSM1, PWID1, Prisoner1, etc.). All focus group discussions were audio recorded and transcribed verbatim. The opinions of the different categories of key populations on the specific issues were collected until saturation point was reached. A manual thematic analysis was conducted in relation to the theory of planned behavior. Throughout the review, recurring explanatory statements were identified and classified into thematic units, including negative or divergent comments to add rigor to the results of our qualitative analysis. During the coding process, we regularly discussed ideas,

questions, or concerns as they arose. We resolved any discrepancies through theoretically informed deliberations that involved rereading of the transcripts, reviews of notes taken from all 14 focus group discussions, as well as our knowledge of HIV prevention among key populations. An Excel file was then created to organize all verbatim by thematic category. Each verbatim was classified under the corresponding code to identify the key determinants of the intention to use self-testing and PrEP. During the analytic process, we leveraged several techniques to ensure validity in qualitative research, including analyst triangulation (two analysts to review findings), and negative case analysis (discussions of elements that would deem contradictory to normal cases). This analysis was carried out by our study team.

#### **Ethical considerations**

We obtained ethical approval from the ethics committee of the University of Kisangani Approval number: UNIKIS/CER/014/2023]. Authorization was also secured from the provincial health and justice authorities before conducting the study at the user-friendly centers and the central prison of Kisangani. Each participant signed a written informed consent form. A financial compensation of 5000 Fc (approximately 2 US\$) was provided to each participant to compensate for the time they dedicated to the study and to reimburse transportation costs.

**RESULTATS****A. Quantitative component***Table I. Socio-demographic and behavioral characteristics of respondents.*

Variables	N = 116	Percent %
<b>Age year (Mean ± SD)</b>	26,03±9,14	
<b>Age range (year)</b>		
18 -24	72	62,1
25 et Plus	44	37,9
<b>Gender</b>		
Male	49	42,2
Female	67	57,8
<b>Study level</b>		
Primary	9	7,7
Secondary	90	77,6
Higher/university	17	14,7
<b>Marital status</b>		
Lives without a spouse	96	82,8
Living with a spouse	20	17,2
<b>Occupancy</b>		
Unoccupied	92	79,3
With occupation	24	24,7
<b>Religion</b>		
Christian	77	66,4
Islamic	31	26,7
Esoteric order	5	4,3
No religion	3	2,6
<b>Amount of money earned per day in \$.</b>		
0 -5	50	43,1
6 -10	50	43,1
More than 10	16	13,8
<b>Number of sexual partners</b>		
0 - 2	43	37,4
3 - 5	62	53,9
More than 5	10	8,7
<b>Sexual orientation</b>		
Homosexual	29	25
Heterosexual	82	70,7
Bisexual	5	4,3
<b>Key populations category</b>		
FSW	42	36,2
MSM	34	29,3
PWID	16	13,8
Prisoner	24	20,7

Table 1 shows that the average age was 26.03±9.14 years. Most of the respondents lived without a partner and did not have an occupation. The majority had 3 to 5 sexual

partners and earned between 6 and 10\$ per day.

Table 2 shows that, at the pre-test, less than one in ten respondents had correct knowledge of the routes of HIV transmission, and nearly a quarter had correct knowledge of the means of HIV prevention. Overall, none of the respondents had any knowledge of combination prevention.

Table 3 shows that at post-test, rapid peer education improved the knowledge of respondents in the intervention group about HIV transmission routes, means of prevention, combination prevention, self-testing and PrEP prescription methods, compared with the control group, and the difference was statistically significant.

**B. Qualitative component****1. Social Norms about HIV and HIV self-testing on attitudes towards PrEP****Acceptability of PrEP as a preventive measure of HIV**

The study aimed to evaluate the acceptability of PrEP among various key population groups. Focus group discussions revealed that key populations view PrEP as an effective strategy for combating HIV. Among FSWs, the majority are willing to take ARVs (PrEP) to prevent contracting the disease.

