



**HAL**  
open science

## HIV self-testing positivity rate and linkage to confirmatory testing and care: a telephone survey in Côte d'Ivoire, Mali and Senegal

Kra Djuhe Arsene Kouassi, Arlette Simo Fotso, Nicolas Rouveau, Mathieu Maheu-Giroux, Marie-Claude Boily, Romain Silhol, Marc d'Elbee, Anthony Vautier, Joseph Larmarange

### ► To cite this version:

Kra Djuhe Arsene Kouassi, Arlette Simo Fotso, Nicolas Rouveau, Mathieu Maheu-Giroux, Marie-Claude Boily, et al.. HIV self-testing positivity rate and linkage to confirmatory testing and care: a telephone survey in Côte d'Ivoire, Mali and Senegal. 2023. hal-04127016v2

**HAL Id: hal-04127016**

**<https://hal.science/hal-04127016v2>**

Preprint submitted on 12 Sep 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

# HIV self-testing positivity rate and linkage to confirmatory testing and care: a telephone survey in Côte d'Ivoire, Mali and Senegal

Arsène Kouassi Kra<sup>1\*</sup>, Arlette Simo Fotso<sup>1,2</sup>, Nicolas Rouveau<sup>1</sup>, Mathieu Maheu-Giroux<sup>3</sup>, Marie-Claude Boily<sup>4</sup>, Romain Silhol<sup>4</sup>, Marc d'Elbée<sup>1,5</sup>, Anthony Vautier<sup>6</sup> and Joseph Larmarange<sup>1,2</sup> on behalf of the ATLAS team

<sup>1</sup> Centre Population et Développement (Ceped), Université Paris Cité, Institut de Recherche pour le Développement (IRD), Inserm, France

<sup>2</sup> Institut National d'études Démographiques (Ined), France

<sup>3</sup> Department of Epidemiology and Biostatistics, School of Population and Global Health, McGill University, Montréal, QC, Canada

<sup>4</sup> MRC Centre for Global Infectious Disease Analysis, School of Public Health, Imperial College London, London, United Kingdom

<sup>5</sup> National Institute for Health and Medical Research UMR 1219, Research Institute for Sustainable Development EMR 271, Bordeaux Population Health Centre, University of Bordeaux, France

<sup>6</sup> Solidarité Thérapeutique et Initiatives pour la Santé (Solthis), Sénégal

\*Corresponding author

Correspondence: [arsene.kra.kouassi@ceped.org](mailto:arsene.kra.kouassi@ceped.org)

## ABSTRACT

HIV self-testing (HIVST) empowers individuals to decide when and where to test and with whom to share their results. From 2019 to 2022, the ATLAS program distributed ~ 400 000 HIVST kits in Côte d'Ivoire, Mali, and Senegal. It prioritised key populations, including female sex workers and men who have sex with men, and encouraged secondary distribution of HIVST to their partners, peers and clients.

To preserve the confidential nature of HIVST, use of kits and their results were not systematically tracked. Instead, an anonymous phone survey was carried out in two phases during 2021 to estimate HIVST positivity rates (phase 1) and linkage to confirmatory testing (phase 2). Initially, participants were recruited via leaflets from March to June and completed a sociobehavioural questionnaire. In the second phase (September to October), those with a reactive HIVST result were re-contacted for another questionnaire. Of the 2 615 initial participants, 89.7% reported consistent results between their interpretation and the number of lines on the HIVST (i.e., 1 for negative, 2 for reactive). The HIVST positivity rates ranged between 2.4% and 9.1% depending on calculations.

The second phase saw 78 out of 126 eligible participants complete the questionnaire. Of the 27 who reported a consistent reactive result in the first phase, 15 (56%, 95%CI: 36 to 74%) underwent confirmatory HIV testing, with 12 (80%) confirmed as HIV-positive, all of whom began antiretroviral treatment.

NOTE: This preprint reports new research that has not been certified by peer review and should not be used to guide clinical practice.

43 The confirmation rate of HIVST results was fast, with 53% doing so within a week and 91% within  
44 three months of self-testing. Two-thirds (65%) went to a general public facility, and one-third to  
45 a facility dedicated to key populations.

46 The ATLAS HIVST distribution strategy reached people living with HIV in West Africa. Linkage to  
47 confirmatory testing remained sub-optimal in these first years of HIVST implementation.  
48 However, if confirmed HIV-positive, almost all initiated treatment. HIVST constitutes a relevant  
49 complementary tool to existing screening services.

50 .  
51 **Keywords:** HIV self-testing, linkage to confirmatory testing and care, phone-based survey, key  
52 populations, West Africa.

53

54

55

56

## Introduction

57 Early testing followed by successful linkage to antiretroviral treatment for those diagnosed with HIV can  
58 drastically reduce the risk of onward HIV transmission and mortality [1–6]. In 2021, according to the United  
59 Nations Program for HIV/AIDS (UNAIDS), 81% of the adult population living with HIV in West and Central Africa  
60 knew their status. Only 77% of them were on antiretroviral treatment[7], below the 95-95-95 UNAIDS targets  
61 for 2025 [8]. The 95-95-95 targets aim for 95% of people living with HIV to know their status, 95% of those  
62 diagnosed to receive treatment, and 95% of those on treatment to achieve viral suppression. Improving  
63 diagnosis coverage, especially among vulnerable key populations at high risk of HIV acquisition and  
64 transmission, is the necessary first step to achieve this goal.

65 HIV self-testing (HIVST) is the process by which a person who wants to know their HIV status collects their  
66 own sample (oral fluid or blood), performs the test, and then interprets the results themselves, often in a private  
67 setting [9]. It is an innovative tool that empowers individuals and guarantees the confidentiality of the test  
68 [10]. Individuals may decide when and where to test and with whom they want to share their result. It's a tool  
69 that is widely accepted by various populations, including key populations [11–18]. It has been shown to be  
70 effective in screening populations vulnerable to HIV acquisition and transmission that are often hardly reached  
71 through conventional approaches [19–21]. The World Health Organization (WHO) has recommended HIVST as  
72 a complementary testing approach since 2016 [22].

73 The STAR project carried in Eastern and Southern Africa and funded by Unitaid aimed to boost the global  
74 market for HIVST . The project unfolded in three phases: Phase 1 ran from September 2015 to August 2017,  
75 Phase 2 spanned from August 2017 to July 2020, and Phase 3 took place between January 2020 and July 2021  
76 (<https://www.psi.org/fr/project/star/>). Following the experience gained in Eastern and Southern Africa under  
77 the STAR project [11, 23–28], the Unitaid funding agency sought to stimulate HIVST in West Africa where HIV  
78 epidemics differs, are more concentrated, and where key populations (e.g., female sex workers and men who  
79 have sex with men) share a disproportionate HIV burden. The ATLAS programme (*AutoTest de dépistage du*  
80 *VIH : Libre d'Accéder à la connaissance de son Statut*) aimed to promote, implement, and expand HIVST in Côte  
81 d'Ivoire, Mali, and Senegal [29] where the national HIV prevalence in 2021 were was 1.9% (1.7%-2.2%) , 0.8%  
82 (0.6%-1%) , and 0.3% (0.3%-0.4%) respectively [30].

83 To preserve the anonymity and confidentiality of HIVST and not impede their use, ATLAS decided, in line  
84 with WHO recommendations, not to track the use and outcomes of distributed HIVST kits systematically. Such  
85 tracking can be logistically challenging and costly and could limit the distribution, redistribution and use of  
86 HIVST [31]. Without systematic tracking, it is challenging to obtain information on the users of the HIVST,  
87 their results and on linkage to confirmatory testing and treatment, which are crucial indicators to assess  
88 program effectiveness and impact. For instance, the positivity rate can reflect the yield of new individuals  
89 diagnosed with HIV and if the testing modality is indeed reaching those in need. Diagnosed individuals must  
90 seek confirmatory testing and be linked to care to maximise health benefits and decrease onward transmission

91 We conducted an innovative survey by setting up an anonymous and free telephone platform in Côte  
92 d'Ivoire, Mali and Senegal while preserving anonymity and encouraging voluntary participation. A second  
93 phase of the survey was conducted among those with an HIVST reactive result in the first survey. Here we  
94 present the HIV test positivity rates from the phase 1 questionnaire and the links with confirmatory tests and  
95 care.

96

## Materials and Methods

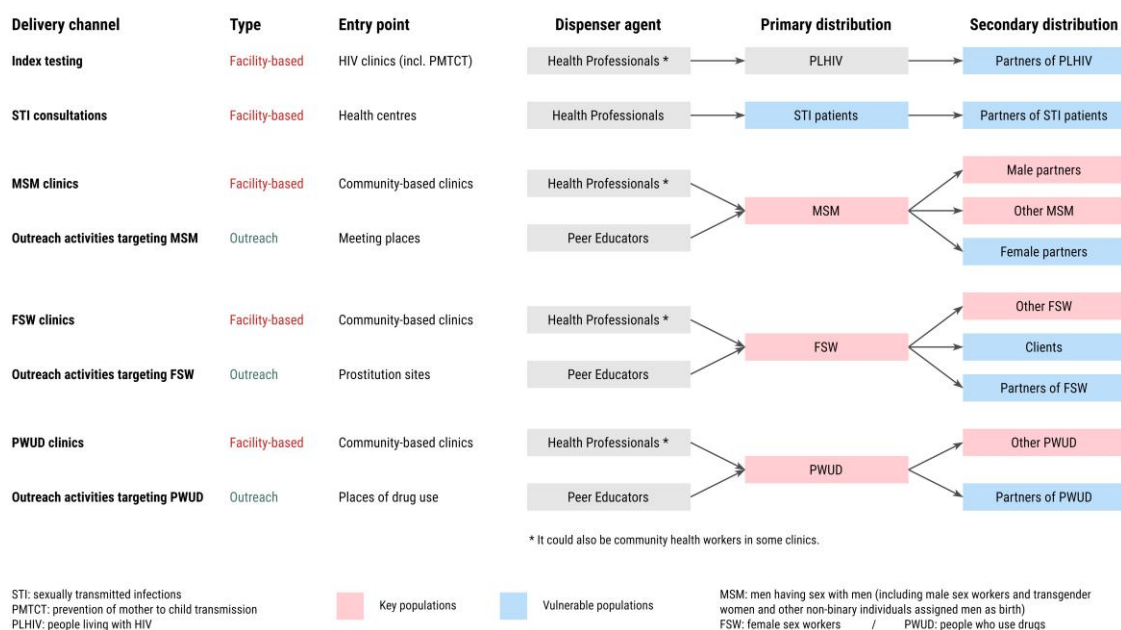
### ATLAS program description

97 ATLAS HIVST distribution was integrated into existing testing policies, programmes and activities in each  
98 country; 397 367 HIVST kits were freely distributed between July 2019 and February 2022 as part of the three  
99 countries' national AIDS strategies. At the time of ATLAS's implementation in 2019, only small-scale HIVST pilot  
100 programs had been previously conducted in Senegal and Côte d'Ivoire, whereas Mali had no previous  
101 experience of HIVST. In Senegal, for instance, the first pilot survey took place between April 2017 and June  
102 2018 [32].

