Performance, Usability and Acceptance of the Blood-Based INSTI HIV Self Test in High and Low HIV Prevalent Populations

Results and lessons learned from population-based usability and performance studies with first time self-testers in sub-Saharan Africa

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Disclosure: I am employed by bioLytical Laboratories Inc. Studies in Kenya and Congo were sponsored by bioLytical.

INSTI HIV Self Test

- Two versions, same contents, flow-through rapid test platform similar to CLIA waived POC INSTI HIV test, except:
  - Simplified Instructions for Use
  - No capillary pipette (single free flowing drop of blood)
- Results in 1 minute

4 studies were conducted in 2017-2018 in sub-Saharan Africa…

1 HSTAR-001: INSTI Usability Assessment

Wits RHI, Johannesburg, SA.

The ***purpose*** of this observed Usability Assessment was to document if "lay" people, non-professional and inexperienced in HIV self-testing, can successfully perform the steps to use the INSTI HIV Self Test without product familiarization.

Primary Objectives were to document and record:

1. Label comprehension (understanding of Instructions for Use, test limitations, test goal, inspection of test components)
2. Usability / user interaction with the device and accuracy of testing process
3. Results interpretation (contrived results)

Subjects were observed performing the self-test procedure, but did not interpret their own results…

HSTAR-001:
Participant demographics

- **Participants enrolled:** 200, no prior self testing
- **Gender:** 48% male, 52% female
- **Age:** 18-65; majority 18-35.
- **Education:** ⅓ ≤ gr. 7;
  ⅓ gr. 8-12;
  ⅓ ≥ college/university
- **Employment:** 48.5% unemployed

HSTAR-001:
Outcomes

Usability Aspect (n=200)	Outcome (%)
Complete critical steps correctly	**96.5**
Mock results interpreted correctly	**97.4**
Device and IFU easy to use	**99.0**
Would use this test again	**98.5**
Would recommend this test	**97.5**
Knew to go to a clinic if positive	**99.0**
Successfully have a blood drop fall into INSTI Sample Diluent	**85.5**

Good usability in the hands of intended users, how would INSTI perform in prospective field studies…?

2 Performance and usability evaluation of the INSTI HIV Self Test in Kenya

PLoS ONE 13(9): e0202491. Open access, Bwana, P et al https://doi.org/10.1371/journal.pone.0202491

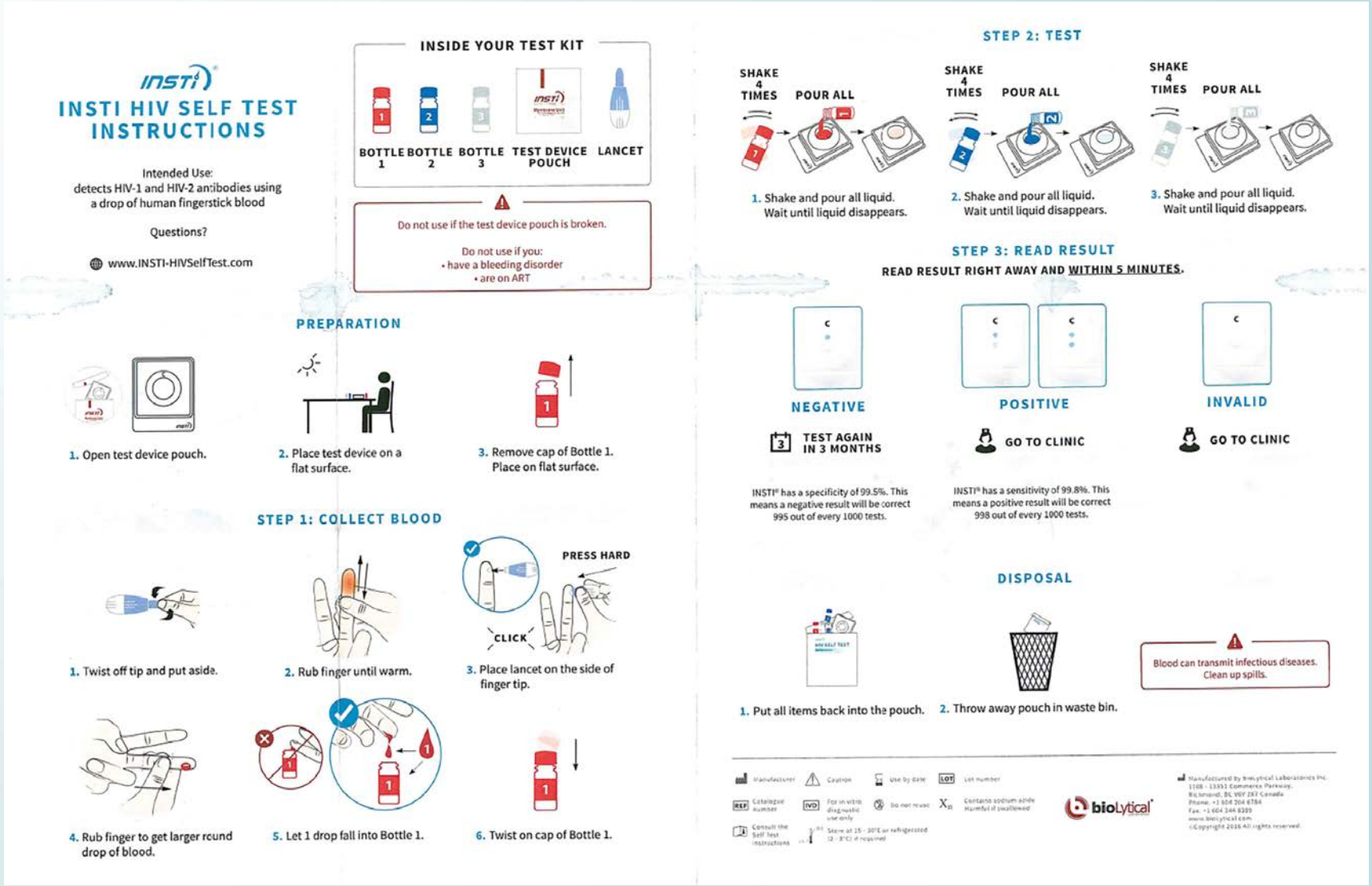
Background:

- Kenya has an adult HIV prevalence rate of 5.4%, with approximately 1.6 million people living with HIV.
- Of these, approximately 53% are unaware of their HIV status.
- In 2017, under a collaboration with CHAI, bioLytical sponsored a study from the Kenya Medical Research Institute (KEMRI) to assess performance and usability of the INSTI HIV Self Test.

KEMRI:
Study Design

- Cross sectional, observed study of consenting adults in Western Kenya conducted at market centers and village squares, supported by village chiefs and county administrations.
- Known HIV positive patients were recruited from clinics in the study area.
- For **method comparison**, self-interpreted INSTI HIV Self Test results were compared to the Kenya national algorithm test methods including 4th gen HIV Ag/Ab EIA for calculation of sensitivity and specificity.
- The **usability** study was a mixed methods, directly observed, qualitative (questionnaire-driven) study.
- For **readability**, the first 91 participants from the methods comparison study were given contrived test units and asked to interpret the results.

The INSTI HIV Self Test instructions were provided in English on one side…



INSTI HIV SELF TEST INSTRUCTIONS

Intended Use:
detects HIV-1 and HIV-2 antibodies using a drop of human fingerstick blood

Questions?

www.INSTI-HIVSelfTest.com

INSIDE YOUR TEST KIT

BOTTLE 1 | BOTTLE 2 | BOTTLE 3 | TEST DEVICE POUCH | LANCET

Do not use if the test device pouch is broken.

Do not use if you:
- have a bleeding disorder
- are on ART

PREPARATION

1. Open test device pouch.
2. Place test device on a flat surface.
3. Remove cap of Bottle 1. Place on flat surface.

STEP 1: COLLECT BLOOD

1. Twist off tip and put aside.
2. Rub finger until warm.
3. Place lancet on the side of finger tip.

PRESS HARD

CLICK

4. Rub finger to get larger round drop of blood.
5. Let 1 drop fall into Bottle 1.
6. Twist on cap of Bottle 1.

STEP 2: TEST

SHAKE 4 TIMES POUR ALL

1. Shake and pour all liquid. Wait until liquid disappears.
2. Shake and pour all liquid. Wait until liquid disappears.
3. Shake and pour all liquid. Wait until liquid disappears.

STEP 3: READ RESULT

READ RESULT RIGHT AWAY AND WITHIN 5 MINUTES.

NEGATIVE

TEST AGAIN IN 3 MONTHS

INSTI® has a specificity of 99.5%. This means a negative result will be correct 995 out of every 1000 tests.

POSITIVE

GO TO CLINIC

INSTI® has a sensitivity of 99.8%. This means a positive result will be correct 998 out of every 1000 tests.