*"I'm going to take the medicine so that I don't get AIDS, as I'm not married and if I meet a man who has AIDS and I take this medicine I won't get the disease."* (FSW1)

*"I'm going to take it because if I have sex with a man I won't get the disease."* (FSW2)

Most MSM, PWID and Prisoners also expressed positive attitudes about PrEP. However, different reasons emerged about why taking PrEP was encouraging to them. For example, some of them expressed themselves in these terms:

*"I'm going to agree to take Prep because sometimes during sex, the condom breaks, but if you're already on Prep, it will protect you"* (MSM1).

*"Sometimes someone comes up to you suddenly and you're forced to have sex, if*

you're already taking Prep, it's easy. I'll agree to take the medication (MSM 2).

Tableau II: Respondents' knowledge of HIV, self-testing and PRE-TEST pre-exposure prophylaxis

Variables	Pre-test knowledge assessment			P-value
	Groupe A n=56(%)	Groupe B n=60(%)	All n=116(%)	
<b>Knowledge of HIV transmission routes</b>				
Correct	5(8,93)	4(6,67)	9(7,76)	0,649
Incorrect	51(91,07)	56(93,33)	107(92,24)	
<b>Knowledge of HIV prevention methods</b>				
Correct	12(21,43)	13(21,67)	25(21,55)	0,975
Incorrect	44(78,57)	47(78,33)	91(78,45)	
<b>Knowledge of HIV Risk Behavior</b>				
Correct	6(10,71)	7(11,67)	13(11,21)	0,871
Incorrect	50(89,29)	53(88,33)	103(88,79)	
<b>Knowledge of combined prevention</b>				
Yes	0(0)	0(0)	0(0)	
No	56(100)	60(100)	116(100)	
<b>Knowledge of drugs for HIV treatment</b>				
Yes	28(50)	29(48,33)	57(49,14)	0,858
No	28(50)	31(51,67)	59(50,86)	
<b>Knowledge of HIV testing methods</b>				
Yes	15(26,79)	12(20)	27(23,28)	0,387
No	41(76,72)	48(80)	89(76,72)	
<b>Knowledge of self-test types</b>				
Yes	10(17,86)	14(23,33)	24(20,69)	0,467
No	46(82,14)	46(76,67)	92(79,31)	
<b>Knowledge of the self-testing service offer</b>				
Yes	8(14,29)	9(15)	17(14,66)	0,913
No	48(85,71)	51(85)	99(85,34)	
<b>Knowledge of where self-tests are dispensed/sold</b>				
Yes	9(16,07)	9(15)	18(15,52)	0,873
No	47(83,93)	51(85)	98(84,48)	
<b>Knowing what to do in the event of a positive self-test</b>				
Yes	15(26,79)	15(25)	30(25,86)	0,826
No	41(73,21)	45(75)	86(74,14)	
<b>Heard Spoken about PrEP</b>				
Yes	9(16,07)	10(16,67)	19(16,38)	0,931
No	47(83,93)	50(83,33)	97(83,62)	
<b>Knowledge of the types of people for whom PrEP is recommended</b>				
Yes	7(12,5)	8(13,33)	15(12,93)	0,894
No	49(87,5)	52(86,67)	101(87,07)	
<b>Whether PrEP provides 100% protection</b>				
Yes	32(57,14)	34(56,67)	66(56,9)	0,959
No	24(42,86)	26(43,33)	50(43,1)	
<b>Knowledge of PrEP prescribing methods</b>				
Intermittent or continuous	8(14,29)	9(15)	17(14,66)	0,913
Don't know	48(85,71)	51(85)	99(85,34)	

Table III: Assessment of knowledge about HIV, self-testing and post-test PrEP after Rapid Peer Training in the intervention group (RPT)