103 The design of the different delivery channels and the priority populations were developed with country  
104 stakeholders including national AIDS programs/councils, international institutions including the WHO,  
105

106 international and national non-governmental organisations involved in local HIV programs, and civil society  
 107 and community leaders. ATLAS HIVST distribution was organised through eight different operational delivery  
 108 channels (Figure 1), i.e. five facility-based approaches (delivery of HIVST kits through public or community-  
 109 based health facilities) and three community-based approaches involving outreach activities engaging female  
 110 sex workers (FSW), men who have sex with men (MSM), and people who use drugs (PWUD) [29]. Peer  
 111 educators conducted these outreach activities through group activities (e.g. talks, discussion groups, night  
 112 visits, social events, or parties) and face-to-face activities (e.g. home visits). Outreach activities represented  
 113 the majority (~85%) of ATLAS's distribution volume.  
 114

### ATLAS delivery channels to reach key populations and other vulnerable populations



115

116 **Figure 1.** ATLAS delivery channels (adapted from Rouveau et al., 2021, Describing, analysing and  
 117 understanding the effects of the introduction of HIV self-testing in West Africa through the ATLAS  
 118 programme in Côte d'Ivoire, Mali and Senegal, BMC Public Health, <https://doi.org/10.1186/s12889-021-10212-1>). FSW=female sex workers, MSM=men who have sex with men, PLHIV=people living with HIV  
 119 PMTCT=prevention of mother-to-child transmission, PWUD=people who use drugs, STI=sexually  
 120 transmitted infection.  
 121

122  
 123 ATLAS activities relied on both primary and secondary distribution. HIVST kits were distributed by peer  
 124 educators and healthcare professionals to primary contacts for their personal use (primary distribution). With  
 125 secondary distribution, primary contacts were provided HIVST kits and invited to redistribute them to their  
 126 peers, partners, and clients. These secondary contacts were often members of key populations that can be  
 127 more difficult to engage in HIV prevention, along with other peripheral vulnerable populations. This chain-  
 128 referral distribution of HIVST implies that end-users were not limited to primary contacts.

129 Only oral self-testing (OraQuick HIV Self-Test®) has been distributed through ATLAS. OraSure Technologies,  
 130 the manufacturer of the OraQuick test, accompanies each HIVST kit with a user manual for result  
 131 interpretation. OraQuick HIVST results should be interpreted as follow. It is reactive if two lines (C & T) are  
 132 visible (even barely), non-reactive if only the C (control) line is visible, and invalid if no line is visible or if only  
 133 the T (test) line is visible.

134 In addition to the manufacturer's instructions (Figure 2), locally adapted brochures and explanatory videos  
 135 in French and local languages have been developed to help users perform the test, interpret the result and  
 136 know what actions should be taken following a non-reactive, a reactive or indeterminate result. They also  
 137 encouraged people with a reactive HIVST to seek confirmatory HIV testing and care. Individuals with a non-  
 138 reactive test were invited to retest after 3 months if still exposed to HIV. Existing toll-free hotlines in each

139 country were strengthened and trained on HIVST, to offer information about HIV, prevention, testing, use and  
140 interpretation of HIVST and counseling.  
141

# ORAQUICK® HIV SELF-TEST

## INTERPRETING RESULTS Read test results in a well-lit area

### HIV POSITIVE RESULT



Two complete lines, even if the line is faint, means you may be HIV POSITIVE and you need to seek additional testing by a trained professional to confirm an HIV diagnosis.



As soon as possible . . .  
Visit your nearest  
HIV Testing Centre or  
Health Facility

### HIV NEGATIVE RESULT

#### IF READ BEFORE 20 MINUTES, RESULT MAY NOT BE CORRECT



ONE LINE next to the "C" and NO line next to the "T", your result is HIV NEGATIVE.

Seek regular testing. If you may have been exposed to HIV, test again in 3 months.

### INVALID RESULT



If there is no line next to the "C" (even when there is a line next to the "T"), the test line or control line are not complete (all the way across the window), or a red background makes it impossible to read the test, the test is not working and should be repeated. **You will need to obtain another test.**



The test did not work properly.  
Visit your nearest HIV Testing  
Centre or Health Facility to  
test again.

### NOT SURE OF RESULT

You do not know your result or you are unsure of your result. Visit your nearest HIV Testing Centre or Health Facility to test again.

### DISPOSE

Remove the test stick, put the cap on the test tube, place in the disposal bag provided and throw away all contents in the normal trash.



142

143  
144

**Figure 2.** Guidelines for interpreting HIVST result, extracted from the English version of the manufacturer instructions for use (OraQuick HIV Self-Test®)

### 145 Study design and data collection

146 The ATLAS program embedded multiple research activities, from qualitative studies to economic analyses,  
147 which have been described in detail elsewhere [17, 29, 33–36].

148 The program included a voluntary anonymous phone survey. Between mid-March and mid-June 2021,  
149 dedicated survey flyers were distributed with the HIVST kits inviting self-test users in each country to call a toll-

150 free number to complete a questionnaire (phase 1). All calls from the three countries, over the same period,  
151 were rerouted to a telephone platform located in Abidjan and operated by Ipsos Côte d'Ivoire, which was  
152 selected following an international call for tenders.

153 The questionnaire, which lasted 20 to 30 minutes, collected information on sociodemographic  
154 characteristics of HIVST users, testing history, sexual and preventive behaviours, HIVST use and difficulties  
155 encountered. Specifically, each participant was asked about the number of lines that appeared when reading  
156 the HIVST result and their self-interpretation of it (reactive or non-reactive). A pilot survey was initially  
157 conducted without offering financial compensation to the participants.[37] Following the results, we decided  
158 to introduce a reward as a token of appreciation for the time participants dedicated to the survey  
159 Consequently, completion of the questionnaire was rewarded with 2 000 XOF ( $\approx$ 3.40 USD) of phone  
160 communication credit. In order to participate in the survey, participants had to be of legal age to use an HIVST  
161 on their own without parental permission (16 years in Côte d'Ivoire, 18 years in Mali, and 15 years in Senegal)  
162 and had to have used an HIVST provided to them through the ATLAS project.

163 As the survey was anonymous, there was a risk that some HIVST users may participate more than once or  
164 that individuals who have never used HIVST tried to participate to receive the financial incentive. To limit these  
165 risks, several measures were taken: (i) the leaflet distributed with the HIVST kits had a unique 9-digit number  
166 generated by the research team that was requested prior to participation in the survey, (ii) the same unique  
167 number could not be used twice, (iii) the financial incentive was only paid out once the questionnaire was fully  
168 completed (however individuals could refuse to answer any particular question), (iv) the same telephone  
169 number could not be used twice to receive the telephone credit. These unique 9-digit numbers were generated  
170 non-sequentially and were grouped by country, delivery channel and implementing partner. Thus, any unique  
171 number could indirectly identify the delivery channel where the HIVST kit was initially dispensed.

172 The time when participants received their HIVST kit was not collected. However, as a survey leaflet was  
173 mandatory to participate, we could estimate that all participants received their HIVST kit during the survey  
174 period (i.e. between mid-March and mid-June 2021).

175 In total, 2 615 participants were recruited for phase 1[38]. Those who reported two lines or a reactive  
176 result ( $n=126$ ) were asked for their consent to be called back a few months later to participate in a  
177 complementary survey and, if consented, to provide a phone contact ( $n=120$ ). As some individuals may delay  
178 their decision to undergo a confirmatory test by several weeks/months after using an HIV self-test, we chose  
179 a minimum of 3-month gap between our two surveys to potentially get an estimate of the maximum number  
180 of participants who eventually underwent confirmatory testing. From September 27<sup>th</sup> to October 22<sup>nd</sup>, 2021,  
181 96 were successfully recontacted and invited to complete a 5-minute questionnaire (phase 2) on linkage to  
182 confirmatory testing and care. Among those, 89 accepted to participate in phase 2 and 78 fully completed  
183 phase 2 questionnaire.

184 The interviews were conducted in either French, English, Bambara, or Wolof. On-the-fly translation into  
185 other local languages was also available. Compensation of XOF 2 000 ( $\approx$ 3.40 USD) in the form of telephone  
186 credit was given to participants who completed the phase 2 questionnaire. Unlike in phase 1, it was not a  
187 financial incentive as participants were informed about it only at the end of the interview. Interviews were not  
188 audio-recorded. Questionnaires' responses were captured on a computer and stored in a database managed  
189 by PAC-CI, an Ivorian research institute with expertise in clinical research.

190 At the end of the survey, collected telephone numbers (for appointments and rewards) were deleted from  
191 the database. All procedures have been described in a publicly available data management plan  
192 (<https://dmp.opidor.fr/plans/3354/export.pdf>). The complete project protocol, including the data  
193 management plan (required by the ethics committees), was written in French .

## 194 **Data analysis**

195 Based on phase 1 participants' self-reports, we distinguished those having reported an HIVST result  
196 consistent with both the reported number of visible lines and the reported self-interpretation (2 visible lines  
197 and result interpreted as reactive, one line and interpreted as non-reactive, or no/one line and interpreted as  
198 invalid), an inconsistent result, or a partial result (they refused to answer or answered they didn't know to one  
199 or both questions ).

200 To estimate HIVST positivity rates, we separately considered the self-interpreted results and the reported  
201 number of lines on the HIVST. For each source, we made three hypotheses (low, central, and high) about "don't  
202 know" and refusals (DK-R). Using self-reported results (respectively the reported number of visible lines), the

203 low hypothesis considered DK-R as non-reactive (as one line), and the high hypothesis as reactive (as two lines),  
204 while DK-R were excluded from both the numerator and the denominator in the central hypothesis. Positivity  
205 rates were stratified by respondents' gender, country, and distribution channel.

206 We described the selection of eligible participants for phase 2 questionnaires and corresponding  
207 participation rates. To assess any participation bias, characteristics of phase 2 participants were compared  
208 with individuals eligible for phase 2 but who did not participate and with phase 1 participants not eligible for  
209 phase 2.

210 Among phase 2 eligible participants who completed their questionnaire, linkage to confirmatory testing,  
211 the proportion being confirmed HIV positive, and the proportion who initiated treatment were described,  
212 stratified by the reported number of lines and self-interpreted HIVST result in phase 1 questionnaire.