INVALID

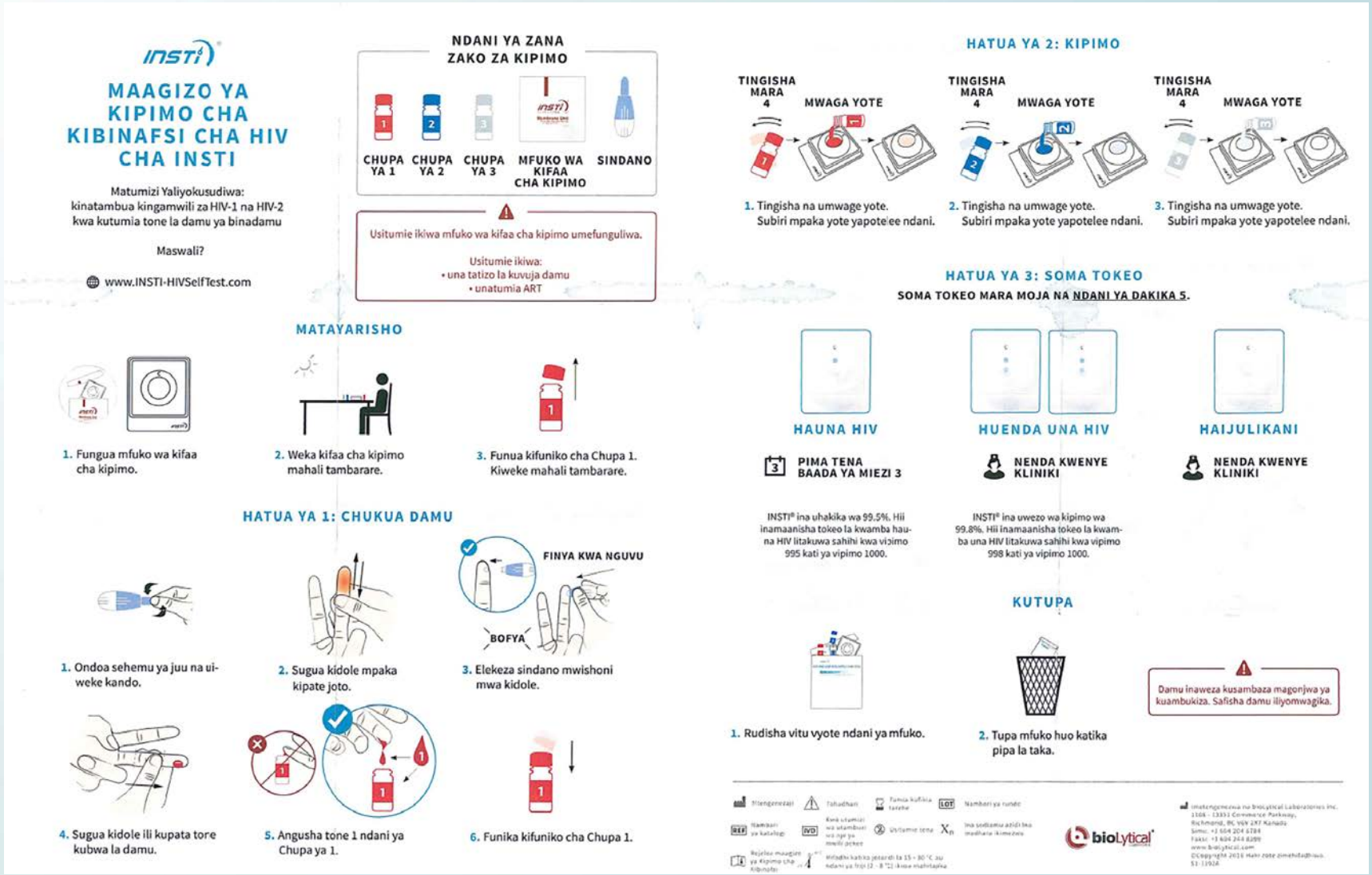
GO TO CLINIC

DISPOSAL

1. Put all items back into the pouch.
2. Throw away pouch in waste bin.

Blood can transmit infectious diseases. Clean up spills.

…and Swahili on the other side.