Variables	Post test Knowledge assessment			
	Groupe A With RPT	Groupe B Without RPT	OR b(IC 95%)	P value
	OUI n=56(%)	OUI n=60(%)		
<b>Knowledge of HIV transmission routes</b>				
Yes	50(79,3)	13 (20,7)	30,1(9,69-101,5)	<0,0001
No	6(11,3)	47(88,7)	1	
<b>Knowledge of HIV prevention methods</b>				
Yes	39(73,4)	14(26,6)	7,5(3,06-18,8)	<0,0001
No	17(26,9)	46 (73,1)	1	
<b>Knowledge of risky behavior</b>				
Yes	44(86,3)	7(13,7)	27,7(9,19-88,5)	<0,0001
No	12(18,5)	53(81,5)	1	
<b>Knowledge of combined prevention</b>				
Yes	56(91,8)	5 (8,2)		<0,0001*
No	0(0)	55(100)		
<b>Knowledge of self-test types</b>				
Yes	49(76,6)	15(23,4)	21(7,22-65,01)	<0,0001
No	7(13,5)	45(86,5)	1	
<b>Knowledge of the self-testing service offer</b>				
Yes	48(81,4)	11(18,6)	26,7(9,02-82,29)	<0,0001
No	8(14,1)	49(85,9)	1	
<b>Knowing how to proceed if the self-test result is positive</b>				
Yes	42(72,4)	16(27,6)	8,25 (3,33-20,71)	<0,0001
No	14(24,1)	44(75,9)	1	
<b>Heard about PrEP</b>				
Yes	50(81,9)	11(18,1)	37,12(11,58-127,81)	<0,0001
No	6(10,9)	49(89,1)	1	
<b>Knowledge of the types of people for whom PrEP is indicated</b>				
Yes	51(85)	9(15)	72,25(18,83-322,3)	<0,0001
No	4(7,3)	51(92,7)		

\*Test Fisher Exact RPT (Rapid Peer Training)

"I'm going to take this medicine to protect myself because sometimes when I'm already under the effects and I go out with a girl from home where I have to do body-to-body sex and if I already took the PrEp, it would protect me. it's better to prevent" (PWID1).

"I'm going to accept taking this medicine because it will be like 'anti-bullet' so that if the microbe comes it won't get in"(Prisoner1).

being ill were reported as factors hindering participants' intention to use PrEP. Others spoke of the difficulty of taking medication every day, and the fear of stigmatization and discrimination if someone sees you taking ARVs, they'll think you've got HIV. They thought in these terms:

"For me I will not accept to take because there is a risk as it does not protect at 100%, you can meet with someone as it protects at 90% it will leave me the disease" (FSW3).

"I'm not going to agree to take these drugs because if someone sees you taking the AIDS drug, they're going to damage your reputation for having AIDS" (FSW4).

### **Acceptability of the use of PrEP and other preventive measure**

The majority of key populations are willing to take PrEP in combination with other prevention methods:

"I'll take the medication and use condoms because it will prevent pregnancy and syphilis (sophis)" (FSW5).

"I prefer to take Prep and use a condom to prevent the man from ejaculating on me with the risk of germs and pregnancy" (FWS6).

"I'll agree to take Prep, which only protects me against HIV, and the condom will protect me against other infections"(MSM3).

"I think there are two advantages to using PrEP and condoms: you can forget to take PrEP and the condom will help you, or you can take PrEP regularly even if you forget to use a condom, so there's no real danger (For PWID 2).

"For me, it's an advantage to combine the two methods, because either the ARVs don't work and the condom will protect you, or the condom didn't work and the ARVs will protect you" (Prisoner2).

Some of the sex workers and prisoners were not in favour of combining PrEP with other HIV prevention methods, and their views were divided:

"No, I had said that I don't prefer to take ARVs because if a customer finds ARVs in your bag he'll be scared and he'll run away from you, your market will be ruined. I prefer to use only condoms" (FSW7).

"For me, I will accept to take only the medication because sometimes the use of a condom complicates things" (Prisoner3).