213 We also describe (i) for those who did not link to confirmatory testing, the main reported reason; and (ii)  
214 for those who did link to confirmatory testing, the type of facility attended for confirmation and the time  
215 between HIVST and confirmatory testing.

216 A dedicated anonymised dataset and the corresponding R script are available on Zenodo  
217 (<https://doi.org/10.5281/zenodo.8329454>) to allow replication of the analysis. All analyses have been  
218 performed using R version 4.3.1 [39]. All the descriptive tables were generated using the *tbl\_summary()*  
219 function from the *gtsummary* package [40]. Confidence intervals (95% confidence interval, 95%CI) were  
220 computed using Wilson's method with Yate's continuity correction (*prop.test()* function).  
221

## 222 **Ethics**

223 ATLAS research protocol (version 3.0, October 8 2020) has been approved by the WHO Ethical Research  
224 Committee (January 12, 2021, reference: ERC 0003181), the National Ethics Committee for Life Sciences and  
225 Health of Côte d'Ivoire (November 27, 2020, reference: 191-20/MSHP/CNESVS-km, IRB:000111917), the Ethics  
226 Committee of the Faculty of Medicine and Pharmacy of the University of Bamako, Mali (November 16, 2020,  
227 reference: 2020/254/CE/FMPOS/FAPH), and the National Ethics Committee for Health Research of Senegal  
228 (January 26, 2021, protocol SEN19/32, n°8 MSAS/CNERS/Sec).

229 The full research protocol was written in French ([https://hal.science/ATLAS\\_ADVIH/hal-04121482v1](https://hal.science/ATLAS_ADVIH/hal-04121482v1)). The  
230 peer-reviewed protocol has been published in English elsewhere [29].

## 231 **Results**

### 232 **HIVST results**

233 Of the 2 615 participants recruited in phase 1, 2 346 (89.7%) reported a self-interpreted HIVST result  
234 consistent with their reported number of visible lines on the HIVST: 2 292 (88.0%) reported one line self-  
235 interpreted as non-reactive, 50 (1.9%) two lines self-interpreted as reactive, and 4 (0.2%) no/one line self-  
236 interpreted as invalid (table 1). In contrast, 48 (1.8%) reported inconsistent answers: 10 (0.4%) one line self-  
237 interpreted as reactive, 35 (1.3%) two lines self-interpreted as non-reactive/ and 3 (0.1%) no line self-  
238 interpreted as non-reactive.

239 Finally, 221 (8.5%) reported a partial result: 147 (5.6%) reported 0, 1 or 2 lines but did not know how to  
240 interpret the result or refused to answer, 46 (1.7%) self-interpreted their result but did not know or refused to  
241 report the number of lines, and 28 (1.1%) did not know or refused to answer to both questions



242

243 **Table 1.** Self-reported HIV self-test (HIVST) result, reported number of lines on the HIVST, and positivity rates  
 244 according to different hypotheses among participants of the first phase of the survey in Côte d'Ivoire, Mali,  
 245 and Senegal (2021).

Phase 1 participants	Formula	2615 (100%)
<b>Consistent answer (C)</b>	<b><math>C = C_1 + C_2 + C_3</math></b>	<b>2346 (89.7%)</b>
2 lines / reactive <sup>†</sup>	$C_1$	50 (1.9%)
1 line / non-reactive	$C_2$	2 292 (88%)
0-1 line/ invalid	$C_3$	4 (0.2%)
<b>Inconsistent answer (I)</b>	<b><math>I = I_1 + I_2 + I_3 + I_4 + I_5</math></b>	<b>48 (1.8%)</b>
1 line / reactive <sup>†</sup>	$I_1$	10 (0.4%)
0 line / reactive <sup>†</sup>	$I_2$	0 (0%)
2 lines/ non-reactive <sup>†</sup>	$I_3$	35 (1.3%)
0 line / non-reactive	$I_4$	3 (0.1%)
2 lines/ invalid <sup>†</sup>	$I_5$	0 (0%)
<b>Partial answer (P)</b>	<b><math>P = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7</math></b>	<b>221 (8.5%)</b>
0 line / DK-R	$P_1$	1 (<0.1%)
1 line / DK-R	$P_2$	117 (4.5%)
2 lines/ DK-R <sup>†</sup>	$P_3$	29 (1.1%)
DK-R / reactive <sup>†</sup>	$P_4$	2 (<0.1%)
DK-R / non-reactive	$P_5$	44 (1.7%)
DK-R / invalid	$P_6$	0 (0%)
DK-R / DK-R	$P_7$	28 (1.1%)
<b>Positivity Rate</b>		
<b>Based on self-interpreted test results</b>		
Low hypothesis (DK-R as not reactive)	$(C_1 + I_1 + I_2 + P_4) / n$	62 / 2615 (2.4 %)
Central hypothesis (DK-R excluded)	$(C_1 + I_1 + I_2 + P_4) / (C + I + P_4 + P_5 + P_6)$	62 / 2440 (2.5 %)
High hypothesis (DK-R as reactive)	$(C_1 + I_1 + I_2 + P_1 + P_2 + P_3 + P_4 + P_7) / n$	237 / 2615 (9.1%)
<b>Based on the reported number of lines</b>		
Low hypothesis (DK-R as 1 line)	$(C_1 + I_3 + I_5 + P_3) / n$	114 / 2615 (4.4 %)
Central hypothesis mid (DK-R excluded)	$(C_1 + I_3 + I_5 + P_3) / (C + I + P_1 + P_2 + P_3)$	114 / 2541 (4.5 %)
High hypothesis (DK-R as 2 lines)	$(C_1 + I_3 + I_5 + P_3 + P_4 + P_5 + P_6 + P_7) / (C + I + P_1 + P_2 + P_3)$	188 / 2615 (7.2 %)
†: Eligible for phase 2 Survey		
DK: don't know. R: refused to answer		

246

247 **HIVST positivity rates**

248 Based on self-interpreted HIVST results, the overall positivity rate was 2.4% when DK-R were considered  
 249 non-reactive (low hypothesis, Figure 3, Table S2). Rate was similar at 2.5% by excluding DK-R from the  
 250 numerator and the denominator (central hypothesis). Considering DK-R as reactive (high hypothesis) increased  
 251 the positivity rate to 9.1%. Estimates based on the reported number of visible lines on the HIVST were 4.4%,  
 252 4.5% and 7.2%, respectively, for the low, central, and high hypotheses. Positivity rates ranged from 1.8% to  
 253 9.8% in Côte d'Ivoire, 3.5% to 7.8% in Mali, and 1.2% to 15.0% in Senegal depending on the hypothesis (e.g.,  
 254 low or high; Figure S4, Table S2).

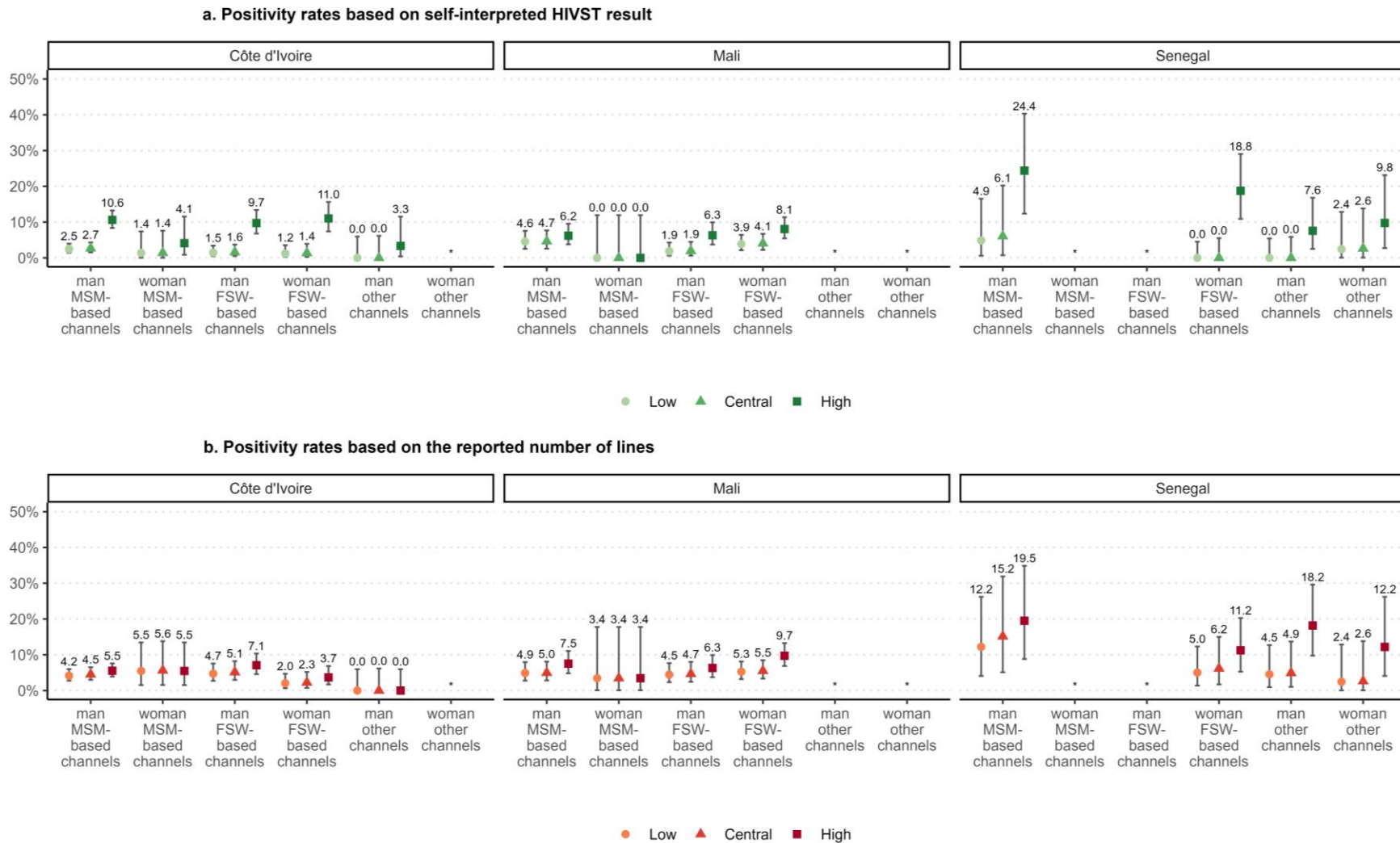
255 Positivity rates (central hypothesis based on the number of lines) were higher among participants recruited  
256 through community-based distribution channels. It was 4.8% for men and 4.9% for women in the MSM-based  
257 channels, and 4.6% for men and 4.2% for women in the FSW-based channels. Compared to 3.1% for men and  
258 2.9% for women in the other distribution channels (PWUD-based and facility-based).

