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Acceptability and use of HIV self-testing among young people in sub-Saharan Africa: a mixed methods systematic review

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Abstract

Background Young people (YP) are disproportionately affected by the HIV pandemic in sub-Saharan Africa (SSA), but testing rates remain low despite global targets of testing 95% of people with HIV infection by 2030. HIV self-testing (HIVST) has been recently introduced to reach high-risk population groups such as these. Thus, synthesis of emerging evidence on the acceptability and use of HIVST among YP in SSA is needed so that comprehensive information can be generated to inform policy and practice.

Methods We employed a mixed methods systematic review of quantitative and qualitative literature reporting on HIVST among YP involving any design and published in English by 31st of October 2023. The review synthesized quantitative evidence on acceptability and use of HIVST, and qualitative evidence on perspectives of YP about HIVST. We searched databases of published articles (e.g. MEDLINE, CINAHL) and Gray literature sources (e.g. Google, Google Scholar). The concepts for the search included self-testing, HIV/AIDS, and countries in SSA. Two authors independently screened, retrieved full-text, and assessed quality of the studies.

Results A total of 4150 studies were retrieved and 32 studies were finally included in the review. Acceptability of HIVST computed from a single item asking YP on their preference or willingness or demand for HIVST was moderate (34–67%) to high ($\geq 67\%$) among YP in SSA. Nine of the fourteen studies that reported on acceptability found high acceptability of HIVST. Use of HIVST ranged from 0.8 to 100% while in most studies the use rate was below 50%. Key barriers to HIVST use were coping with a positive test in the absence of counselling and support, physical discomfort, and cost of kits. Perceived enablers included perceptions of HIVST as promoting personal empowerment and autonomy; privacy and confidentiality; and convenience in location, time, and skill.

Conclusions HIVST was highly accepted but not well utilized among YP in SSA. YP showed diversified needs with mixed preferences for location, and modalities of service provision. Overall, the review identified heterogeneous evidence in terms of methods, population, outcome measures, and results. The review was registered in the International Prospective Registry of Systematic Reviews (PROSPERO: ID = CRD42021278919).

Keywords HIV, Self-testing, Young people, Adolescents, Youths, Acceptability, Use, Barriers, Enablers, Facilitators

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Background

The Human Immunodeficiency virus (HIV) continues to be a major public health issue globally with approximately 39 million people living with the HIV virus at the end of 2022 and claiming over 40 million lives so far [1]. The World Health Organization (WHO) African region (part of Africa consisting of west Africa, central Africa, east and southern African countries) carries the highest burden of people living with HIV (PLHIV) (25.6 million), of which the Southern and Eastern Africa regions are the hardest hit regions with about 20.4 million PLWHA in 2022 [1–3]. In 2021, 84% of YP with HIV were in SSA. The sequelae of HIV infection, known as Acquired Immunodeficiency Syndrome (AIDS), is the leading cause of death for YP aged 10–24 years in Africa and adolescents in SSA, as well as second highest cause of death among YP globally [4]. The increasing population of YP in Africa, compounded by unsafe sexual practices and low knowledge about HIV and sexual health among YP, threatens to increase new HIV infections further [5]. Adolescent girls and young women are particularly at risk for new infections in SSA accounting for 66% of new HIV infections in the region [6]. Although young people are still at high risk of new HIV infection in SSA, there has been a decline in new HIV infection over the last decade, including among young people aged 15–24 [50% and 44% reduction for young women, and young men respectively since 2010] [6], and this needs to be supported to continue.

In 2020, the Joint United Nations Programme on HIV and AIDS (UNAIDS) proposed the UNAIDS 95-95-95 targets to be achieved by 2025 - that is, 95% of people living with HIV (PLHIV) know their HIV status, 95% of PLHIV who know their status initiate treatment, and 95% of PLHIV who are on treatment are virally suppressed [7]. However, in 2023 in the Eastern and Southern African region, only 25% of girls and 17% of boys aged 15–19 were tested for HIV and received their result in the last 12 months [8]. Meeting the first target of diagnosing 95% of people with an HIV infection, particularly for young people, requires moving beyond a passive testing approach where the client self-presents for testing, to more proactive, rights-based testing initiatives, such as HIVST [9, 10] that can be tailored to differed age groups, geographic areas and populations [11–13].

HIVST is defined as a test that can either be performed in the clinic or in the community setting whereby individuals self-collect a specimen, perform the test, and interpret the test results by themselves [14]. It is not a definitive test for HIV diagnosis, rather it is a screening test for the presence of HIV antibodies or antigen, and a reactive self-test always requires further confirmatory testing from a trained health professional [14, 15]. The first kit was proposed in 1986, the home sample

collection HIVST was available 10 years later in 2006, and the rapid diagnostic HIVST was approved by the United States (US) Federal Drug Administration 16 years later in 2012 [16]. Due to high interest among different population groups as of then, WHO formally recommended its use in 2016, and to date almost 100 countries have included it as part of their national testing strategy [14, 16].

