

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

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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 participants who had reported two lines or who reported~~ a reactive HIVST result were ~~re-contacted for~~recontacted to ~~complete~~ another questionnaire. Of the 2,615 initial participants, 89.7% reported consistent ~~results~~response 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.~~

~~Overall HIV positivity rate was 2.5% (central hypothesis, low: 2.4%, high: 9.1%) based on self-interpreted results, and 4.5% (4.4% to 7.2%) based on the reported number of lines. Variations were observed according to country, distribution channel, sex and age group.~~

The second phase saw 78 out of 126 eligible participants complete the questionnaire. Of the 27 who reported a consistent reactive ~~result~~response in the first phase, 15 (56%, 95%CI: 36 to 74%)

45 underwent confirmatory HIV testing, with 12 (80%) confirmed as HIV-positive, all of whom began
46 antiretroviral treatment.

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

50 The ATLAS HIVST distribution strategy reached people living with HIV in West Africa. Linkage to
51 confirmatory testing following a reactive HIVST remained ~~sub-optimal~~relatively low in these first
52 years of HIVST implementation. However, if confirmed HIV-positive, almost all initiated
53 treatment. HIVST constitutes a relevant complementary tool to existing screening services.

54 .
55 **Keywords:** AIDS; HIV self-testing, linkage to confirmatory testing and care; Self-Testing; Key Populations;
56 MSM; sex-workers; phone-based survey; key populations; West Africa; confirmatory testing; follow-up
57 care; public health program evaluation.

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Introduction

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

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

78 The HIV Self-Testing in Africa (STAR-project) carried in Eastern and Southern Africa and funded by Unitaid
 79 aimed to boost the global market for HIVST. ~~The project unfolded in three phases: Phase 1 ran from September~~
 80 ~~2015 to August 2017, Phase 2 spanned from August 2017 to July 2020, and Phase 3 took place between January~~
 81 ~~2020 and July 2021 ([https://www.psi.org/fr/project/star/]). Following the experience gained in Eastern and~~
 82 ~~Southern Africa under the STAR project [11, 23–28], the Unitaid funding agency sought to stimulate HIVST in~~
 83 ~~West Africa where HIV epidemics differs, are more concentrated, and where key populations (e.g., female sex~~
 84 ~~workers and men who have sex with men) share a disproportionate HIV burden. The ATLAS programme~~
 85 ~~(AutoTest de dépistage du VIH : Libre d'Accéder à la connaissance de son Statut) aimed to promote, implement,~~
 86 ~~and expand HIVST in Côte d'Ivoire, Mali, and Senegal [29] where the national HIV prevalence in 2021 were~~
 87 ~~1.9% (1.7%-2.2%), 0.8% (0.6%-1%), and 0.3% (0.3%-0.4%) respectively [30].~~

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 95 2020 and July 2021 ([https://www.psi.org/fr/project/star/]). Following the experience gained in Eastern and
 96 Southern Africa under the STAR project [11, 23–28], the Unitaid funding agency sought to stimulate HIVST in
 97 West Africa where HIV epidemics are distinguished by their more
 98 concentrated and less generalised nature compared to those in Eastern and Southern Africa. In this region, the
 99 general population prevalences are relatively low to very low, and key populations (for example, female sex
 100 workers and men who have sex with men) are particularly affected and bear a disproportionate share of the
 101 HIV burden [29]. The ATLAS programme (AutoTest de dépistage du VIH : Libre d'Accéder à la connaissance de
 102 son Statut) aimed to promote, implement, and expand HIVST in Côte d'Ivoire, Mali, and Senegal [30] where
 103 the national HIV prevalence in 2021 was 1.9% (1.7%-2.2%), 0.8% (0.6%-1%), and 0.3% (0.3%-0.4%) respectively
 104 [31].

105 To preserve the anonymity and confidentiality of HIVST and not impede their use, ATLAS decided, in line
 106 with WHO recommendations, not to track the use and outcomes of distributed HIVST kits systematically. Such
 107 tracking can be logistically challenging and costly and could limit the distribution, redistribution and use of
 108 HIVST [31][32]. Without systematic tracking, it is challenging to obtain information on the users of the HIVST,
 109 their results and on linkage to confirmatory testing and treatment, which are crucial indicators to assess
 110 program effectiveness and impact. For instance, the positivity rate can reflect the yield of new individuals
 111 diagnosed with HIV and if the testing modality is indeed reaching those in need. Diagnosed individuals must
 112 seek confirmatory testing and be linked to care to maximise health benefits and decrease onward
 113 transmission.

109 We conducted an innovative survey by setting up an anonymous and free telephone platform in Côte
 110 d'Ivoire, Mali and Senegal while preserving anonymity and encouraging voluntary participation. ~~In the~~ In the second
 111 ~~phase of the survey was conducted among those with an~~ phase of the survey was conducted among those with an ~~(September-October), participants who had reported~~
 112 ~~two lines or a self-interpreted HIVST result as reactive result in the first survey were recontacted to complete~~
 113 ~~another questionnaire.~~ two lines or a self-interpreted HIVST result as reactive result in the first survey were recontacted to complete
 another questionnaire. Here we present the HIV test positivity rates from the phase 1 questionnaire and the
 links with confirmatory tests and care.

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Materials and Methods

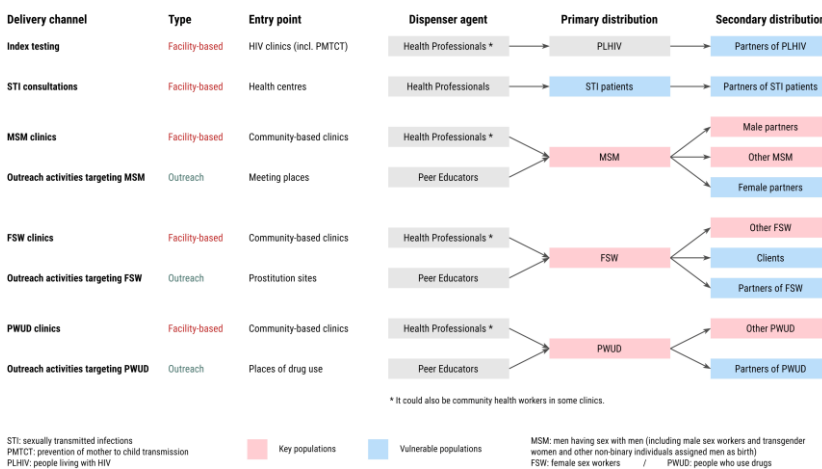
ATLAS program description

116 ATLAS HIVST distribution was integrated into existing testing policies, programmes and activities in each
 117 country; 397,367 HIVST kits were freely distributed between July 2019 and February 2022 as part of the three
 118 countries' national AIDS strategies. At the time of ATLAS's implementation in 2019, only small-scale HIVST pilot
 119 programs had been previously conducted in Senegal and Côte d'Ivoire, whereas Mali had no previous
 120 experience ofwith HIVST. In Senegal, for instance, the first pilot survey took place between April 2017 and June
 121 2018 [32-33].