INSTI

MAAGIZO YA KIPIMO CHA KIBINAFSI CHA HIV CHA INSTI

Matumizi Yaliyokusudiwa:
kinatambua kingamwili za HIV-1 na HIV-2 kwa kutumia tone la damu ya binadamu

Maswali?

www.INSTI-HIVSelfTest.com

NDANI YA ZANA ZAKO ZA KIPIMO

CHUPA YA 1 | CHUPA YA 2 | CHUPA YA 3 | MFUKO WA KIFAA CHA KIPIMO | SINDANO

Usitumie ikiwa mfuko wa kifaa cha kipimo umefunguliwa.

Usitumie ikiwa:
- una tatizo la kuvuja damu
- unatumia ART

MATAYARISHO

1. Fungua mfuko wa kifaa cha kipimo.
2. Weka kifaa cha kipimo mahali tambarare.
3. Funua kifuniko cha Chupa 1. Kiweke mahali tambarare.

HATUA YA 1: CHUKUA DAMU

1. Ondoa sehemu ya juu na uiweke kando.
2. Sugua kidole mpaka kipate joto.
3. Elekeza sindano mwishoni mwa kidole.

FINYA KWA NGUVU

BOFYA

4. Sugua kidole ili kupata tone kubwa la damu.
5. Angusha tone 1 ndani ya Chupa ya 1.
6. Funika kifuniko cha Chupa 1.

HATUA YA 2: KIPIMO

TINGISHA MARA 4 MWAGA YOTE

1. Tingisha na umwage yote. Subiri mpaka yote yapotelee ndani.
2. Tingisha na umwage yote. Subiri mpaka yote yapotelee ndani.
3. Tingisha na umwage yote. Subiri mpaka yote yapotelee ndani.

HATUA YA 3: SOMA TOKEO

SOMA TOKEO MARA MOJA NA NDANI YA DAKIKA 5.

HAUNA HIV
PIMA TENA BAADA YA MIEZI 3

INSTI® ina uhakika wa 99.5%. Hii inamaanisha tokeo la kwamba hauna HIV litakuwa sahihi kwa vipimo 995 kati ya vipimo 1000.

HUENDA UNA HIV
NENDA KWENYE KLINIKI

INSTI® ina uwezo wa kipimo wa 99.8%. Hii inamaanisha tokeo la kwamba una HIV litakuwa sahihi kwa vipimo 998 kati ya vipimo 1000.

HAIJULIKANI
NENDA KWENYE KLINIKI

KUTUPA

1. Rudisha vitu vyote ndani ya mfuko.
2. Tupa mfuko huo katika pipa la taka.

Damu inaweza kusambaza magonjwa ya kuambukiza. Safisha damu iliyomwagika.

bioLytical

Results:
Performance Evaluation

- A total of 476 (207 HIV positive, 269 HIV negative) subjects completed the self test and provided venous blood for 4th gen EIA testing
- From the 470 subjects[1] with valid INSTI and 4th gen EIA results:
  - **INSTI Sensitivity: 98.99%** (199/201)
  - **INSTI Specificity: 98.15%** (264/269)

[1] 6 invalids were excluded from calculations

KEMRI: INSTI Usability Outcomes

Usability Aspect	HSTAR-001 (%) n=200	KEMRI (%) n=350
Complete critical steps correctly	**96.5**	**98.9**
Results interpreted correctly	**97.4** (mock)	**98.6**
Device and IFU easy to use	**99.0**	**96.9**
Would use this test again	**98.5**	**96.6**
Would recommend this test	**97.5**	**97.2**
Successfully have a blood drop fall into INSTI Sample Diluent	**85.5**	**85.6**

Results:
Contrived Results Interpretation
n=91

- All the 91 participants correctly identified strong positive, negative and invalid results
- Only 31 were able to identify weak positive results: ***likely due to the Swahili IFU not having an image of a weak positive result.***

Good overall usability and performance, however observers assisted in sample collection as needed. Mitigation required to improve fingerstick blood sample collection and interpretation of weak positive results…

3 HSTAR-003: Controlled study to evaluate the performance of the INSTI HIV Self Test by untrained laypersons

Wits RHI, Johannesburg, SA.

WITS UNIVERSITY

Study Design

- Prospective, observed, cross-sectional field study
- Each participant was presented with an INSTI HIV Self-Test and asked to perform the test on their own with no interaction from the observer.
- The participant was evaluated for self-testing **Usability, Interpretation,** and **Comprehension**.
- All results were compared to the South Africa standard HIV testing algorithm (4th gen HIV Ag/Ab EIA) for determining sensitivity and specificity
- Consecutive recruitment was initiated until 850 unassisted HIV Self-Test results were obtained and 900 subjects completed all usability elements.