Since late diagnosis of HIV is one of the main reasons for poor treatment outcomes among YP in SSA [17], the new initiative of HIVST has the potential to increase access to testing, knowledge of one's status, diagnosis and initiation of treatment among PLHIV [15]. However, barriers have been identified for HIV screening including stigma, discrimination, lack of privacy and confidentiality, which are relevant for people of any age group. However, YP face the greatest obstacles owing to their social dependence on their families or guardians, and the legal age of consent to test [13, 18].

In its 2016 guideline on HIVST, the WHO indicated acceptability of HIV testing service is an important factor for service use among key populations and YP [14]. However, existing studies on acceptability of HIVST among YP are few, despite a great interest reported in the available studies [13, 19, 20]. Accessing confirmatory testing, coping with a reactive self-test result, and linkage to care were concerns associated with HIVST [14, 21]. More recent studies have also explored the need for counseling from providers for adolescents and YP who had worries about their reactions to a positive result and the accuracy of the results [22–24]. YP have unique sexual and reproductive health needs as they might have unsupportive families, experience stigma and unsupportive norms at community and societal levels, and face unfriendly health care environment [25, 26]. To respond to these special needs, there is a need to perform targeted review to bring about stronger recommendations for policy making, as well as to advance research specific to their needs.

Studies conducted after the formal development of the WHO guideline [14] on the acceptability, uptake and modalities of service on HIVST amongst YP have not been systematically synthesized. Furthermore, although there have been previous HIVST reviews for the general population [20, 27], and adult men [28, 29] in SSA, none of them focused on YP. In early 2020, Tonen-Wolyec et al. reviewed the existing literature on HIVST among adolescents in SSA, and indicated the need for operational research on acceptability and practicability of HIVST among adolescents [13]. The review was a broad literature review, aimed to indicate the available evidence (rather than a systematic review), targeted only at adolescents (aged 10–19), therefore not covering YP aged 20–24), did not report qualitative findings and was undertaken when there were limited studies. Young people (YP) are defined

differently by different institutions and countries. Whilst the African Charter defines youths as those between 15 and 35 years [30], we have adopted the age range 10–24 recommended by WHO and United Nations Population Fund [30–32] to make global comparison of our findings.

Therefore, the present review synthesized evidence on the acceptability and use of HIVST among YP in SSA seeking to answer the research question: What is the acceptability, uptake, and perspectives of HIVST among YP (10 to 24 years) in SSA?

Methods

The protocol for the systematic review was registered on International Prospective Registration of Systematic Reviews (PROSPERO) with PROSPERO ID=CRD42021278919 [33]. Based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, the [methods](#) section is presented below. The checklist filled is available as Supplementary file [S1](#).

Eligibility criteria

This review included all papers based on original primary data conducted in any setting (health facility, home, youth friendly-centers, schools, and community setup), which employed any study design examining acceptability and/or uptake/use and/or perspectives of adolescents and youths (aged 10–24 years) of any gender about HIVST and were conducted in SSA countries. Articles were included if they were published in scholarly journals or unpublished studies or reports (gray literature), published in English and before 31 October 2023. We also included seven papers with participants we considered as near miss (above the age of 24 years), with four papers including YP up to 25 [34–37], two papers where YP were reported separately amongst a larger study [23, 38], and one study where 83% of the students in the study constituted YP [39]. Documents with incomplete data, such as editorials, commentaries, advocacy, and letters, as well as review articles were excluded from the review.

Data items (outcomes) definitions

This mixed methods systematic review synthesized quantitative evidence on acceptability, use of HIVST, and the perspectives of YP on HIVST.

Acceptability of HIVST was defined as volunteering to show up for HIVST. The level of acceptability was measured as the proportion of YP who chose to self-test among those who were offered and consented to test either in assisted or unassisted manner, as defined in a previous worldwide review on HIVST [40]. We used the acceptability cut off points from Carmen Figueroa et al.'s previous classification where they used the definition, *willingness to take a test in the future*, and classified

acceptability score as “high” ($\geq 67\%$), “moderate” (66–34%), and “low” ($\leq 33\%$) in their review of literature on attitude and acceptability of HIVST among key populations [41].

Use of HIVST was defined as self-reported or observed use of the HIVST kits by YP for testing themselves, either in assisted or unassisted manner. This review considered studies reporting use of HIVST as a proportion or percentage of YP who tested themselves for HIV among those who were offered and consented to test.