122 The design of the different delivery channels and the priority populations were developed with country
 123 stakeholders including national AIDS programs/councils, international institutions including the WHO,
 124 international and national non-governmental organisations involved in local HIV programs, and civil society
 125 and community leaders. ATLAS HIVST distribution was organised through eight different operational delivery
 126 channels (Figure 1), i.e. five facility-based approaches (delivery of HIVST kits through public or community-
 127 based health facilities) and three community-based approaches involving outreach activities engaging female
 128 sex workers (FSW), men who have sex with men (MSM), and people who use drugs (PWUD) [29]-[30]. Peer
 129 educators conducted these outreach activities through group activities (e.g. talks, discussion groups, night
 130 visits, social events, or parties) and face-to-face activities (e.g. home visits). Outreach activities represented
 131 the majority (~85%) of ATLAS's distribution volume.
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ATLAS delivery channels to reach key populations and other vulnerable populations



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Figure 111. ATLAS delivery channels (adapted from Rouveau et al., 2021, Describing, analysing and understanding the effects of the introduction of HIV self testing in West Africa through the ATLAS programme in Côte d'Ivoire, Mali and Senegal, BMC Public Health, <https://doi.org/10.1186/s12889-021-40212-4> [30]). FSW=female sex workers, MSM=men who have sex with men, PLHIV=people living with HIV PMTCT=prevention of mother-to-child transmission, PWUD=people who use drugs, STI=sexually transmitted infection.

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

147 Only oral self-testing (OraQuick HIV Self-Test®) has been distributed through ATLAS. OraSure Technologies,
 148 the manufacturer of the OraQuick test, accompanies each HIVST kit with a user manual for result
 149 interpretation- (Figure 2). OraQuick HIVST results should be interpreted as follow- It is- "reactive" ("positive")
 150 if two lines (C & T) are visible (even barely), "non-reactive" ("negative") if only the C (control) line is visible,
 151 and "invalid" if no line is visible or if only the T (test) line is visible. To be noted, the French version of the HIVST
 152 instructions distributed by ATLAS used the wording "reactive" / "non-reactive" instead of "positive" /
 153 "negative" to qualify the HIVST result, following WHO vocabulary in their HIVST guidelines[20] as an HIVST is
 154 triage test and does not provide a definitive HIV-positive diagnosis. The questionnaire of the survey also used
 155 "reactive" / "non-reactive" wording (<https://doi.org/10.5281/zenodo.10210464>).
 156

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.



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.**



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.



158 Figure 222. Guidelines for interpreting HIVST result, extracted from the English version of the
159 manufacturer instructions for use (OraQuick HIV Self-Test®). To be noted, the French version distributed
160 by ATLAS was using the wording "Reactive" / "Non-reactive" instead of "Positive" / "Négative" to qualify
161 the HIVST result.

162
163 In addition to the manufacturer's instructions (Figure 2), locally adapted brochures and explanatory videos
164 in French and local languages have been developed to help users perform the test, interpret the result and
165 know what actions should be taken following a non-reactive, a reactive or indeterminate result- (for example
166 : <https://youtu.be/laCCjVEKZto> in English or <https://youtu.be/1xziLD309U> in French). They also encouraged
167 people with a reactive HIVST to seek confirmatory HIV testing and care. Individuals with a non-reactive test
168 were invited to retest after 3 months if still exposed to HIV. Existing toll-free hotlines in each country were
169 ~~strengthened~~strengthened and trained on HIVST, to offer information about HIV, prevention, testing, use and
170 interpretation of HIVST and HIVST and counseling.
171

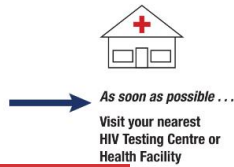
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Figure 2. Guidelines for interpreting HIVST result, extracted from the English version of the manufacturer instructions for use (OraQuick HIV Self-Test®)

Study design and data collection

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

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The program included a voluntary anonymous phone survey. Between mid-March and mid-June 2021, dedicated survey flyers were distributed with the HIVST kits inviting self-test users in each country to call a toll-free number to complete a questionnaire (phase 1). All calls from the three countries, over the same period,

183 were rerouted to a telephone platform located in Abidjan and operated by Ipsos Côte d'Ivoire, which was
184 selected following an international call for tenders.

185 ~~The questionnaire, which lasted 20 to 30 minutes, collected information on sociodemographic~~
186 ~~characteristics of HIVST users, testing history, sexual and preventive behaviours, HIVST use and difficulties~~
187 ~~encountered. Specifically, each participant was asked about the number of lines that appeared when reading~~
188 ~~the HIVST result and their self-interpretation of it (reactive or non-reactive). A pilot survey was initially~~
189 ~~conducted without offering financial compensation to the participants.[37] Following theA pilot survey was~~
190 ~~initially conducted without offering financial compensation to the participants [38]. Following its~~ results, we
191 decided to introduce a reward as a token of appreciation for the time participants dedicated to the survey.
192 Consequently, completion of the questionnaire was rewarded with 2,000 XOF (~~≈~~approximately 3.40 USD) of
193 phone communication credit. ~~This reward was mentioned on the survey flyers.~~ In order to participate in the
194 survey, participants had to be of legal age to use an HIVST on their own without parental permission (16 years
195 in Côte d'Ivoire, 18 years in Mali, and 15 years in Senegal) and had to have used an HIVST provided to them
196 through the ATLAS project.

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

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

209 ~~In total, 2 615 participants were recruited for phase 1[38].The phase 1 questionnaire, which lasted 20 to~~
210 ~~30 minutes, collected information on sociodemographic characteristics of HIVST users (including age, sex,~~
211 ~~marital status, education level), testing history (having ever tested for HIV before using HIVST and date of last~~
212 ~~HIV test), sexual and preventive behaviours, HIVST use and difficulties encountered [39]. Specifically, each~~
213 ~~participant was asked about the number of lines that appeared when reading the HIVST result and their self-~~
214 ~~interpretation of it (reactive or non-reactive).~~

215 ~~In total, 2,615 participants were recruited for phase 1[39].~~ Those who reported two lines or a reactive
216 result (n=126) were asked for their consent to be called back a few months later to participate in a
217 complementary survey and, if consented, to provide a phone contact (n=120). As some individuals may delay
218 their decision to undergo a confirmatory test by several weeks/months after using an HIV self-test, we chose
219 a minimum of 3-month gap between our two surveys to potentially get an estimate of the maximum number
220 of participants who eventually underwent confirmatory testing.

221 From September 27th to October 22nd, 2021, 96 were successfully recontacted and invited to complete a
222 5-minute questionnaire (phase 2) ~~on linkage to confirmatory testing and care.~~ Among those, 89 accepted to
223 participate in phase 2 and 78 fully completed phase 2 questionnaire. ~~Phase 2 questionnaire asked the~~
224 ~~participants if they had undergone a confirmatory test following their HIVST, reasons for not linking to~~
225 ~~confirmatory testing (if not linked), time between HIVST and confirmatory testing (if linked), type of facility for~~
226 ~~confirmatory testing, confirmation test result, linkage to antiretroviral treatment (if confirmed HIV-positive).~~

227
228 The interviews were conducted in either French, English, Bambara, or Wolof. On-the-fly translation into
229 other local languages was also available. Compensation of XOF 2,000 (≈3.40 USD) in the form of telephone
230 credit was given to participants who completed the phase 2 questionnaire. Unlike in phase 1, it was not a
231 financial incentive as participants were informed about it only at the end of the interview. Interviews were not
232 audio-recorded. Questionnaires' responses were captured on a computer and stored in a database managed
233 by PAC-CI, an Ivorian research institute with expertise in clinical research.