### **The choice between continuous and intermittent PrEP**

Participants were asked to give their opinions on the type of PrEP they preferred; Our interviews with various categories of key populations showed that continuous PrEP was much more widely accepted than intermittent PrEP for FSW, MSM and PWID:

"I'm going to choose continue because I have sex day and night " (FSW6)

"I have sex every day and I also have to take medicines every day I choose PrEp Continue". (FSW7)

"I'd rather take it every day, because even if I have sex without control, it will protect me". (MSM5),

"I'm going to choose PrEp every day because you never know you're going to meet street girls and often we have sex without condoms" (PWID 4).

On the other hand, in the case of prisoners who did not have regular intercourse, they preferred the sequential or intermittent PrEP. "Here in prison, we don't have husbands, we don't have regular sex, I'll choose intermittent. Here in prison, they don't allow us women to have sex" (Prisoner 2).

"I'm going to take intermittent and alternate with caution. If I choose to continue, I run the risk of being at risk at any moment" (Prisoner 4).

"I'll take intermittent, the hunter shoots when there is game, but the enemy is not there I'll shoot why, I prefer to take by moment" (Prisoner 5).

### **Acceptability of HIV self-testing as a technology to support PrEP**

Regarding the use of self-testing as a technology to support PrEP adherence, most in all categories of key populations were in favour of using self-testing to support PrEP as a way for them to check the effectiveness of PrEP and at the same time check their serological status.

The few who were not in favour cited the fear of a positive result when the self-test is used alone and would like to take PrEP and do

their serological monitoring at the user-friendly center or medical center.

Choice of self-test type and preference between self-test and screening test at a user-friendly center or healthcare facility:

When asked about their preference between blood and saliva self-testing, most of them preferred blood self-testing for the simple reason that blood contains a large quantity of microbes. They expressed themselves as follows:

*"I'd rather use a blood self-test because there are a lot of viruses in the blood" (MSM7)*

*"I'd rather use a blood self-test because there are a lot of viruses in the blood" (FSW8)*

*"Saliva is just the water that circulates in the body and in saliva we've been told there's no virus, I'm going to prefer blood" (MSM 8).*

*"Microbe can be found in the blood, I prefer the blood test, I prefer the sanguine for more precision" (PWID 5).*

*"The blood test is really good for us PWIDs, as we inject drugs, so I prefer the blood test for greater accuracy" (PWID6).*

Although a large number have opted for the blood self-test, some prefer the saliva self-test for fear of needles.

When it came to the choice of testing method, whether at the healthcare facility / friendly center or the self-test, opinions were divided. Some preferred to go for testing at a friendly counter or healthcare facility for greater accuracy, while others preferred self-testing for greater reliability and, above all, confidentiality. Their opinions on this issue:

*"I'm going to choose for myself and I'm going to prefer to do it myself. At the hospital, sometimes the providers don't know the secret" (FSW9).*

*"I'm used to coming to the friendly center to get tested every three months, I'll prefer to get tested at the friendly center, do it myself at home I won't know" (MSM9).*

*"I'm going to choose I'm going to prefer to do the self-test and keep my secret, if you go to the hospital often people panic and start bringing you drugs, it's better to do it alone and keep the secret" (PWID7).*

*"I'm going to do it myself to find out how things are going in my body, it's much quicker. When I know that my body's all right, I'll-I'll continue to protect myself" (Prisoner3).*

## **2. Perceived behavioral control of HIV testing and using PrEP intention**

### **Changes in sexual behavior when using HIV self-testing and PrEP**

Overall, the majority of key populations felt that PrEP use already protected them from the risk of acquiring HIV, so the trend was for an increase in the number of sexual partners, and for some to abandon condoms in the presence of their regular partners.