259 When analyzing positivity rates by age group (Table S3), for those under 24 years old, the rates ranged  
260 from 2.2% to 7.4% based on the reported self-interpreted result and from 3.1% to 5.9% based on the reported  
261 number of lines. Among those aged 25 to 34 years old, it fluctuated between 2.7% and 9.5% based on the  
262 reported self-interpreted result and from 4.9% to 7.8% based on the reported number of lines. Lastly, for  
263 individuals 35 years old or older, the rate layed between 1.8% and 12% based on the reported self-interpreted  
264 result and between 4.9% and 9.3% based on the reported number of lines.

## 265 **Participation in phase 2**

266 During phase 1, 126 individuals reported two lines or self-interpreted their result as reactive and were  
267 therefore eligible for phase 2 (Table 1). Among them, 6 refused to be re-contacted after phase 1 (Figure 4).  
268 Among the 120 (95%) who agreed to be re-contacted, 24 (20%) were unreachable at the time of the phase 2  
269 survey, and 96 (80%) were successfully re-contacted. Among the latest, 89 (93%) accepted to participate in the  
270 phase 2 survey. Ten dropped out before the end of the interview, and 1 disconnected and was unreachable  
271 afterwards. As a result, 78 participants completed phase 2 questionnaire. Of the 78 participants, 39 (50%) were  
272 from Côte d'Ivoire, 31 (40%) from Mali, and 8 (10%) from Senegal (Table S1). Participation rates were 54% for  
273 participants who reported a consistent result (2 lines and reactive), 71.1% for those with an inconsistent result  
274 (either 2 lines & non-reactive, or 1 line & reactive), and 65.5% for those reporting a partial result (2 lines & DK-  
275 R or DK-R & reactive).

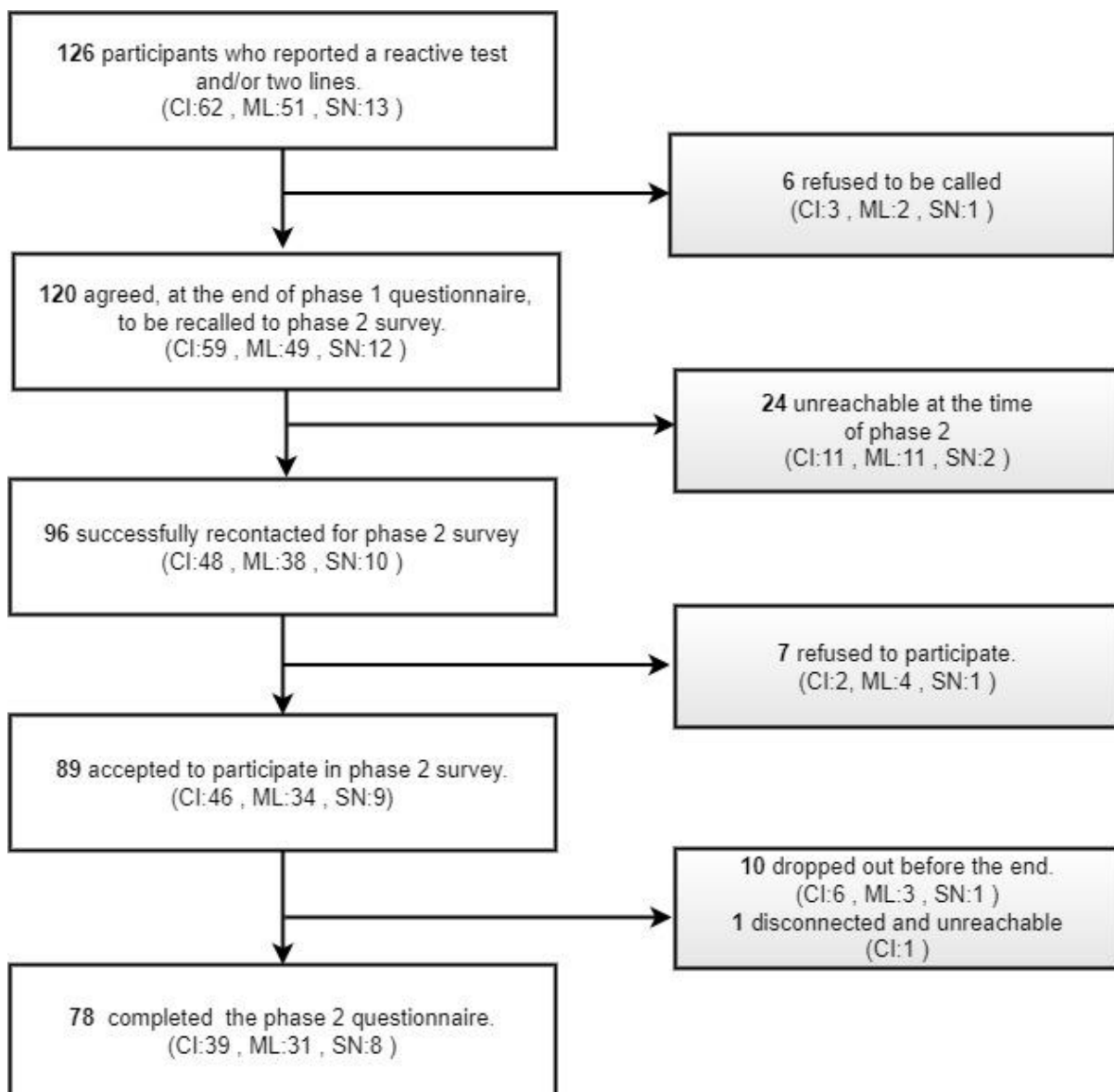
276 The participants who completed the phase 2 questionnaire had similar sociodemographic characteristics  
277 (e.g. country, sex, distribution channel, age group, marital status) compared to those eligible for phase 2, but  
278 that did not complete it, and to phase 1 participants not eligible for phase 2 (Table S1). For most participants  
279 (86%), phase 2 questionnaire was completed between 4 and 6 months after phase 1 questionnaire (Table S5).



280

281  
282  
283

**Figure 3.** Positivity rates and 95%CI based on self-interpreted HIVST results or the reported number of visible lines, by distribution channel, gender and country, among participants of the first survey phase in Côte d'Ivoire, Mali, and Senegal (2021). The asterisk indicate that there was no participant in that distribution channel. FSW=female sex worker, MSM=men who have sex with men.



284

285  
286  
287

**Figure 4.** Flow chart of the participant selection process for the 2nd phase of the survey in Côte d'Ivoire (CI), Mali (ML), and Senegal (SN) (2021).

288 **Linkage to confirmatory testing and care**

289 Overall, 34 of the 78 who completed the phase 2 questionnaire (44%) reported having performed  
290 confirmatory testing. Linkage was higher for those who reported 2 lines and correctly self-interpreted their  
291 result as reactive (56%,95%CI: 36-74%), than for those who reported two lines but did not know or refused  
292 to report their test interpretation ( 44%, (95%CI: 22-69%) and those who reported 2 lines but incorrectly  
293 self-interpreted the result as non-reactive (36%, 95%CI: 19-57%) (Table 3). Finally, among the 8 participants  
294 who reported none/one line or did not know how many lines and incorrectly self-interpreted the result as  
295 reactive, only 2 linked to confirmatory testing.

296 The main reason given for not linking to confirmatory testing was that *“their HIVST was non-reactive”*  
297 (18/44, 41%, and although 8 of these 18 reported a reactive result in phase 1 questionnaire), followed by  
298 *“not knowing that a confirmation test was required”* (10/44, 23%), and *“not having time”* (8/44, 18%) (Table  
299 S4).

300 When participants were linked to confirmatory testing, it was usually shortly after performing their  
301 HIVST: 53% linked in less than one week and 91% in less than 3 months (Table S5). Most participants (65%)  
302 performed their confirmatory testing in a general public facility (health centre, hospital, clinic or maternity)  
303 whereas 35% chose a community-based clinic or health centre dedicated to key populations (Table S6).

304 Among the 34 that linked to confirmatory testing, 19 (56%, 95%CI: 38-72%) were confirmed HIV-  
305 positive, and 18 (95%, 95%CI; 72-100%) initiated antiretroviral treatment. Of the 18 participants who  
306 initiated ART, 11 (72%) underwent their confirmation test less than a week after their self-test, 2 (11%) did  
307 so between 1 and 2 weeks, 1 (5.6%) between 3 and 4 weeks, 1 (5.6%) waited between 1 and 2 months, and  
308 1 (5.6%) proceeded with the test three months later. Among the 27 who reported a consistent reactive  
309 result in the phase 1 questionnaire, 15 (56%, 95%CI: 36-74%) linked to confirmatory test, 12 (80%) were  
310 confirmed HIV-positive and all started treatment (100%).

311  
312

313  
314

**Table 2.** Linkage to confirmatory testing, proportion being confirmed HIV positive and treatment initiation, by reported number of lines and self-interpreted HIVST result among eligible participants of the second phase of the survey who completed their questionnaire in Côte d'Ivoire, Mali, and Senegal (2021).

Reported number of lines/ self-interpreted HIVST result	Completed phase 2 n	Linked to confirmatory testing		Confirmed HIV positive		Initiated ART	
		n (%)	95%CI	n (%)	95%CI	n (%)	95%CI
Overall	78	34 (44%)	33% to 55%	19 (56%)	38% to 72%	18 (95%)	72% to 100%
2 lines / reactive	27	15 (56%)	36% to 74%	12 (80%)	51% to 95%	12 (100%)	70% to 100%
1 line / reactive	7	1 (14%)	1% to 58%	0 (0%)	0% to 80%		
2 lines / non-reactive	25	9 (36%)	19% to 57%	3 (33%)	9% to 69%	3 (100%)	31% to 100%
2 lines / DK-R	18	8 (44%)	22% to 69%	4 (50%)	22% to 78%	3 (75%)	22% to 99%
DK-R / reactive	1	1(100%)	5% to 100%	0 (0%)	0% to 95%		

315  
316

DK: don't know. R: refuse to answer. CI: confidence interval.

317

## Discussion

318 Our study shows that the strategy implemented by the ATLAS program, through the secondary  
319 distribution of HIVST kits and dedicated channels, achieved HIV positivity rates ranging from 2.4% to 9.1%  
320 based on the reported result, and from 3.8% to 7.2% based on the number of lines reported. The proportion  
321 of participants with a reactive HIVST that sought confirmatory testing was 44% (95% CI: 33%-55%). Of  
322 those who underwent confirmatory testing, 56% (95% CI: 38%-72%) were found to be HIV-positive and,  
323 among them, 95% (95% CI: 72%-100%) initiated treatment. Among the participants who confirmed their  
324 reactive HIVST with a traditional facility-based HIV test, 65% did so within a week and 91% within three  
325 months.