234 At the end of the survey, collected telephone numbers (for appointments and rewards) were deleted from
235 the database. All procedures have been described in a publicly available data management plan
236 (<https://dmp.opidor.fr/plans/3354/export.pdf>). The complete project protocol, including the data

237 management plan (required by the ethics committees), was written in French. Both phase 1 and phase 2
238 questionnaires have been made available online and a link is now provided
239 (<https://doi.org/10.5281/zenodo.10210464>).

240 Data analysis

241 Following a previously published analysis [39], and due to small numbers of participants in certain
242 distribution channels, distribution channels (Figure 1) were grouped in three categories: FSW-based channels
243 (outreach or facility-based), MSM-based channels (outreach or facility-based) and other channels (PWUD-
244 based channels, index testing, STI consultations).

245 Based on phase 1 participants' self-reports, we distinguished between those having reported an HIVST
246 result who provided consistent with both response, i.e. the reported number of visible lines and was consistent
247 with the reported self-interpretation (2 visible lines and result interpreted reported as reactive, one line and
248 interpreted reported as non-reactive, or no/one line and interpreted as invalid), and those who provided
249 inconsistent result, or response, i.e. the number of visible lines was inconsistent with the self-interpretation of
250 the result, or those who returned only a partial result (they refused response (refusal to answer or answered
251 they didn't "I don't know" to one or both questions).

252 To estimate HIVST positivity rates due to inconsistent responses, we separately considered the self-
253 interpreted results and the reported number of lines on the HIVST, to estimate HIVST positivity rates. For each
254 source, we made three hypotheses (low, central, and high) about excluded "don't know" and refusals (DK-R).
255 Using self-reported results (respectively the reported number of visible lines), the low hypothesis considered
256 DK-R as non-reactive (as one line), and the high hypothesis as reactive (as two lines), while DK-R were excluded
257 from both the numerator and the denominator in the central hypothesis. Positivity rates were stratified by
258 respondents' gender, country, and distribution channel (central hypothesis). We also computed the highest
259 positivity (assuming all DK-R as reactive) and lowest positivity (assuming all DK-R as non-reactive).

260 We conducted two binomial logistic regression analyses to examine the positivity rate in our central
261 scenario, based on self-interpreted results on one hand, and based on the reported number of lines on the
262 other. We deemed it important to stratify the positivity rates by country, sex, distribution channel, and age
263 group (15-24, 25-34, and 35+).

264 As the key population profile of participants should differ substantially by distribution channel (women
265 from the FSW-based channel are more likely FSW while those from the MSM-based channel are more likely
266 female partners of MSM; men from the MSM-based channel are more likely MSM while those from the FSW-
267 based channel are more likely partners or clients of FSW, see Figure 1), we decided to combine distribution
268 channel and sex into a single combined variable.

269 We described the selection of eligible participants for phase 2 questionnaires and corresponding
270 participation rates. To assess any participation bias, characteristics of phase 2 participants (country, sex and
271 distribution channel, age group, marital status, educational level, and first-time testers, i.e. whether they ever
272 tested for HIV before using HIVST) were compared with individuals eligible for phase 2 but who did not
273 participate and with phase 1 participants not eligible for phase 2. Bivariate comparison was done using chi-
274 squared tests, and multivariate comparison using a multinomial logistic regression model and then computing
275 likelihood-ratio tests.

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

279 We also ~~described~~ described (i) for those who did not link to confirmatory testing, the main reported reason;
280 and (ii) for those who did link to confirmatory testing, the type of facility attended for confirmation and the
281 time between HIVST and confirmatory testing.

282 A dedicated anonymised dataset and the corresponding R script are available on Zenodo
283 (<https://doi.org/10.5281/zenodo.8329454>) to allow replication of the analysis. All analyses have
284 been performed using R version 4.3.1 [39],[40]. All the descriptive tables were generated using the
285 `tbl_summary()` function from the `gtsummary` package [40],[41]. Confidence intervals (95% confidence interval,
286 95%CI) were computed using Wilson's method with Yate's continuity correction (`prop.test()` function, in the
287 `'stats'` package). Multinomial models were computed with `multinom()` from the 'nnet' package and likelihood-
288 ratio tests with `Anova()` from 'car'.
289

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

297 The full research protocol was written in French (https://hal.science/ATLAS_ADVIH/hal-04121482v1). The
298 peer-reviewed protocol has been published in English elsewhere [[2930](#)].

Code de champ modifié

299 **Results**

300 **HIVST results**

301 Of the 2,615 participants recruited in phase 1, 2,346 (89.7%) reported a self-interpreted HIVST result
302 consistent with their reported number of visible lines on the HIVST: 2 292 (88.0%) reported one line self-
303 interpreted as non-reactive, 50 (1.9%) two lines self-interpreted as reactive, and 4 (0.2%) no/one line self-
304 interpreted as invalid (table 1). In contrast, 48 (1.8%) reported inconsistent **answersresponse**: 10 (0.4%) one
305 line self-interpreted as reactive, 35 (1.3%) two lines self-interpreted as non-reactive/ and 3 (0.1%) no line self-
306 interpreted as non-reactive. Finally, 221 (8.5%) reported a partial result: 147 (5.6%) reported 0, 1 or 2 lines but
307 did not know how to interpret the result or refused to answer, 46 (1.7%) self-interpreted their result but did
308 not know or refused to report the number of lines, and 28 (1.1%) did not know or refused to answer to both
309 questions.

310

311 **Table 114. Self-reported**Reported self-interpreted HIV self-test (HIVST) result, reported number of lines on
 312 the HIVST, and positivity rates according to different hypotheses among participants of the first phase of the
 313 survey in Côte d'Ivoire, Mali, and Senegal (2021).