*"For me, my darling (whom we call confidence, love, busy, kolo lopango) is without condoms if he wants, we make love without condoms and others with condoms". (FSW10)*

*"Normally, if my partner's self-test result is negative, I will do it without a condom, but I will use a condom at times to avoid pregnancy or other infections" (FSW11).*

*"These days it's hard to find clients who pay better, often it's 2000fc, 1000fc so if I already take the PrEP has to increase the number of clients to earn a bit more" (FSW12).*

*"We have children and expenses the PrEP can make it easier for me to increase the number of partners and earn a little more to support my family" (FSW13).*

*"As for me, you can't use a condom with everyone, if you have your boyfriend with whom you usually have sex, it's without a condom and you use a condom with casual sex" (MSM10).*

As for the number of sexual partners, the trend was to increase the number of sexual partners.

"If I already take the Prep I will no longer choose whatever the number of partners we will go to earn a little more" (MSM11).

"As for me to be comfortable, I need three or four sweethearts and a fiancée I can count on, so I'm tempted to increase the number if I'm on PrEp" (PWID 7).

A minority thought it was important to maintain the number of sexual partners or to reduce it because the residual risk was there.

"I'm going to keep the same number, I'm not going to add or subtract, I'm going to keep the same number" (MSM12).

"For me, I decrease the partners of outside, with the prep I risk to give confidence to a darling and to begin to have sexual intercourse without protection there is risk of contamination " (PWID8).

"I'm not going to raise it because he might catch other germs besides AIDS" (Prisoner4).

## DISCUSSION

This study aimed to assess the impact of HIV self-testing as a technology supporting PrEP in key populations. We conducted a sequential mixed-method study, with a quantitative component preceding the qualitative component. This method has been used by other authors [17,18]. This enabled us to assess how key populations (PS, MSM, PWID and prisoners) perceive PrEP, obtain their favorable opinion of the use of self-testing to evaluate the efficacy of PrEP, changes in sexual behavior in the face of a negative self-test result.

Our study population was young, with an average age of 26.03±9 years, all from groups at high risk of contracting HIV infection. Most had 3 to 5 partners a day and earned between six and ten dollars a day (Table I). These results are similar to those found in the surveys carried out in Cameroon and those found by Bea Vuylsteke et al in Côte d'Ivoire [19,20]. In most cases, key populations tend to increase the number of sexual partners in order to gain a little more. This is risky behaviour that exposes them to the risk of contracting HIV. In the focus group

responses, it was clear that adopting PrEP as a prevention method would make their task easier, even if they continued to increase the number of sexual partners, the risk would be minimised.

Concerning knowledge of HIV at pre-test, we found that only 7.7% of respondents had correct knowledge of HIV transmission routes, while 21.55% had correct knowledge of HIV prevention methods (Table II). The difference between the two groups was not statistically significant. These results are similar to those found by Ba K et al. in Nouakchott, Mauritania, who found that 7.4% of inmates had perfect knowledge of HIV prevention methods [21]. In both groups, no category had any knowledge of combined prevention. In our study, 20.69% of our respondents knew the different types of self-test (17.86% intervention group VS 23.33% control group), only 15.52% did not know where to obtain the self-test, and when faced with a reactive result, the majority of respondents did not know what to do (Table II). These results differ from those of Aminata Diallo in Mali, who found that 70.3% of respondents knew where to obtain the self-test, and 43% did not know what to do when faced with a reactive result [22]. This difference was due to the fact that the latter study was conducted among students with a high level of education, most of whom had already been in contact with the self-test. In Kisangani, on the other hand, the majority of key populations had a low level of education, access to the self-test was not easy because it had not yet been widely used, and many had no knowledge of how to handle and interpret a reactive result. For this reason, it was necessary to find mechanisms for capacity building through rapid peer training.

With regard to PrEP, 16.38% had knowledge of PrEP, and the difference between the two groups was not statistically significant; 12.93% knew the types of people for whom PrEP was indicated, and only 14.66% knew how to prescribe PrEP (Table II), and the difference between the groups was not statistically significant. Several studies have shown that PrEP is still little known in certain

key population categories around the world [17,25,26].

At the post-test after capacity-building, key populations' knowledge of HIV, self-testing and PrEP improved significantly in Group A (intervention group) compared with Group B, with a statistically significant difference.