326

327 According to our estimates, HIVST positivity rates ranged from 1.8% to 9.8% in Côte d'Ivoire, 3.5% to  
328 7.8% in Mali, and 1.2% to 15.0% in Senegal depending on how missing results (e.g., “don't know” and  
329 refusals) were classified. Overall, these results for HIVST positivity are generally higher than the average  
330 overall positivity of HIV testing services (excluding HIVST) in West Africa. For instance, in 2020 an estimated  
331 1.9% of all HIV tests performed were found to be positive in the region (95% credible intervals: 1.3 to 2.7%)  
332 [41]. Further, among 15-24 and 25-34 years old, which constitute more than 80% of our sample, overall  
333 positivity was 0.9% (0.7 to 1.3%) and 1.6% (1.2 to 2.2%), respectively. Collectively, these results provide  
334 evidence that HIVST is a high-yield testing modality that can address the unmet HIV testing needs of key  
335 populations and their partners.

336

337 It is important to interpret these HIV positivity rates while considering the treatment-adjusted  
338 prevalence (i.e., removing those on treatment from the numerator and denominator of HIV prevalence), a  
339 more reliable indicator for evaluating the effectiveness of targeted screening programs [42]. In West Africa,  
340 the treatment-adjusted prevalence remained relatively low in 2021: 0.6% in Côte d'Ivoire, 0.7% in Mali,  
341 and 0.06% in Senegal, according to UNAIDS data (<https://aidsinfo.unaids.org/>). Our results suggest that the  
342 ATLAS HIVST distribution strategy successfully reached people living with HIV. In 2021, a study based on  
343 the UNAIDS-supported *Shiny90* mathematical model [43] estimated, using data from 184 population  
344 surveys and reports from national HIV screening programs from 40 sub-Saharan African countries, that the  
345 positivity rates for conventional HIV testing were 1.4% in Côte d'Ivoire, 2.2% in Mali, and 1.0% in Senegal.  
346 These rates were lower than our estimates for HIVST, even when using our lower (conservative) estimate.  
347 These rates are also in lines with those collected by ATLAS implementing partners. Between 2020 and 2021,  
348 these ATLAS partners collected spontaneous feedback from HIVST users. This unpublished data collection  
349 was non-systematic and varied from one partner to another. Among 4 463 documented feedbacks, HIVST  
350 was reactive for 188 cases (4.2%), consistent with our estimates based on the reported number of visible  
351 lines (4.5%, central hypothesis).

352

353 In our study, most participants (90%) demonstrated a consistent interpretation between the number  
354 of lines reported and the reported HIVST result. However, 2% of them inconsistently interpreted the  
355 results. Among them, a small number reported the presence of two visible lines, suggesting potential issues  
356 in interpreting the number of visible lines on HIVST kits. In the context of the ATLAS program, the  
357 distribution strategy combining primary and secondary approaches has led many HIVST users to perform  
358 their HIVST without receiving advice from a healthcare professional or a trained peer educator. Although  
359 the HIVST is not designed to require supervision, it is essential to have received information on its use  
360 before proceeding with the test. A study conducted within the framework of the ATLAS program  
361 demonstrated that the manufacturer's instructions alone were insufficient in a multilingual context with  
362 low literacy levels. The use of additional aids, such as a demonstration video or a toll-free helpline, proved  
363 necessary [44]. Similarly, a study carried out in China in 2018 on the unsupervised use of HIVST among 27  
364 MSM found that only 5 (or 19%) made no errors, and 44% received an invalid test result due to various  
365 mistakes made [45]. However, the lack of supervision is likely insufficient to explain the inconsistencies  
366 observed [23]. Some inconsistencies may result from a misunderstanding of the terms “reactive” and “non-  
367 reactive”, particularly considering that HIVST was a new tool in our context and that traditional terms used  
368 to describe conventional HIV testing are “positive” and “negative”. This possible misunderstanding of the  
369 terms is also highlighted by the fact that 8 participants reported a “reactive” result in phase 1 questionnaire

370 and then in phase 2 that their test was “*non-reactive*” as the main reason for not linking to confirmatory  
371 testing. Specific qualitative interviews or focus groups discussion with HIVST users could help better  
372 understand how they perceive different terms.

373  
374 Our linkage to confirmatory testing estimates were based on small numbers resulting in large  
375 confidence intervals. Nevertheless, the overall proportion was clearly sub-optimal (44%, 95% confidence  
376 interval from 33% to 55%). However, this estimate includes some individuals who did not adequately self-  
377 interpreted their HIVST result as reactive. When considering only those who reported two lines and self-  
378 interpreted their result as reactive, the linkage rate increased to 56% (36% to 74%). This percentage is  
379 closer to that was observed in a study conducted in Kenya on HIV testing of FSW male partners using HIVST  
380 secondary distribution, where 65% of men with a reactive result had a confirmatory test [46]. Linkage to  
381 confirmatory testing happened relatively quickly after HIVST use: 53% did it in less than a week and 91% in  
382 less than three months. Similar results were observed in a study in the general population in Zambia[47],  
383 and a study among MSM in Nigeria [48].

384  
385 The main reasons given for not linking to confirmatory testing suggest potential misinterpretation of  
386 the result or misunderstanding about the need to perform a confirmatory HIV test, highlighting the need  
387 to improve messaging around HIVST, in particular when HIV self-testing policies will be scaled-up. For those  
388 who did confirmatory testing and were confirmed HIV positive, initiation of antiretroviral treatment was  
389 almost systematic, showing good linkage to care after confirmatory testing, as observed in many HIVST  
390 studies in sub-Saharan Africa [49–51].

391  
392 Previous analyses of ATLAS data showed that HIVST could reach people not reached by conventional  
393 HIV testing approaches [52], particularly partners and clients of key populations and key population  
394 members not self-identifying as such [38]. It is consistent with the finding that two-thirds of participants  
395 who did confirmatory testing went to a general health facility rather than a community clinic dedicated to  
396 key populations. In a study conducted in 2018 in Côte d’Ivoire among MSM, one-third of the participants  
397 preferred community-based testing, one-third expressed no preference, and one-third preferred  
398 undifferentiated HIV testing services (general population), mentioning the lack of discretion and anonymity  
399 of community-based sites and the desire to avoid the gaze of others [53].

400  
401 The implementation of a telephone survey, aimed at gathering information from HIVST users while  
402 preserving anonymity and without interfering with secondary distribution, has proven to be very useful to  
403 evaluate the ATLAS program. However, its high cost makes it difficult to integrate it into national strategies  
404 for assessing the impact of HIVST. Nevertheless, other impact evaluation methods, such as data  
405 triangulation [35] and modelling [36], may prove more suitable for routine monitoring of HIVST’s impacts.

406  
407 A previous analysis of this survey among ATLAS HIVST users showed that HIVST secondary distribution  
408 was feasible and acceptable [38]: participants reported that they appreciated the ease of use of HIVST, its  
409 discretion and the fact that they are autonomous in carrying out the test. Finally, HIVST appeared as a  
410 relevant additional approach for those usually distant from community activities and HIV testing services,  
411 and has the potential to reach, beyond key populations, partners, clients, and other groups vulnerable to  
412 HIV.

413  
414 ATLAS’ HIVST distribution strategy successfully reached people living with HIV in West Africa, although  
415 linkage to confirmatory testing remained sub-optimal in these first years of HIVST implementation.  
416 However, among participants who confirmed their reactive self-test result with a traditional facility-based  
417 HIV test, a substantial proportion quickly proceeded with this confirmation (more than half in less than a  
418 week and the vast majority in less than three months). Furthermore, if individuals were confirmed HIV-  
419 positive, almost all began antiretroviral treatment. We showed that HIVST has the potential to reach more  
420 hidden populations and constitutes a relevant complementary tool to existing screening services. To fully  
421 harness the potential of self-tests, messaging around HIVST and its interpretation could be improved.

422



423

## Appendices

424

**Table S1.** Eligibility and participation in phase 2 survey by sociodemographic characteristics, distribution channel, HIV testing history, the reported number of lines and the self-interpreted HIV self-testing (HIVST) result

425

	Eligible for phase 2 completed the questionnaire N=78	Eligible for phase 2 but did not complete the questionnaire N= 42	Not eligible for Phase 2 N = 2 495	p-value (Chi <sup>2</sup> test)	Overall N= 2 615 (phase 1 participants)
<b>Country</b>				0.9	
Côte d'Ivoire	39 (50%)	20 (48%)	1 331 (53%)		1 390 (53%)
Mali	31 (40%)	18 (43%)	935 (37%)		984 (38%)
Senegal	8 (10%)	4 (9.5%)	229 (9.2%)		241 (9.2%)
<b>Sex and distribution channel</b>				0.3	
Man : MSM-based channels	35 (45%)	14 (33%)	948 (38%)		997 (38%)
Woman : MSM-based channels	5 (6.4%)	0 (0%)	98 (3.9%)		103 (3.9%)
Man : FSW-based channels	22 (28%)	10 (24%)	588 (24%)		620 (24%)
Woman : FSW-based channels	14 (18%)	15 (36%)	656 (26%)		685 (26%)
Man: Other delivery channels	1 (1.3%)	2 (4.8%)	134 (5.4%)		137 (5.2%)
Woman : Other delivery channels	1 (1.3%)	1 (2.4%)	71 (2.8%)		73 (2.8%)
<b>Age group</b>				0.5	
15-24 years or less	27 (35%)	20 (48%)	1 117 (45%)		1 164 (45%)
25-34 years	38 (49%)	16 (38%)	1,009 (40%)		1 063 (41%)
35 years or more	13 (17%)	6 (14%)	369 (15%)		388 (15%)
<b>Marital status</b>				0.3	
single	54 (69%)	28 (67%)	1 679 (67%)		1 761 (67%)
divorced / separated / widowed	6 (7.7%)	2 (4.8%)	89 (3.6%)		97 (3.7%)
living with partner / married	18 (23%)	12 (29%)	727 (29%)		757 (29%)
<b>Educational level</b>				0.057	
none / primary	13 (17%)	10 (24%)	480 (19%)		503 (19%)
secondary	50 (64%)	28 (67%)	1 354 (54%)		1 432 (55%)
higher	15 (19%)	4 (9.5%)	661 (26%)		680 (26%)
<b>First-time tester</b>				0.3	
no	40 (51%)	22 (52%)	1 475 (59%)		1 537 (59%)
yes	38 (49%)	20 (48%)	1 020 (41%)		1 078 (41%)