Phase 1 participants	Formula	2615 (100%)
Consistent answer response (C)	C = C₁ + C₂ + C₃	2346 (89.7%)
2 lines / reactive [†]	C ₁	50 (1.9%)
1 line / non-reactive	C ₂	2 292 (88%)
0-1 line/ invalid	C ₃	4 (0.2%)
Inconsistent answer response (I)	I = I₁ + I₂ + I₃ + I₄ + I₅	48 (1.8%)
1 line / reactive [†]	I ₁	10 (0.4%)
0 line / reactive [†]	I ₂	0 (0%)
2 lines/ non-reactive [†]	I ₃	35 (1.3%)
0 line / non-reactive	I ₄	3 (0.1%)
2 lines/ invalid [†]	I ₅	0 (0%)
Partial answer response (P)	P = P₁ + P₂ + P₃ + P₄ + P₅ + P₆ + P₇	221 (8.5%)
0 line / DK-R	P ₁	1 (<0.1%)
1 line / DK-R	P ₂	117 (4.5%)
2 lines/ DK-R [†]	P ₃	29 (1.1%)
DK-R / reactive [†]	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%)
Positivity Rate		
Based on self-interpreted test results		
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%)
Based on the reported number of lines		
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		

314

315 HIVST positivity rates

316 Based on self-interpreted HIVST results, the overall positivity rate was 2.4% when DK-R were considered
 317 non-reactive (low hypothesis, Figure 3, Table S2). Rate was similar at 2.5% by excluding DK-R from the
 318 numerator and the denominator (central hypothesis). Considering DK-R as reactive (high hypothesis) increased
 319 the positivity rate to 9.1%. Estimates based on the reported number of visible lines on the HIVST were 4.4%,
 320 4.5% and 7.2%, respectively, for the low, central, and high hypotheses. Positivity rates ranged from 1.8% to
 321 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.,
 322 low or high; Figure S4, Table S2).

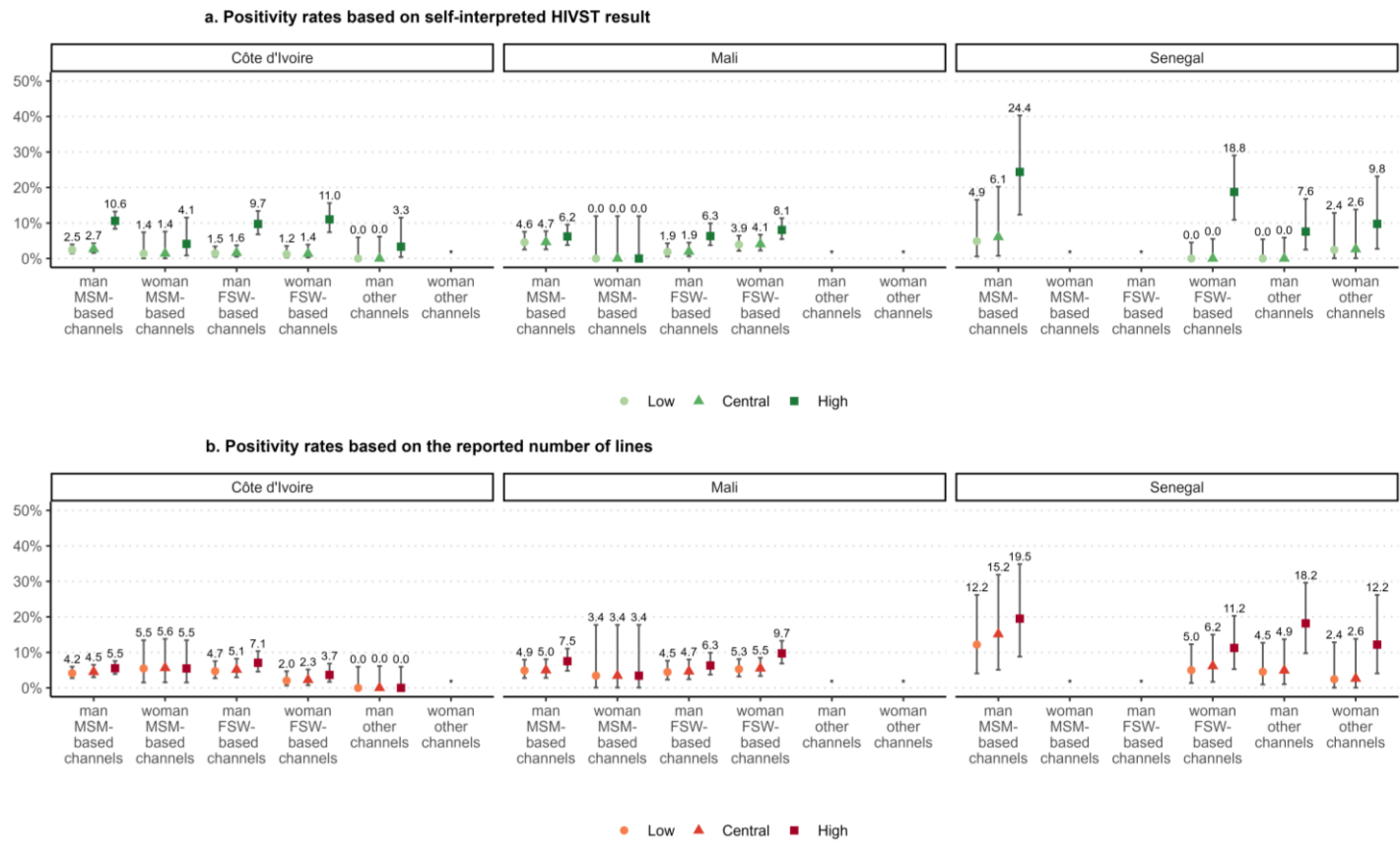
323 Positivity rates (central hypothesis based on the number of lines) were higher among participants recruited
324 through community-based distribution channels. It was 4.8% for men and 4.9% for women in the MSM-based
325 channels, and 4.6% for men and 4.2% for women in the FSW-based channels. ~~Compared~~compared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

327 When ~~analyzing~~analysing positivity rates by age group (Table S3), for ~~those under~~participants aged
328 between 15 to 24 years old, the rates ranged from 2.2% to 7.4% based on the reported self-interpreted result
329 and from 3.1% to 5.9% based on the reported number of lines. Among those aged 25 to 34 years old, it
330 fluctuated between 2.7% and 9.5% based on the reported self-interpreted result and from 4.9% to 7.8% based
331 on the reported number of lines. Lastly, for individuals 35 years old or older, the rate layed between 1.8% and
332 12% based on the reported self-interpreted result and between 4.9% and 9.3% based on the reported number
333 of lines.

334 **Participation in phase 2**

335 During phase 1, 126 individuals reported two lines or self-interpreted their result as reactive and were
336 therefore eligible for phase 2 (Table 1). Among them, 6 refused to be ~~re-contacted~~recontacted after phase 1
337 (Figure 4). Among the 120 (95%) who agreed to be ~~re-contacted~~recontacted, 24 (20%) were unreachable at
338 the time of the phase 2 survey, and 96 (80%) were successfully ~~re-contacted~~recontacted. Among the latest, 89
339 (93%) accepted to participate in the phase 2 survey. Ten dropped out before the end of the interview, and 1
340 disconnected and was unreachable afterwards. As a result, 78 participants completed phase 2 questionnaire.
341 Of the 78 participants, 39 (50%) were from Côte ~~d'Ivoire~~d'Ivoire, 31 (40%) from Mali, and 8 (10%) from Senegal
342 (Table ~~S4~~S2). Participation rates were 54% (27/50) for participants who reported a consistent ~~result~~response
343 (2 lines and reactive), ~~71.4%~~ 32/45 for those with an inconsistent ~~result~~response (either 2 lines & non-
344 reactive, or 1 line & reactive), and ~~65.5%~~ 66% (19/31) for those reporting a partial ~~result~~response (2 lines & DK-
345 R or DK-R & reactive).