Comparing group A (intervention) with group B (no intervention), knowledge of HIV transmission methods was 79.3% Vs 20.7% OR CI95 30.1(9.69-101.5)  $p < 0.0001$ . Knowledge of prevention methods was 73.4% Vs 26.6 OR CI95 7.5(3.06-18.8)  $p < 0.0001$ . Knowledge of combined prevention 91.8% Vs 8.2%  $p < 0.0001$ . Knowledge of the self-testing service 81.4% VS 18.6% OR CI95 26.7(9.02-82.29); Knowledge of the types of people for whom PrEP is indicated 85% VS 15% OR CI95 72.25 (18.83-322.3)  $p < 0.0001$  and PrEP prescription methods 91.67% VS 8.93% OR IC95 40.8(12.21-152.69). The difference is statically significant. These results clearly show that rapid training by pairs in the intervention group had a beneficial effect on improving people's knowledge of prevention methods that affect them. Peer education remains an effective strategy for achieving acceptability and adherence to prevention methods among certain categories of the population. Although this study concerned the key populations who frequent the user-friendly center, it is a strategy that can be implemented by the HIV control program for the implementation of self-testing and PrEP. It was clear from the focus groups that almost all the participants in the intervention group were in favour of using self-testing to support PrEP.

On the whole, participants expressed different views on the role of social norms in their intention to undergo regular self-testing to support PrEP adherence. Our findings are generally aligned with existing literature related to barriers and facilitators to HIV testing and PrEP among Key populations. The majority of our respondents were in favor of using PrEP as HIV prevention method. This acceptability of self-testing has been reported in the Carin Ahouada et al, 2020 studies in Benin [17]. Other authors have reported

lower acceptability rates among MSM (41%) in northern Thailand [27]. As for the unfavorable opinions evoked, in particular the fear of stigmatization and discrimination among FSWs and MSM, these results are similar to those found by Ingrid Young, 2014 [18]. Social, behavioral and psychological factors such as stigma, prejudice, rejection, uncertainty and fear could be a barrier to the success of PrEP among MSM have been reported by Jaspal & Daramilas, 2016 [28]. It is therefore also important for communities to be made aware of the need to prevent stigma and discrimination against key populations. This will enable them to come out of hiding, have free access to combined prevention methods and live their sexuality responsibly.

Concerning the choice between continuous and intermittent PrEP, opinions were divided among the different categories of key populations, with some favoring continuous PrEP because they have sex every day, and others preferring intermittent PrEP because they are not exposed every day. These results are similar to those of Carin Ahouada et al, 2020 in Benin[17].

Another finding indicated that HIV **risk perception**, based upon actual risk behaviors such as frequency of sexual activities and unprotected sexual intercourse, drove participants decisions related to HIV tested and PrEP. The positive relationship between perceived risk and PrEP is supported by results of previous studies. The randomized IPERGAY [29] and PROUD [30] trials, in which participants used PrEP on demand and daily, respectively. The favourable attitude of key populations towards continuous PrEP stems from their perception of the risk of contracting HIV. They are aware that having multiple unprotected sexual encounters is a real risk, and sometimes some clients do not prefer condoms; the most effective means is to take ARVs regularly to minimise the chances of infection through unprotected sex.

About the Choice of self-test type and preference between self-test and screening test at a user-friendly center or healthcare

facility, the majority of participants said that when they are on PrEP, they would prefer to use the self-test rather than go to clinic, and the majority preferred blood self-testing to saliva self-testing to support PrEP. Studies by Kenneth Ngure et al 2022 and Katrina F et al 2018 [5,6] showed that self-testing was a technology that could support PrEP in key populations.