426

	Eligible for phase 2 completed the questionnaire N=78	Eligible for phase 2 but did not complete the questionnaire N= 42	Not eligible for Phase 2 N = 2495	p-value (Chi <sup>2</sup> test)	Total N= 2 615 (phase 1 participants)
<b>Result and number line</b>				<0.001	
2 lines / reactive	27 (35%)	20 (48%)	3 (0.1%)		50 (1.9%)
1 line / non-reactive	0 (0%)	0 (0%)	2 292 (92%)		2 292 (88%)
0-1 line / invalid	0 (0%)	0 (0%)	4 (0.2%)		4 (0.2%)
1 line / reactive	7 (9.0%)	3 (7.1%)	0 (0%)		10 (0.4%)
2 lines / non-reactive	25 (32%)	9 (21%)	1 (<0.1%)		35 (1.3%)
0 line / non-reactive	0 (0%)	0 (0%)	3 (0.1%)		3 (0.1%)
0 line / DK-R	0 (0%)	0 (0%)	1 (<0.1%)		1 (<0.1%)
1 line / DK-R	0 (0%)	0 (0%)	117 (4.7%)		117 (4.5%)
2 lines / DK-R	18 (23%)	9 (21%)	2 (<0.1%)		29 (1.1%)
DK-R / reactive	1 (1.3%)	1 (2.4%)	0 (0%)		2 (<0.1%)
DK-R / DK-R	0 (0%)	0 (0%)	28 (1.1%)		28 (1.1%)
DK-R / non-reactive	0 (0%)	0 (0%)	44 (1.8%)		44 (1.7%)

427

FSW: female sex workers, MSM: men having sex with men

428

429 **Table S2.** Positivity rates based on self-interpreted HIVST results or the reported number of visible lines, by distribution channel, gender and country, among  
 430 participants of the first survey phase in Côte d'Ivoire, Mali, and Senegal (2021).

			MSM-based channels		FSW-based channels		Others delivery channels		Total
			Man	Woman	Man	Woman	Man	Woman	
<b>Positivity rate based on self-reported HIVST results</b>	<b>Low</b>	Côte d'Ivoire	2.5% (16/650)	1.4% (1/73)	1.5% (5/339)	1.2% (3/245)	0% (0/60)	0% (0/23) †	1.8% (25/1 390)
		Mali	4.6% (14/306)	0% (0/29)	1.9% (5/269)	3.9% (14/360)	9.1% (1/11) †	0% (0/9) †	3.5% (34/984)
		Senegal	4.9% (2/41)	0% (0/1) †	0% (0/12) †	0% (0/80)	0% (0/66)	2.4% (1/41)	1.2% (3/241)
		Overall	3.2% (32/997)	1.0% (1/103)	1.6% (10/620)	2.5% (17/685)	0.7% (1/137)	1.4% (1/73)	2.4% (62/2 615)
	<b>Central</b>	Côte d'Ivoire	2.7% (16/597)	1.4% (1/71)	1.6% (5/311)	1.4% (3/221)	0% (0/58)	0% (0/21) †	2.0% (25/1 279)
		Mali	4.7% (14/301)	0% (0/29)	1.9% (5/257)	4.1% (14/345)	9.1% (1/11) †	0% (0/9) †	3.6% (34/952)
		Senegal	6.1% (2/33)	0% (0/1) †	0% (0/11) †	0% (0/65)	0% (0/61)	2.6% (1/38)	1.4% (3/209)
		Overall	3.4% (32/931)	1.0% (1/101)	1.7% (10/579)	2.7% (17/631)	0.8% (1/130)	1.5% (1/68)	2.5% (62/2 440)
	<b>High</b>	Côte d'Ivoire	10.6% (69/650)	4.1% (3/73)	9.7% (33/339)	11% (27/245)	3.3% (2/60)	8.7% (2/23)	9.8% (136/1 390)
		Mali	6.2% (19/306)	0% (0/29)	6.3% (17/269)	8.1% (29/360)	9.1% (1/11) †	0% (0/9) †	6.7% (66/984)
		Senegal	24.0% (10/41)	0.0% (0/1) †	8.3% (1/12) †	19.0% (15/80)	7.6% (5/66)	9.8% (4/41)	15.0% (35/241)
		Overall	9.8% (98/997)	2.9% (3/103)	8.2% (51/620)	10.0% (71/685)	5.8% (8/137)	8.2% (6/73)	9.1% (237/2 615)
<b>Positivity rate based on the reported number of visible lines</b>	<b>Low</b>	Côte d'Ivoire	4.2% (27/650)	5.5% (4/73)	4.7% (16/339)	2.0% (5/245)	0% (0/60)	4.3% (1/23)	3.8% (53/1 390)
		Mali	4.9% (15/306)	3.4% (1/29)	4.5% (12/269)	5.3% (19/360)	9.1% (1/11) †	0% (0/9) †	4.9% (48/984)
		Senegal	12.2% (5/41)	0% (0/1) †	0% (0/12) †	5.0% (4/80)	4.5% (3/66)	2.4% (1/41)	5.4% (13/241)
		Overall	4.7% (47/997)	4.9% (5/103)	4.5% (28/620)	4.1% (28/685)	2.9% (4/137)	2.7% (2/73)	4.4% (114/2 615)
	<b>Central</b>	Côte d'Ivoire	4.2% (27/641)	5.5% (4/73)	4.8% (16/331)	2.1% (5/241)	0% (0/60)	4.5% (1/22) †	3.9% (53/1 368)
		Mali	5.0% (15/298)	3.4% (1/29)	4.5% (12/264)	5.5% (19/344)	9.1% (1/11) †	0% (0/9) †	5.0% (48/955)
		Senegal	13.2% (5/38)	0% (0/1) †	0% (0/10) †	5.3% (4/75)	5.3% (3/57)	2.7% (1/37)	6.0% (13/218)
		Overall	4.8% (47/977)	4.9% (5/103)	4.6% (28/605)	4.2% (28/660)	3.1% (4/128)	2.9% (2/68)	4.5% (114/2 541)
	<b>High</b>	Côte d'Ivoire	5.5% (36/650)	5.5% (4/73)	7.1% (24/339)	3.7% (9/245)	0% (0/60)	8.7% (2/23) †	5.4% (75/1 390)
		Mali	7.5% (23/306)	3.4% (1/29)	6.3% (17/269)	9.7% (35/360)	9.1% (1/11) †	0% (0/9) †	7.8% (77/984)
		Senegal	19.5% (8/41)	0% (0/1) †	16.7% (2/12) †	11.2% (9/80)	18.2% (12/66)	12.2% (5/41)	14.9% (36/241)
		Overall	6.7% (67/997)	4.9% (5/103)	6.9% (43/620)	7.7% (53/685)	9.5% (13/137)	9.6% (7/73)	7.2% (188/2 615)

431 DK: don't know. R: refusals. FSW: female sex workers, MSM: men having sex with men, PR: positivity rate.

432 †: indicated cells with less than 25 participants.

433 Low hypothesis: DK-R as non-reactive or 1 line. Central hypothesis: DK-R excluded from the numerator and the denominator. High hypothesis: DK-R as reactive or 2 lines.

434

435  
436

**Table S3.** Positivity rates based on self-interpreted HIVST results or the reported number of visible lines, by age group and country, among participants of the first survey phase in Côte d'Ivoire, Mali, and Senegal (2021).

			15-24 years	25-34 years old	35 years or more	Total
<b>Positivity rate based on self-reported HIVST results</b>	Low	Côte d'Ivoire	1.7% (11/645)	2.0% (11/553)	1.6% (3/192)	1.8% (25/1 390)
		Mali	3.3% (15/455)	3.9% (16/415)	2.6% (3/114)	3.5% (34/984)
		Senegal	0.0% (0/64)	2.1% (2/95)	1.2% (1/82)	1.2% (3/241)
		Overall	2.2% (26/1 164)	2.7% (29/1 063)	1.8% (7/388)	2.4% (62/2 615)
	Central	Côte d'Ivoire	1.8% (11/604)	2.2% (11/506)	1.8% (3/169)	2.0% (25/1 279)
		Mali	3.4% (15/439)	4.0% (16/403)	2.7% (3/110)	3.6% (34/952)
		Senegal	0.0% (0/56)	2.4% (2/82)	1.4% (1/71)	1.4% (3/209)
		Overall	2.4% (26/1 099)	2.9% (29/991)	2.0% (7/350)	2.5% (62/2 440)
	High	Côte d'Ivoire	8.1% (52/645)	10.0% (58/553)	14.0% (26/192)	9.8% (136/1 390)
		Mali	6.8% (31/455)	6.7% (28/415)	6.1% (7/114)	6.7% (66/984)
		Senegal	13.0% (8/64)	16.0% (15/95)	15.0% (12/82)	15.0% (35/241)
		Overall	7.8% (91/1 164)	9.5% (101/1 063)	12.0% (45/388)	9.1% (237/2 615)
<b>Positivity rate based on the reported number of visible lines</b>	Low	Côte d'Ivoire	3.1% (20/645)	4.5% (25/553)	4.2% (8/192)	3.8% (53/1 390)
		Mali	4.8% (22/455)	4.8% (20/415)	5.3% (6/114)	4.9% (48/984)
		Senegal	1.6% (1/64)	7.4% (7/95)	6.1% (5/82)	5.4% (13/241)
		Overall	3.7% (43/1 164)	4.9% (52/1 063)	4.9% (19/388)	4.4% (114/2 615)
	Central	Côte d'Ivoire	3.1% (20/637)	4.6% (25/546)	4.3% (8/185)	3.9% (53/1 368)
		Mali	4.9% (22/447)	5.0% (20/401)	5.6% (6/107)	5.0% (48/955)
		Senegal	1.9% (1/54)	8.2% (7/85)	6.3% (5/79)	6.0% (13/218)
		Overall	3.8% (43/1 138)	5.0% (52/1 032)	5.1% (19/371)	4.5% (114/2 541)
	High	Côte d'Ivoire	4.3% (28/645)	5.8% (32/553)	7.8% (15/192)	5.4% (75/1 390)
		Mali	6.6% (30/455)	8.2% (34/415)	11.0% (13/114)	7.8% (77/984)
		Senegal	17.0% (11/64)	18.0% (17/95)	9.8% (8/82)	15.0% (36/241)
		Overall	5.9% (69/1 164)	7.8% (83/1 063)	9.3% (36/388)	7.2% (188/2 615)

437

438 **Table S4.** Main reason for not linking to confirmatory testing among phase 2 participants who did not link to confirmatory testing, by reported number of lines and  
 439 self-interpreted HIVST result.