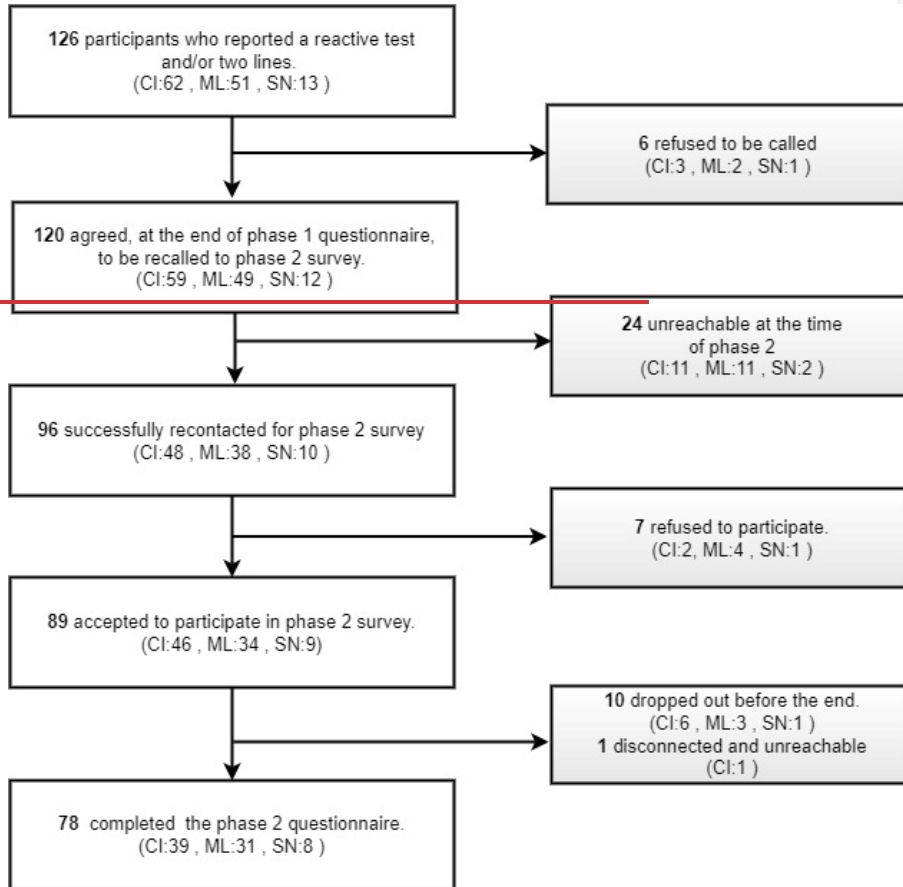
346 The participants who completed the phase 2 questionnaire had similar sociodemographic characteristics
347 (e.g. country, sex, distribution channel, age group, marital status) compared to those eligible for phase 2, but
348 that did not complete it, and to phase 1 participants not eligible for phase 2 (Table ~~S4~~S4). For most participants
349 (86%), phase 2 questionnaire was completed between 4 and 6 months after phase 1 questionnaire (Table S5).

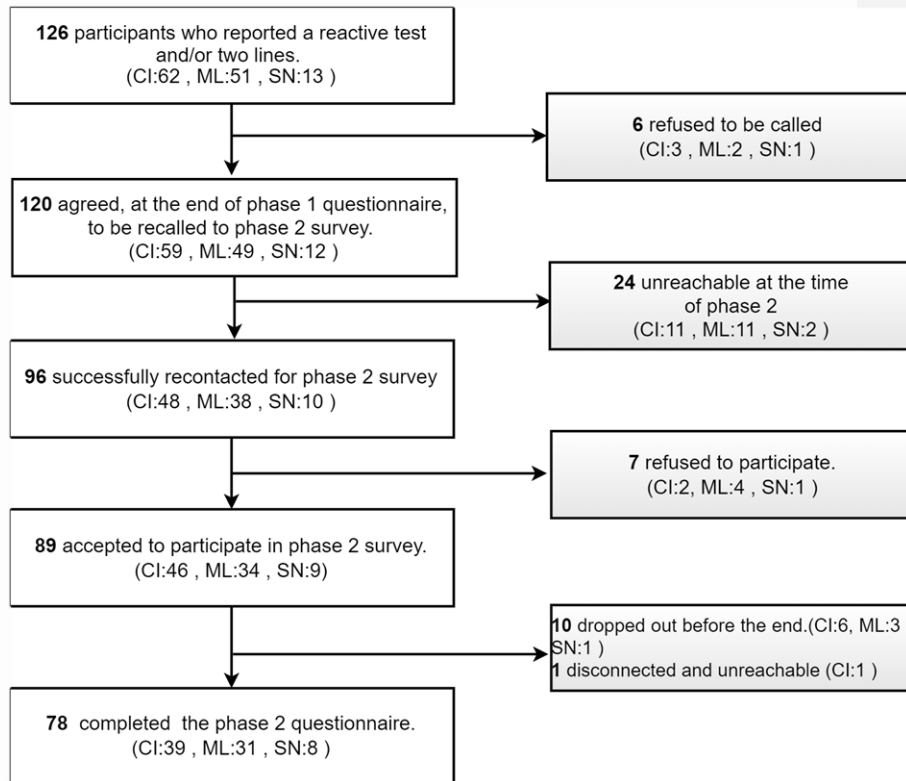


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Figure 333. Positivity rates and 95%CI based on self-interpreted HIVST results or the reported number of visible lines, by distribution channel, **gender** and country, among participants of the first survey phase in Côte d'Ivoire, Mali, and Senegal (2021). The asterisk indicate that there was no participant in that distribution channel. FSW=female sex worker, MSM=men who have sex with men. MSM-based channels include facility-based and outreach. FSW-based channels include facility-based and outreach. Other channels include PWUD-based channels, index testing and STI consultations.





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Figure 444-: 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).

360 **Linkage to confirmatory testing and care**

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

368 The main reason given for not linking to confirmatory testing was that “*their HIVST was non-reactive*”
369 (18/44, 41%, and although 8 of these 18 reported a reactive result in phase 1 questionnaire), followed by
370 “*not knowing that a confirmation test was required*” (10/44, 23%), and “*not having time*” (8/44, 18%) (Table
371 [S4S6](#)).

372 When participants were linked to confirmatory testing, it was usually shortly after performing their
373 HIVST: 53% linked in less than one week and 91% in less than 3 months (Table S5). Most participants (65%)
374 performed their confirmatory testing in a general public facility (health centre, hospital, clinic or maternity)
375 whereas 35% chose a community-based clinic or health centre dedicated to key populations (Table [S6S7](#)).