Concerning the preference of blood self-testing over saliva self-testing, in various studies carried out previously, when the choice of HIV blood self-testing was opposed to HIV saliva self-testing, opinions differed but the majority opted for blood self-testing the studies by Ndungu et al. (2023), Mantell et al. (2022) in Kenya and Lippman et al. (2018) in South Africa, participants preferred blood self-testing [31-33]. On the other hand, in the study by Ritchwood et al (2019), 80% of participants preferred salivary HIV self-testing [34] and Tonen et al (2019) in the population aged 18 to 49 with high HIV risk the preference for oral fluid-based self-testing was greater than that for blood-based self-testing [35].

Lastly, psychological factors including **attitudes, subjective norms, and perceived behavioral control** towards HIV testing were found to have impacts on the HIV testing and PrEP intentions of Key population. There was a strong consensus that participants cared about their health and took responsibility for protecting themselves by knowing their HIV status while they are on PrEP. Nevertheless, some expressed concern about confidentiality if self-testing is carried out with the assistance of a clinic or user-friendly center. Peer educators, regular sexual partners and friendly center providers were the biggest influencers towards HIV testing and PrEP behavior among key population in Kisangani and they held strong personal beliefs that they could manage a HIV test and PrEP when needed.

Our study found strong **perceived behavioral control towards** HIV testing and PrEP across all participants. Most participants felt that this combined prevention method would be easy to use.

Obstacles to the use of these two methods were evoked if the tests had to be paid for, if there were shortages of self-tests and ARVs. Some of these obstacles were reported in studies by Ahouada et al, 2020 in Benin [17]. The non-availability of ARVs and self-testing for a fee were reported as obstacles in studies by Haidara, A. C. (2020) in Bamako, Mali, where 81.2% of health professionals had never offered to carry out self-testing due to the non-availability of tests [24].

The majority of participants intended not to use condoms while on PrEP, especially with their regular partners. Faced with a negative self-test result because they were already on PrEP, the majority tended to increase the number of sexual partners to improve income and earn a little more. This has also been reported among men who have sex with men in Benin [17]. This attitude risks exposing them further to the risk of contamination.

This qualitative study is the first in Kisangani (DRC) to show that self-testing can support the evaluation of PrEP efficacy in key populations. The results could make a significant contribution to the implementation of the PrEP strategy among key populations.

One of the prerequisites for successful implementation of combined prevention is the availability of inputs and drugs. Further intervention studies are needed to jointly test the contribution of self-testing to support adherence to PrEP. For example, examining the impact of self-testing on actual PrEP adherence rates, or exploring the feasibility of integrating these interventions into existing HIV care programs.

#### **Limits**

Although this is one of the first studies in Kisangani (DRC) to show that self-testing can support the evaluation of PrEP efficacy in key populations, it does have limitations. First, the study was limited to participants who had access to the key populations' friendly centers. This data collection method could have introduced selection bias because it limited participation to those who had access to the key populations' friendly centers, thus hindering the generalizability of our findings.

Second, in the quantitative section, after Rapid Training based on Peer Education, the ideal would have been to seek out the link between improved knowledge and behaviour change in the intervention group where we were just looking to improve knowledge of self-testing and PrEP. To get round this aspect, the intention to change behaviour was sought in the focus group sessions.

Last, given the time available for the focus group, we only received the opinions of the participants in a dichotomous way, favourable or unfavourable. This reduced time did not allow us to go into the reasons behind these opinions in depth. Subjective norms about HIV testing and PrEP have not been explored in depth either. Future studies should consider these limitations in the design and implementation to facilitate broader participation and better data collection.

### CONCLUSION

The rate of uptake of combined prevention interventions is low due to key populations' poor knowledge of HIV, self-testing and PrEP. Our intervention in terms of briefing and rapid training by peers on the combined prevention strategy has significantly improved their knowledge. The majority of populations are in favor of the use of self-testing to support the effectiveness of PrEP. This will require accompanying measures to make PrEP drugs and self-testing available in their communities. In the DRC, the implementation of self-testing to support the effectiveness of PrEP among key populations is feasible and acceptable to them.

### COMPETING INTERESTS

The authors declare no competing interests.

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