	Overall	2 lines / reactive	1 line / reactive	2 lines / non-reactive	2 lines / DK-R
My test was non-reactive	18 (41%)	6 (50%)	2 (33%)	5 (31%)	5 (50%)
I didn't know we should get a confirmatory test	10 (23%)	2 (17%)	2 (33%)	5 (31%)	1 (10%)
I didn't have time	8 (18%)	3 (25%)	0 (0%)	3 (19%)	2 (20%)
I feared that others would know the result	2 (4.5%)	0 (0%)	0 (0%)	1 (6.2%)	1 (10%)
I already knew the result before using HIVST	2 (4.5%)	1 (8.3%)	1 (17%)	0 (0%)	0 (0%)
I had no specific reason	2 (4.5%)	0 (0%)	1 (17%)	1 (6.2%)	0 (0%)
I didn't know where to take the test	1 (2.3%)	0 (0%)	0 (0%)	1 (6.2%)	0 (0%)
The testing site was too far away	1 (2.3%)	0 (0%)	0 (0%)	0 (0%)	1 (10%)
Total	44 (100%)	12 (27.3%)	6 (13.6%)	16 (36.4%)	10 (22.7%)

440 DK: don't know. R: refuse to answer

441

442

443 **Table S5.** Time between HIVST and confirmatory testing among phase 2 participants who did link to confirmatory testing, by reported number of lines and self-  
 444 interpreted HIVST result.

	Overall	2 lines /reactive	1 line /reactive	2 lines /non-reactive	2 lines /DK-R	DK-R / reactive
less than a week	18 (53%)	12 (80%)	0 (0%)	0 (0%)	6 (75%)	0 (0%)
between 1 and 2 weeks	4 (12%)	1 (6.7%)	0 (0%)	2 (22%)	1 (12%)	0 (0%)
between 3 and 4 weeks	2 (5.9%)	1 (6.7%)	0 (0%)	0 (0%)	1 (12%)	0 (0%)
between 1 and 2 months	7 (21%)	1 (6.7%)	0 (0%)	5 (56%)	0 (0%)	1 (100%)
more than 3 months	3 (8.8%)	0 (0%)	1 (100%)	2 (22%)	0 (0%)	0 (0%)
<b>Total</b>	<b>34 (100%)</b>	<b>15 (44.2%)</b>	<b>1 (2.9%)</b>	<b>9 (26.5%)</b>	<b>8 (23.5%)</b>	<b>1 (2.9%)</b>

445 DK: don't know. R: refuse to answer

446

447 **Table S6.** Place of confirmatory testing among phase 2 participants who did link to confirmatory testing, by reported number of lines and self-interpreted HIVST  
 448 result.

	Overall	2 lines /reactive	1 line /reactive	2 lines /non-reactive	2 lines /DK-R	DK-R / reactive
Health Center / Hospital / Clinic / Maternity	12 (35%)	3 (20%)	0 (0%)	6 (67%)	3 (38%)	0 (0%)
Community Clinic / KP-dedicated Health Center	22 (65%)	12 (80%)	1 (100%)	3 (33%)	5 (62%)	1 (100%)
<b>Total</b>	<b>34 (100%)</b>	<b>15 (44.2%)</b>	<b>1 (2.9%)</b>	<b>9 (26.5%)</b>	<b>8 (23.5%)</b>	<b>1 (2.9%)</b>

449 DK: don't know. R: refuse to answer

450

451 **Table S7.** Time between phase 1 and phase 2 interviews among phase 2 participants who did link to confirmatory testing, by reported number of lines and self-  
 452 interpreted HIVST result.

	Overall	2 lines /reactive	1 line /reactive	2 lines /non-reactive	2 lines /DK-R	DK-R / reactive
between 4 and 6 months	67 (86%)	24 (89%)	5 (71%)	21 (84%)	17 (94%)	0 (0%)
less than 4 months	8 (10%)	3 (11%)	0 (0%)	4 (16%)	1 (5.6%)	0 (0%)
more than 6 months	3 (3.8%)	0 (0%)	2 (29%)	0 (0%)	0 (0%)	1 (100%)
<b>Total</b>	<b>34 (100%)</b>	<b>15 (44.2%)</b>	<b>1 (2.9%)</b>	<b>9 (26.5%)</b>	<b>8 (23.5%)</b>	<b>1 (2.9%)</b>

453 DK: don't know. R: refuse to answer

454

455

## Acknowledgements

456 We wish to acknowledge the commitment and determination of all the ATLAS program teams, which  
457 made this research possible. We would also like to thank the interviewers for their professionalism in  
458 collecting this sensitive data. Finally, we are grateful to the participants who were kind enough to give us  
459 some of their time by agreeing to take part in the survey.

460

## Data, scripts, code, and supplementary information availability

461 Data, scripts and code are available online on the Zenodo website.  
462 (<https://doi.org/10.5281/zenodo.8329454>).

463

## Conflict of interest disclosure

464 The authors declare that they comply with the PCI rule of no financial conflicts of interest in relation to  
465 the content of the article. They declare no conflict of interest.

466

## Funding

467 This work was supported by Unitaid (Grant Number: 2018-23 ATLAS) with additional funding from  
468 Agence Française pour le Développement (AFD). AKK benefits from an ANRS thesis allowance. MMG's  
469 research program is supported by a Canada Research Chair (Tier 2) in Population Health Modeling. The  
470 funding bodies were not involved in the design of the study and collection, analysis, and interpretation of  
471 data and in writing the manuscript.

472 MCB and RS acknowledge funding from the MRC Centre for Global Infectious Disease Analysis (reference  
473 MR/R015600/1), jointly funded by the UK Medical Research Council (MRC) and the UK Foreign,  
474 Commonwealth & Development Office (FCDO), under the MRC/FCDO Concordat agreement and is also  
475 part of the EDCTP2 programme supported by the European Union. For the purpose of open access, the  
476 author has applied a Creative Commons Attribution (CC BY) license to any Author Accepted Manuscript  
477 version arising.

478

479

480

481

## References

482 1. Das M, Chu PL, Santos G-M, Scheer S, Vittinghoff E, McFarland W, et al. Decreases in Community  
483 Viral Load Are Accompanied by Reductions in New HIV Infections in San Francisco. PLoS ONE.  
484 2010;5:e11068.

485 2. Lima VD, Johnston K, Hogg RS, Levy AR, Harrigan PR, Anema A, et al. Expanded Access to Highly  
486 Active Antiretroviral Therapy: A Potentially Powerful Strategy to Curb the Growth of the HIV  
487 Epidemic. J Infect Dis. 2008;198:59–67.

488 3. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention  
489 of HIV-1 Infection with Early Antiretroviral Therapy. N Engl J Med. 2011;365:493–505.

490 4. Quinn TC, Wawer MJ, Sewankambo N, Serwadda D, Li C, Wabwire-Mangen F, et al. Viral Load  
491 and Heterosexual Transmission of Human Immunodeficiency Virus Type 1. N Engl J Med.  
492 2000;342:921–9.

- 493 5. Hayes RJ, Donnell D, Floyd S, Mandla N, Bwalya J, Sabapathy K, et al. Effect of Universal Testing  
494 and Treatment on HIV Incidence — HPTN 071 (PopART). *N Engl J Med*. 2019;381:207–18.
- 495 6. Grinsztejn B, Hosseinipour MC, Ribaud HJ, Swindells S, Eron J, Chen YQ, et al. Effects of early  
496 versus delayed initiation of antiretroviral treatment on clinical outcomes of HIV-1 infection: results  
497 from the phase 3 HPTN 052 randomised controlled trial. *Lancet Infect Dis*. 2014;14:281–90.
- 498 7. UNAIDS. UNAIDS data 2021. Geneva: Joint United Nations Programme on  
499 HIV/AIDS;UNAIDS/JC3032E. Geneva; 2021.
- 500 8. Joint United Nations Programme on HIV/AIDS. Fast-Track - Ending the AIDS epidemic by 2030.  
501 Geneva; 2014.
- 502 9. Johnson C, Baggaley R, Forsythe S, van Rooyen H, Ford N, Napierala Mavedzenge S, et al. Realizing  
503 the Potential for HIV Self-Testing. *AIDS Behav*. 2014;18:391–5.
- 504 10. Njau B, Covin C, Lisasi E, Damian D, Mushi D, Boulle A, et al. A systematic review of qualitative  
505 evidence on factors enabling and deterring uptake of HIV self-testing in Africa. *BMC Public Health*.  
506 2019;19:1289.
- 507 11. Hector J, Davies M-A, Dekker-Boersema J, Aly MM, Abdalad CCA, Langa EBR, et al.  
508 Acceptability and performance of a directly assisted oral HIV self-testing intervention in adolescents in  
509 rural Mozambique. *PloS One*. 2018;13:e0195391.
- 510 12. Grésenguet G, Longo J de D, Tonen-Wolyec S, Bouassa R-SM, Belec L. Acceptability and Usability  
511 Evaluation of Finger-Stick Whole Blood HIV Self-Test as An HIV Screening Tool Adapted to The  
512 General Public in The Central African Republic. *Open AIDS J*. 2017;11:101–18.
- 513 13. Harichund C, Moshabela M, Kunene P, Abdool Karim Q. Acceptability of HIV self-testing among  
514 men and women in KwaZulu-Natal, South Africa. *AIDS Care*. 2019;31:186–92.
- 515 14. Kalibala S, Tun W, Cherutich P, Nganga A, Oweya E, Oluoch P. Factors Associated with  
516 Acceptability of HIV Self-Testing Among Health Care Workers in Kenya. *AIDS Behav*. 2014;18:405–  
517 14.
- 518 15. Kelvin EA, Cheruvillil S, Christian S, Mantell JE, Milford C, Rambally-Greener L, et al. Choice in  
519 HIV testing: the acceptability and anticipated use of a self-administered at-home oral HIV test among  
520 South Africans. *Afr J AIDS Res*. 2016;15:99–108.
- 521 16. Martínez Pérez G, Steele SJ, Govender I, Arellano G, Mkwamba A, Hadebe M, et al. Supervised  
522 oral HIV self-testing is accurate in rural KwaZulu-Natal, South Africa. *Trop Med Int Health*.  
523 2016;21:759–67.
- 524 17. Ky-Zerbo O, Desclaux A, Boye S, Vautier A, Rouveau N, Kouadio BA, et al. Willingness to use  
525 and distribute HIV self-test kits to clients and partners: A qualitative analysis of female sex workers’  
526 collective opinion and attitude in Côte d’Ivoire, Mali, and Senegal. *Womens Health*.  
527 2022;18:174550572210922.
- 528 18. Kurth AE, Cleland CM, Chhun N, Sidle JE, Were E, Naanyu V, et al. Accuracy and Acceptability  
529 of Oral Fluid HIV Self-Testing in a General Adult Population in Kenya. *AIDS Behav*. 2016;20:870–9.
- 530 19. Johnson CC, Kennedy C, Fonner V, Siegfried N, Figueroa C, Dalal S, et al. Examining the effects  
531 of HIV self-testing compared to standard HIV testing services: a systematic review and meta-analysis.  
532 *J Int AIDS Soc*. 2017;20:21594.