376 Among the 34 that linked to confirmatory testing, 19 (56%, 95%CI: 38-72%) were confirmed HIV-
377 positive, and 18 (95%, 95%CI: 72-100%) initiated antiretroviral treatment. Of the 18 participants who
378 initiated ART, 11 (72%) underwent their confirmation test less than a week after their self-test, 2 (11%) did
379 so between 1 and 2 weeks, 1 (5.6%) between 3 and 4 weeks, 1 (5.6%) waited between 1 and 2 months, and
380 1 (5.6%) proceeded with the test three months later. Among the 27 who reported a consistent reactive
381 [result/response](#) in the phase 1 questionnaire, 15 (56%, 95%CI: 36-74%) linked to confirmatory test, 12 (80%)
382 were confirmed HIV-positive and all started treatment (100%).
383
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Table 222. 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%		

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

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Our study shows that the strategy implemented by the ATLAS program, through the primary and secondary distribution of HIVST kits and dedicated channels, achieved HIV positivity rates ranging from 2.5% (central hypothesis, low: 2.4%, high: 9.1%) based on self-interpreted results, and 4.5% (central hypothesis, low: 4.4%, high: 7.2%) based on the reported result, and from 3.8% to 7.2% based on the number of lines reported. The proportion of participants with a reactive HIVST that sought confirmatory testing was 44% (95% CI: 33%-55%). Of those who underwent confirmatory testing, 56% (95% CI: 38%-72%) were found to be HIV-positive and, among them, 95% (95% CI: 72%-100%) initiated treatment. Among the participants who confirmed their reactive HIVST with a traditional facility-based HIV test, 65% did so within a week and 91% within three months.

According to our estimates, HIVST positivity rates ranged from 1.8% to 9.8% in Côte d'Ivoire, 3.5% to 7.8% in Mali, and 1.2% to 15.0% in Senegal depending on how missing results (e.g., "don't know" and refusals) were classified. We estimated 2.0% (central hypothesis, low: 1.8%, high: 9.8%) based on self-interpreted results, and 3.9% (central hypothesis, low: 3.8%, high: 5.4%) based on the reported number of lines in Côte d'Ivoire. In Mali, these rates were 3.6% (central hypothesis, low: 3.5%, high: 6.7%) and 5% (central hypothesis, low: 4.9%, high: 7.8%), while in Senegal, they were 1.4% (central hypothesis, low: 1.2%, high: 15%) and 6.0% (central hypothesis, low: 5.4%, high: 14.9%). Overall, these results for HIVST positivity are generally higher than the average overall positivity of HIV testing services (excluding HIVST) in West Africa. For instance, in 2020 an estimated 1.9% of all HIV tests performed were found to be positive in the region (95% credible intervals: 1.3 to 2.7%) [41]-[42]. Further, among 15-24 and 25-34 years old, which constitute more than 80% of our sample, overall positivity was 0.9% (0.7 to 1.3%) and 1.6% (1.2 to 2.2%), respectively. Collectively, these results provide evidence that HIVST is a high-yield testing modality that can address the unmet HIV testing needs of key populations and their partners.

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

Our results are in line with data collected by ATLAS implementing partners. Between 2020 and 2021, these ATLAS partners collected spontaneous feedback from HIVST users. This unpublished data collection was non-systematic and varied from one partner to another. Among 4 463 documented feedbacks, HIVST was reactive for 188 cases (4.2%), consistent with our estimates based on the reported number of visible lines (4.5%).

In 2021, a study based on the UNAIDS-supported *Shiny90* mathematical model [43] estimated, using data from 184 population surveys and reports from national HIV screening programs from 40 sub-Saharan African countries, that the positivity rates for conventional HIV testing were 1.4% in Côte d'Ivoire, 2.2% in Mali, and 1.0% in Senegal. Our estimates for HIVST were higher than these estimates for conventional testing.

It is important to interpret HIV positivity rates while considering the treatment-adjusted prevalence (i.e., removing those on treatment from the numerator and denominator of HIV prevalence), a more

442 ~~reliable indicator for evaluating the effectiveness and positivity rates of targeted screening programs [44].~~
443 ~~In West Africa, the treatment-adjusted prevalence remained relatively low in 2021: 0.6% in Côte d'Ivoire,~~
444 ~~0.7% in Mali, and 0.06% in Senegal, according to UNAIDS data (<https://aidsinfo.unaids.org/>).~~ ~~Our positivity~~
445 ~~rates in each country are higher than the treatment-adjusted prevalence, suggesting that the ATLAS HIVST~~
446 ~~distribution strategy successfully reached a hard-to-reach population and at positivity levels at least as high~~
447 ~~as with passive surveillance.~~

448
449 In our study, ~~most 2.0% of the participants (90%) demonstrated a consistent interpretation reported an~~
450 ~~inconsistent response~~ between the number of ~~visible lines reported and their self-interpretation of the~~
451 ~~result and 6.0% reported HIVST result. However, 2% of them inconsistently interpreted the results. Among~~
452 ~~them, a small number reported the presence of two visible lines a number of lines but didn't know how to~~
453 ~~interpret it or refused to answer,~~ suggesting potential issues in interpreting the number of visible lines on
454 HIVST kits. In the context of the ATLAS program, the distribution strategy combining primary and secondary
455 approaches has led many HIVST users to perform their HIVST without receiving advice from a healthcare
456 professional or a trained peer educator. Although the HIVST is not designed to require supervision, it is
457 essential to have received information on its use before proceeding with the test. A study conducted within
458 the framework of the ATLAS program demonstrated that the ~~manufacturer's manufacturer's~~ instructions
459 alone were insufficient in a multilingual context with low literacy levels. The use of additional ~~aidsaid~~, such
460 as a demonstration video or a toll-free helpline, proved ~~to be~~ necessary [44],[45]. Similarly, a study carried
461 out in China in 2018 on the unsupervised use of HIVST among 27 MSM found that only 5 (or 19%) made no
462 errors, and 44% received an invalid test result due to various mistakes made [45],[46]. However, the lack
463 of supervision is likely insufficient to explain the inconsistencies observed [23]. Some inconsistencies may
464 result from a misunderstanding of the terms "reactive" and "non-reactive", particularly considering that
465 HIVST was a new tool in our context and that traditional terms used to describe conventional HIV testing
466 are "positive" and "negative". This possible misunderstanding of the terms is also highlighted by the fact
467 that 8 participants reported a "reactive" result in phase 1 questionnaire and then in phase 2 that their test
468 was "non-reactive" as the main reason for not linking to confirmatory testing. Specific qualitative
469 interviews or focus groups discussion with HIVST users could help better understand how they perceive
470 different terms.

471
472 ~~Our linkageLinkage~~ to confirmatory testing ~~estimates were based on small numbers resulting in large~~
473 ~~confidence intervals. Nevertheless, the overall proportion following a reactive test~~ was clearly sub-optimal
474 ~~(44%, % (95% confidence interval from 33% to 55%)).~~ However, this estimate includes some individuals who
475 did not adequately self-interpreted their HIVST result as reactive. When considering only those who
476 reported two lines and self-interpreted their result as reactive, the linkage rate increased to 56% (36% to
477 74%). This percentage is closer to that was observed in a study conducted in Kenya on HIV testing of FSW
478 male partners using HIVST secondary distribution, where 65% of men with a reactive result had a
479 confirmatory test [46]-[47]. ~~Our estimates were based on small numbers resulting in large confidence~~
480 ~~intervals, but are still showing a low rate.~~

481 Linkage to confirmatory testing happened relatively quickly after HIVST use: 53% did it in less than a
482 week and 91% in less than three months. Similar results were observed in a study in the general population
483 in Zambia [47][48], and a study among MSM in Nigeria [4849].