HSTAR-003:
Performance Evaluation

- A total of 850 (99 HIV positive, 751 HIV negative) subjects completed the self-test and provided venous blood for 4th gen EIA testing
- 3/900 subjects quit the study and 47 subjects interpreted their results as invalid or “do not know”
- From the 850 subjects with valid INSTI and 4th gen EIA results:
  - **INSTI Sensitivity:** 98.99% (98/99)
  - **INSTI Specificity:** 100% (751/751)

HSTAR-003: INSTI Usability Outcomes

Usability Aspect	KEMRI (%) n=350	HSTAR-003 (%) n=900
Complete critical steps correctly	98.9	96.8
Results interpreted correctly	98.6	99.9
Device and IFU easy to use	96.9	99.4
Would use this test again	96.6	95.7
Would recommend this test	97.2	97.3
Successfully have a blood drop fall into INSTI Sample Diluent	85.6	96.2

IFU mitigations led to significant improvement in fingerstick blood drop sample collection and addition

4 Congo-001: A Study to Evaluate the Accuracy, Usability and Readability of the INSTI HIV Self Test Performed by Observed Intended Users in Republic of Congo Testing Sites

Background:

- Congo has an adult HIV prevalence rate of <3%. (low prevalence)
- 75% of the population of 4 million live in the two major urban centers Pointe Noire and Brazzaville.
- The study was conducted on consenting residents of rural and urban regions.
- Prior to this study, no HIV self testing had been conducted in the Republic of Congo

Congo-001

Study Design

- Prospective, observed cross-sectional field study similar to HSTAR-003
- Each participant was presented with a packaged INSTI HIV Self Test and asked to perform the test on their own in the presence of a non-interactive observer.
- The participant was evaluated for self-testing **Usability, Interpretation**, and **Comprehension**.
- All self-test results (participant self-reported result) were compared to the Republic of Congo standard HIV testing algorithm (4th gen EIA) for sensitivity and specificity.
- Consecutive recruitment was initiated until 500 unassisted HIV Self-Test results were obtained and 500 subjects completed all usability elements.

Results: Congo-001 Performance Evaluation

- A total of 500 (392 male, 108 female) subjects completed the self test and provided venous blood for 4th gen EIA testing.
- From the 478 subjects[1] with valid INSTI and 4th gen EIA results:
  - **INSTI Sensitivity: 100%** (11/11)
  - **INSTI Specificity: 100%** (467/467)

[1]22 invalids were excluded from calculations.

Congo-001: INSTI Usability Outcomes

Usability Aspect	HSTAR-003 (%) n=900	Congo (%) n=500
Complete critical steps correctly	**96.8**	**95.6**
Results interpreted correctly	**99.9**	**99.6**
Device and IFU easy to use	**99.4**	**99.0**
Would use this test again	**95.7**	**100**
Would recommend this test	**97.3**	**100**
Successfully have a blood drop fall into INSTI Sample Diluent	**96.2**	**97.0**

No differences in performance, acceptance and usability of INSTI Self Test in a low vs high prevalence populations

Lessons Learned

from the 4 Self Test Field Studies

- Use of a free-flowing blood drop instead of a transfer pipette was feasible, but modifications to the IFU were necessary to improve success rate in successive studies.
- Overall acceptance of a blood-based self test was very high across a broad cross section of intended users in sub-Saharan Africa settings.
- Overall usability and results interpretation of INSTI HIV Self Test by intended users was very high.
- Self-testers had difficulty comprehending the image for removal of the tab from the lancet, which showed only one hand grasping the tab, but no hand holding the lancet body. Revised IFU shows two hands.
- Further revision of IFU illustrated invalid result for visible test do but no control dot.
- Majority of participants would prefer to use the INSTI self test at home rather than in a clinic setting.

Conclusions and Next Steps

Performance (sensitivity and specificity) meets the minimum FDA requirement (lower bound of 95% CI >95%) for INSTI HIV Self Test.

The IFU is critical to ensure self testers of all literacy and socio-economic levels can complete the test correctly.

Blood-based self testing (INSTI) was accurate, easy to perform and very acceptable in the hands of intended users.

As a result of these studies, the INSTI HIV Self Test became the first and only blood-based HIV self test to receive WHO Pre-qualification, in November, 2018.

Pre-submissions under way with FDA and Health Canada for US and Canadian studies of the INSTI HIV Self Test.

Continue to work with research partners towards investigational studies of INSTI HIV Self Test in key populations.

Thank You!

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