- 533 20. World Health Organization. RECOMMENDS HIV SELFTESTING – EVIDENCE UPDATE AND  
534 CONSIDERATIONS FOR SUCCESS. Geneva: World Health Organization; 2019.
- 535 21. Choko AT, Jamil MS, MacPherson P, Corbett E, Chitembo L, Ingold H, et al. Measuring linkage to  
536 HIV treatment services following HIV self-testing in low-income settings. *J Int AIDS Soc.* 2020;23.
- 537 22. World Health Organization. Guidelines on HIV self-testing and partner notification: supplement to  
538 Consolidated guidelines on HIV testing services. <https://apps.who.int/iris/handle/10665/251655>. 2016.
- 539 23. Asiimwe S, Oloya J, Song X, Whalen CC. Accuracy of Un-supervised Versus Provider-Supervised  
540 Self-administered HIV Testing in Uganda: A Randomized Implementation Trial. *AIDS Behav.*  
541 2014;18:2477–84.
- 542 24. Figueroa C, Johnson C, Ford N, Sands A, Dalal S, Meurant R, et al. Reliability of HIV rapid  
543 diagnostic tests for self-testing compared with testing by health-care workers: a systematic review and  
544 meta-analysis. *Lancet HIV.* 2018;5:e277–90.
- 545 25. Chanda MM, Ortblad KF, Mwale M, Chongo S, Kanchele C, Kamungoma N, et al. HIV self-testing  
546 among female sex workers in Zambia: A cluster randomized controlled trial. *PLOS Med.*  
547 2017;14:e1002442.
- 548 26. Tonen-Wolyec S, Filali M, Mboup S, Bélec L. HIV self-testing in Africa: stakes and challenges.  
549 *Médecine Santé Trop.* 2018;28:144–9.
- 550 27. Pant Pai N, Behlim T, Abrahams L, Vadnais C, Shivkumar S, Pillay S, et al. Will an Unsupervised  
551 Self-Testing Strategy for HIV Work in Health Care Workers of South Africa? A Cross Sectional Pilot  
552 Feasibility Study. *PLoS ONE.* 2013;8:e79772.
- 553 28. Brown AN, Djimeu EW, Cameron DB. A Review of the Evidence of Harm from Self-Tests. *AIDS*  
554 *Behav.* 2014;18:445–9.
- 555 29. Rouveau N, Ky-Zerbo O, Boye S, Fotso AS, d’Elbée M, Maheu-Giroux M, et al. Describing,  
556 analysing and understanding the effects of the introduction of HIV self-testing in West Africa through  
557 the ATLAS programme in Côte d’Ivoire, Mali and Senegal. *BMC Public Health.* 2021;21:181.
- 558 30. UNAIDS. UNAIDS DATA 2022. Geneva: Joint United Nations Programme on  
559 HIV/AIDS;UNAIDS/JC3063E.[https://www.unaids.org/sites/default/files/media\\_asset/data-book-](https://www.unaids.org/sites/default/files/media_asset/data-book-2022_en.pdf)  
560 [2022\\_en.pdf](https://www.unaids.org/sites/default/files/media_asset/data-book-2022_en.pdf). Geneva: Joint United Nations Programme on HIV/AIDS; 2022.
- 561 31. World Health Organization. Consolidated guidelines on HIV prevention, testing, treatment, service  
562 delivery and monitoring: recommendations for a public health approach. 2021 update. Geneva: World  
563 Health Organization; 2021.
- 564 32. Lyons CE, Coly K, Bowring AL, Liestman B, Diouf D, Wong VJ, et al. Use and Acceptability of  
565 HIV Self-Testing Among First-Time Testers at Risk for HIV in Senegal. *AIDS Behav.* 2019;23:130–  
566 41.
- 567 33. Boye S, Bouaré S, Ky-Zerbo O, Rouveau N, Simo Fotso A, d’Elbée M, et al. Challenges of HIV  
568 Self-Test Distribution for Index Testing When HIV Status Disclosure Is Low: Preliminary Results of a  
569 Qualitative Study in Bamako (Mali) as Part of the ATLAS Project. *Front Public Health.* 2021;9:653543.
- 570 34. d’Elbée M, Traore MM, Badiane K, Vautier A, Simo Fotso A, Kabemba OK, et al. Costs and Scale-  
571 Up Costs of Integrating HIV Self-Testing Into Civil Society Organisation-Led Programmes for Key  
572 Populations in Côte d’Ivoire, Senegal, and Mali. *Front Public Health.* 2021;9:653612.

- 573 35. Simo Fotso A, Johnson C, Vautier A, Kouamé KB, Diop PM, Silhol R, et al. Routine programmatic  
574 data show a positive population-level impact of HIV self-testing: the case of Côte d'Ivoire and  
575 implications for implementation. *AIDS*. 2022;36:1871–9.
- 576 36. Silhol R, Maheu-Giroux M, Soni N, Fotso AS, Rouveau N, Vautier A, et al. Assessing the potential  
577 population-level impacts of HIV self-testing distribution among key populations in Côte d'Ivoire, Mali,  
578 and Senegal: a mathematical modelling analysis. preprint. *HIV/AIDS*; 2023.
- 579 37. Simo Fotso A, Kra AK, Maheu-Giroux M, Boye S, d'Elbée M, Ky-zerbo O, et al. Is it possible to  
580 recruit HIV self-test users for an anonymous phone-based survey using passive recruitment without  
581 financial incentives? Lessons learned from a pilot study in Côte d'Ivoire. *Pilot Feasibility Stud*.  
582 2022;8:4.
- 583 38. Kouassi AK, Fosto AS, N'Guessan NK, Geoffroy O, Younoussa S, Kabemba OK, et al. Reaching  
584 key and peripheral populations: a phone-based survey of HIV self-test users in West Africa. Durban:  
585 poster #PEC004. <https://hal.science/hal-04121478>. 2021.
- 586 39. R Core Team. *R: A Language and Environment for Statistical Computing*. 2021.
- 587 40. Sjoberg D D, Whiting K, Curry M, Lavery J A, Larmarange J. Reproducible Summary Tables with  
588 the gtsummary Package. *R J*. 2021;13:570.
- 589 41. Giguère K, Eaton JW, Marsh K, Johnson LF, Johnson CC, Ehui E, et al. Trends in knowledge of  
590 HIV status and efficiency of HIV testing services in sub-Saharan Africa, 2000–20: a modelling study  
591 using survey and HIV testing programme data. *Lancet HIV*. 2021;8:e284–93.
- 592 42. Tippet Barr B, Lowrance D, Case Johnson C, Baggaley RC, Rogers J, Balachandra S, et al.  
593 Treatment-adjusted prevalence to assess HIV testing programmes. *Bull World Health Organ*.  
594 2021;99:874–82.
- 595 43. Maheu-Giroux M, Vesga JF, Diabaté S, Alary M, Baral S, Diouf D, et al. Population-level impact  
596 of an accelerated HIV response plan to reach the UNAIDS 90-90-90 target in Côte d'Ivoire: Insights  
597 from mathematical modeling. *PLOS Med*. 2017;14:e1002321.
- 598 44. Vautier A. La notice d'utilisation du fabricant suffit-elle dans un contexte multilingue et de faible  
599 alphabétisation ? L'exemple de l'autodépistage du VIH en Afrique de l'Ouest. 2020.
- 600 45. Wei C, Yan L, Li J, Su X, Lippman S, Yan H. Which user errors matter during HIV self-testing? A  
601 qualitative participant observation study of men who have sex with men (MSM) in China. *BMC Public*  
602 *Health*. 2018;18:1108.
- 603 46. Thirumurthy H, Masters SH, Mavedzenge SN, Maman S, Omanga E, Agot K. Promoting male  
604 partner HIV testing and safer sexual decision making through secondary distribution of self-tests by  
605 HIV-negative female sex workers and women receiving antenatal and post-partum care in Kenya: a  
606 cohort study. *Lancet HIV*. 2016;3:e266–74.
- 607 47. Chipungu J, Bosomprah S, Zanolini A, Thimurthy H, Chilengi R, Sharma A, et al. Understanding  
608 linkage to care with HIV self-test approach in Lusaka, Zambia - A mixed method approach. *PLOS*  
609 *ONE*. 2017;12:e0187998.
- 610 48. Tun W, Vu L, Dirisu O, Sekoni A, Shoyemi E, Njab J, et al. Uptake of HIV self-testing and linkage  
611 to treatment among men who have sex with men (MSM) in Nigeria: A pilot programme using key  
612 opinion leaders to reach MSM. *J Int AIDS Soc*. 2018;21:e25124.

- 613 49. Hlongwa M, Hlongwana K, Makhunga S, Choko A, Dzinamarira T, Conserve D, et al. Linkage to  
614 HIV care following HIV self-testing among men: systematic review of quantitative and qualitative  
615 studies from six countries in sub-Saharan Africa. preprint. In Review; 2022.
- 616 50. Choko AT, MacPherson P, Webb EL, Willey BA, Feasy H, Sambakunsi R, et al. Uptake, Accuracy,  
617 Safety, and Linkage into Care over Two Years of Promoting Annual Self-Testing for HIV in Blantyre,  
618 Malawi: A Community-Based Prospective Study. *PLOS Med.* 2015;12:e1001873.
- 619 51. Green KE, Vu BN, Phan HT, Tran MH, Ngo HV, Vo SH, et al. From conventional to disruptive:  
620 upturning the HIV testing status quo among men who have sex with men in Vietnam. *J Int AIDS Soc.*  
621 2018;21 Suppl 5:e25127.
- 622 52. Ky-Zerbo O, Desclaux A, Kouadio AB, Rouveau N, Vautier A, Sow S, et al. Enthusiasm for  
623 Introducing and Integrating HIV Self-Testing but Doubts About Users: A Baseline Qualitative Analysis  
624 of Key Stakeholders' Attitudes and Perceptions in Côte d'Ivoire, Mali and Senegal. *Front Public Health.*  
625 2021;9.
- 626 53. Inghels M, Kouassi AK, Niangoran S, Bekelynck A, Carilon S, Sika L, et al. Preferences and access  
627 to community-based HIV testing sites among men who have sex with men (MSM) in Côte d'Ivoire.  
628 *BMJ Open.* 2022;12:e052536.
- 629