484
485 ~~The main reasons given for not linking to confirmatory testing suggest potential misinterpretation of~~
486 ~~the result or misunderstanding about the need to perform a confirmatory HIV test, highlighting the need~~
487 ~~to improve messaging around HIVST, in particular when HIV self-testing policies will be scaled up. For those~~
488 ~~who did confirmatory testing and were confirmed HIV positive, initiation of antiretroviral treatment was~~
489 ~~almost systematic, showing good linkage to care after confirmatory testing, as observed in many HIVST~~
490 ~~studies in sub-Saharan Africa [49–51].~~

491
492 ~~Previous analyses of ATLAS data showed that HIVST could reach people not reached by conventional~~
493 ~~HIV testing approaches [52], particularly partners and clients of key populations and key population~~
494 ~~members not self-identifying as such [38]. It is consistent with the finding that two-thirds of participants~~
495 ~~who did confirmatory testing went to a general health facility rather than a community clinic dedicated to~~

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496 key populations. In a study conducted in 2018 in Côte d'Ivoire among MSM, one third of the participants
497 preferred community based testing, one third expressed no preference, and one third preferred
498 undifferentiated HIV testing services (general population), mentioning the lack of discretion and anonymity
499 of community based sites and the desire to avoid the gaze of others [53].

500
501 The implementation of a telephone survey, aimed at gathering information from HIVST users while
502 preserving anonymity and without interfering with secondary distribution, has proven to be very useful to
503 evaluate the ATLAS program. However, its high cost makes it difficult to integrate it into national strategies
504 for assessing the impact of HIVST. Nevertheless, other impact evaluation methods, such as data
505 triangulation [35] and modelling [36], may prove more suitable for routine monitoring of HIVST's impacts.

506
507 A previous analysis of this survey among ATLAS HIVST users showed that HIVST secondary distribution
508 was feasible and acceptable [39]: participants reported that they appreciated the ease of use of HIVST, its
509 discretion and the fact that they are autonomous in carrying out the test. Finally, HIVST appeared as a
510 relevant additional approach for those usually distant from community activities and HIV testing services,
511 and has the potential to reach, beyond key populations, partners, clients, and other groups vulnerable to
512 HIV.

513
514
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516 the result or misunderstanding about the need to perform a confirmatory HIV test, highlighting the need
517 to improve messaging around HIVST, in particular when HIV self-testing policies will be scaled-up. For those
518 who did confirmatory testing and were confirmed HIV positive, initiation of antiretroviral treatment was
519 almost systematic, showing good linkage to care after confirmatory testing, as observed in many HIVST
520 studies in sub-Saharan Africa [50–52].

521
522 Previous analyses of ATLAS data showed that HIVST could reach people not reached by conventional
523 HIV testing approaches [53], particularly partners and clients of key populations and key population
524 members not self-identifying as such [54]. It is consistent with the finding that two-thirds of participants
525 who did confirmatory testing went to a general health facility rather than a community clinic dedicated to
526 key populations. In a study conducted in 2018 in Côte d'Ivoire among MSM, one-third of the participants
527 preferred community-based testing, one-third expressed no preference, and one-third preferred
528 undifferentiated HIV testing services (general population), mentioning the lack of discretion and anonymity
529 of community-based sites and the desire to avoid the gaze of others [55].

530
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533 evaluate the ATLAS program. However, its high cost makes it difficult to integrate it into national strategies
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535 triangulation [36] and modelling [37], may prove more suitable for routine monitoring of HIVST's impacts.

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539 discretion and the fact that they are autonomous in carrying out the test. Finally, HIVST appeared as a
540 relevant additional approach for those usually distant from community activities and HIV testing services,
541 and has the potential to reach, beyond key populations, partners, clients, and other groups vulnerable to
542 HIV.

543
544 ATLAS' HIVST distribution strategy successfully reached people living with HIV in West Africa, although
545 linkage to confirmatory testing following a reactive HIVST remained sub-optimal/relatively low in these first
546 years of HIVST implementation, and sub-optimal in the perspective of achieving UNAIDS 95-95-95 targets.
547 However, among participants who confirmed their reactive self-test result with a traditional facility-based
548 HIV test, a substantial proportion quickly proceeded with this confirmation (more than half in less than a
549 week and the vast majority in less than three months). Furthermore, if individuals were confirmed HIV-

550 positive, almost all began antiretroviral treatment. We showed that HIVST has the potential to reach more
551 hidden populations and constitutes a relevant complementary tool to existing screening services. To fully
552 harness the potential of self-tests, messaging around HIVST and its interpretation could be improved.
553

Appendices

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Table S111. Eligibility and participation in phase 2 survey by sociodemographic characteristics, distribution channel, HIV testing history, Positivity rates based on the reported number of visible lines and their on self-interpreted HIV self-testing (HIVST) result results and associated factors (binomial logistic regression), among participants of the first survey phase in Côte d'Ivoire, Mali, and Senegal (2021)

	Positivity rate based on the reported number of visible lines (central hypothesis)	Positivity rate based on self-reported HIVST results (central hypothesis)	Not eligible for Phase 2	p-value (Chi ² test)	Overall (phase 1 participants) OR	95% CI	p-value
	Eligible for phase 2 completed the questionnaire N=78 OR	Eligible for phase 2 but did not complete the questionnaire N=429 95% CI	N=2495				
Country (Intercept)	0.04	0.02, 0.08		<0.001	0.03	0.901, 0.07	<0.001
— Côte d'Ivoire	39 (50%)	20 (48%)	1331 (53%)				
— Mali	31 (40%)	18 (43%)	935 (37%)				
— Senegal	8 (10%)	4 (9.5%)	229 (9.2%)				
Sex and distribution channel				0.34			0.10
Man : MSM-based channels	35 (45%)	14 (33%)	948 (38%)				
Woman : MSM-based channels	5 (6.4%)	0 (0%)	98 (3.9%)	>0.9	0.25	0.00, 1.122	0.2
Man : FSW-based channels	22 (28%)	10 (24%)	588 (24%)		0.42	0.19, 0.86	0.023
Woman : FSW-based channels	14 (18%)	15 (36%)	656 (26%)		0.51	0.26, 0.98	0.048
Man: Other delivery channels	0.46	0.13, 1.13	134 (5.4%)		0.26	0.01, 1.43	0.37

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Woman : Other delivery channels	0.38		0.06, 1 (1.3%), 44	1	71	73 (0.02, 2.8%), 30	0.4
Country	-	-	0.2	=	=	0.10	
Côte d'Ivoire	=	=	=	=	=		
Mali	1.33	0.88, 2.02	0.2	1.66	0.97, 2.90	0.067	
Senegal	1.79	0.84, 3.58	0.11	0.70	0.15, 2.34	0.6	
Age group							0.2
15-24 years or less	27 (35%)	=	20 (48%)	=	1 117 (45%)	1 164 (45%)	5
25-34 years	38 (49%)	1.44	16 (38%)	0.94, 2.20	0.092	1,009 (40%), 39	0.80, 2.43 (41%), 0
35 years or more	13 (17%)	1.61	0.84, 3.00	6 (0.14%)	369 (15%), 1.19	0.43, 2.93 (15%), 0	2 388
Marital status							0.2
single	54 (69%)	=	28 (67%)	=	0.2 (67%)	0.3 (67%)	1 761 (67%)
divorced / separated / widowed	6 (7.7%)	1.55	2 (4.8%)	89 (0.62, 3.6%), 50	97 (0.3, 7%)	2.02 (0.54, 6.00)	0.2
living with partner / married	18 (23%)	0.76	12 (29%)	0.46, 1.21	727 (29%), 0	1.11 (0.59, 2.02)	0.7
Educational level							0.13
none / primary	13 (17%)	=	10 (24%)	=	480 (19%)	=	503 (19%)
secondary	50 (64%)	1.01	28 (67%)	0.62, 1.354 (54%), 71	>0.9	0.98 (0.52, 1.432)	>0.9
higher	15 (19%)	0.62	4 (9.5%)	0.33, 1.18	661 (26%), 0	0.23 (0.07, 0.62)	0.006
First-time tester							0.3
no	40 (51%)		22 (52%)		1 475 (59%)		1 537 (59%)

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—yes	38 (49%)	20 (48%)	1 020 (41%)	1 078 (41%)
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	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 ² -test)	Total N=2615 (phase 1 participants)
Result and number line				<0.001	
—2 lines / reactive	27 (35%)	20 (48%)	3 (0.1%)		50 (1.9%)
—1 line / non-reactive	0 (0%)	0 (0%)	2292 (92%)		2292 (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%)

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

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Table S22. Positivity rates 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). FSW-based channels include facility-based and outreach. Other channels include PWUD-based channels, index testing and STI consultations.

			MSM-based channels		FSW-based channels		Others delivery channels		Total
			Man	Woman	Man	Woman	Man	Woman	
Positivity rate based on self-reported HIVST results	Low	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)
	Central	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)
	High	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)
Positivity rate based on the reported number of visible lines	Low	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)
	Central	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)
	High	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)

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

†: indicated cells with less than 25 participants.

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.

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Table S333. 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
Positivity rate based on self-reported HIVST results	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)
Positivity rate based on the reported number of visible lines	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)

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Table S444. Eligibility and participation in phase 2 survey by sociodemographic characteristics, distribution channel, and HIV testing history (bivariate and multinomial regression model). FSW-based channels include facility-based and outreach. Other channels include PWUD-based channels, index testing and STI consultations.

	<u>completed phase 2 questionnaire</u> N = 78	<u>eligible for phase 2 but did not complete the questionnaire</u> N = 48	<u>phase 1 participants not eligible for phase 2</u> N = 2,489	<u>bivariate p-value (Chi² test)</u>	<u>multivariate p-value (multinomial model)</u>	<u>Overall N = 2,615 (phase 1 participants)</u>
Country				<u>0.9</u>	<u>0.8</u>	
Côte d'Ivoire	39 (50%)	23 (48%)	1,328 (53%)			1,390 (53%)
Mali	31 (40%)	20 (42%)	933 (37%)			984 (38%)
Senegal	8 (10%)	5 (10%)	228 (9.2%)			241 (9.2%)
Sex and distribution channel				<u>0.3</u>	<u>0.06</u>	
Man: MSM-based channels	35 (45%)	18 (38%)	944 (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 (21%)	588 (24%)			620 (24%)
Woman: FSW-based channels	14 (18%)	16 (33%)	655 (26%)			685 (26%)
Man: Other delivery channels	1 (1.3%)	3 (6.3%)	133 (5.3%)			137 (5.2%)
Woman: Other delivery channels	1 (1.3%)	1 (2.1%)	71 (2.9%)			73 (2.8%)
Age group				<u>0.5</u>	<u>0.11</u>	
15-24 years or less	27 (35%)	21 (44%)	1,116 (45%)			1,164 (45%)
25-34 years	38 (49%)	20 (42%)	1,005 (40%)			1,063 (41%)
35 years or more	13 (17%)	7 (15%)	368 (15%)			388 (15%)
Marital status				<u>0.3</u>	<u>0.5</u>	
single	54 (69%)	32 (67%)	1,675 (67%)			1,761 (67%)
divorced / separated / widowed	6 (7.7%)	2 (4.2%)	89 (3.6%)			97 (3.7%)
living with partner / married	18 (23%)	14 (29%)	725 (29%)			757 (29%)
Educational level				<u>0.079</u>	<u>0.09</u>	
none / primary	13 (17%)	13 (27%)	477 (19%)			503 (19%)
secondary	50 (64%)	29 (60%)	1,353 (54%)			1,432 (55%)
higher	15 (19%)	6 (13%)	659 (26%)			680 (26%)
First-time tester				<u>0.2</u>	<u>0.228</u>	
no	40 (51%)	25 (52%)	1,472 (59%)			1,537 (59%)
yes	38 (49%)	23 (48%)	1,017 (41%)			1,078 (41%)

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

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Table S555. Time between HIVST and confirmatory testing among phase 2 participants who did link to confirmatory testing, by reported number of lines and self-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%)
Total	34 (100%)	15 (44.2%)	1 (2.9%)	9 (26.5%)	8 (23.5%)	1 (2.9%)

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

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Table S666. 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 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%)

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

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587 **Table S775**—Time between HIVST and confirmatory testing among phase 2 participants who did link to confirmatory testing, by reported number of lines and self-
 588 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 2 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%)
Total	34 (100%)	15 (44.2%)	1 (2.9%)	9 (26.5%)	8 (23.5%)	1 (2.9%)

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

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591 **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 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%)
Total	34 (100%)	15 (44.2%)	1 (2.9%)	9 (26.5%)	8 (23.5%)	1 (2.9%)

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

593

594 **Table S887**—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-
 595 interpreted HIVST result.

	Overall	2 lines /reactive	1 line /reactive	2 lines /non-reactive	2 lines /DK-R	DK-R / reactive
less than 4 months	8 (10%)	3 (11%)	0 (0%)	4 (16%)	1 (5.6%)	0 (0%)
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%)
Total	34 (100%)	15 (44.2%)	1 (2.9%)	9 (26.5%)	8 (23.5%)	1 (2.9%)

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

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598

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603

Data, scripts, code, and supplementary information availability

604 Data, scripts and code are available online ~~on~~ (<https://doi.org/10.5281/zenodo.10255772>) as well as
605 the ~~Zenodo website~~ survey questionnaires (<https://doi.org/10.5281/zenodo.10210464>).
606 (<https://doi.org/10.5281/zenodo.8329454>).

607

Conflict of interest disclosure

608 The authors declare that they comply with the PCI rule of no financial conflicts of interest in relation to
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610

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