Perspectives of YP towards HIVST, including the acceptability, perceived barriers, and facilitators of HIVST, and perceived solutions, were synthesized from qualitative studies reporting on these among YP irrespective of the year of publication, setting and design of the studies.

Data sources and search strategy

A comprehensive search of the literature was performed by accessing scholarly databases and gray literature sources through Flinders Library with the assistance of experienced librarians, who assisted with search strategy development, translation, and validation. Databases searched were PubMed/Medline, Scopus, Web of Science, ProQuest, Science Direct, CINAHL, PsychInfo, Embase, Clinical trial.org, Cochrane Central, and African Index Medicus. Gray literature was also searched using Google, Google Scholar and other sources including ProQuest Thesis and Dissertation International. The details of the search strategy and each database's search translation is available in Supplementary File [2](#).

Selection process and study risk of bias assessment

Two reviewers (EAZ and HAG) screened the articles independently through a staged process, firstly reviewing articles by their title and abstract, then reviewing short-listed articles by full text. The process was performed in the Covidence software platform. Disagreements were resolved through discussion with the review team (AZ, JS, and BMG).

The mixed methods appraisal tool (MMAT, version 2018) was used to appraise the quality of studies included in the review [42]. The tool is designed to appraise a range of study designs of systematic mixed method reviews. According to the guidance in the scoring of the articles [43], the quality of the studies was rated from 1 to 5 where 1, 2, 3, 4, 5 indicating 20%, 40%, 60%, 80% and 100% respectively from low to high quality. For a quantitative study, the scores are based solely on the criteria for the type of quantitative design employed; for a qualitative study, the scoring is based on the criteria to assess qualitative studies more broadly. For mixed method studies, the lowest score from the assessment made to the quantitative, qualitative, and mixed methods is used to

rate the articles' quality. We have classified papers with scores 1–2 as low quality, 3 as moderate quality, and 4–5 as high quality (Supplementary file 3). One author (EAZ) appraised the quality of all included studies, with second reviewers as follows: a qualitative researcher (AZ) appraised the quality of qualitative studies, and a quantitative researcher (JS) appraised the quality of quantitative and mixed method studies. Disagreements between reviewers was resolved through discussion with the review team. An overall score was made to determine the quality of the studies following the guidance on the reporting the quality of articles for the MMAT [43]. Because of the limited number of studies, no study was excluded from inclusion because of the quality assessment.

Data extraction process and other variables considered as data items

Data were extracted by the first author (EAZ) using an extraction template prepared in MS Excel and verified by the other researchers (HA, JS, and AZ). Study investigators for articles with an incomplete or unclear data were contacted via email. Key quotes of participants in the primary study were also extracted from qualitative study articles included in the review. Other data was collected on author, year, and the source of publication for the report, study country, study setting, study design, aims and sample characteristics of the study. Insights on experiences and preferences for different HIVST modalities (oral versus blood-based testing, assisted versus unassisted, need for pre-and post-test counselling) was also synthesized from the articles.

Synthesis

We summarized the characteristics of the included studies and synthesized information relevant to the objectives of the study using a qualitative approach. We presented acceptability and use estimates descriptively but did not conduct meta-analysis because of substantial heterogeneity in the included studies in the measurement, sampling and conduct of the studies (Supplementary file 3). The qualitative findings were inductively synthesized using thematic synthesis techniques and finally categorized under the overarching themes as barriers and facilitators to the acceptability and use of HIVST. Views or perceptions of YP on HIVST were initially synthesized in codes reflective of their perceived barriers and facilitators using NVivo Software. Strategies suggested by the study participants were also included to support interpretation of findings and recommendations based on the findings. Similar or related codes were merged to form primary synthesis statements. Reflections or quotes with comprehensive meaning have been presented alongside the primary synthesis statements. The pooled statements were

merged into categories based on similarity in meaning. Finally, categories with shared meaning were further synthesized into one or more themes.

Because of the nature of the review having multiple complementary review questions, we have been guided by the recommendations of Hong et al., 2017 to make the mixed methods synthesis from quantitative and qualitative studies [44]. Thus, we have used parallel-results design of a convergent synthesis design which allows separate presentation of qualitative and quantitative findings in the **results** section and the integration or interpretation of findings in the **discussion** section.

Results

Study selection and characteristics

A total of 4403 studies were identified from various sources, and 32 studies were included in the final review. Forward and backward citation search of the included studies and search of reference lists of reviews on HIVST did not yield new studies to include in the review. Twelve of the studies were quantitative studies [34, 37, 39, 45–53], another 14 were qualitative [22–24, 36, 54–63] and the remaining six employed mixed methods [35, 38, 64–67] (Table 1).

The PRISMA Flow Diagram adapted from PRISMA 2020 [68] is indicated in Fig. 1.

The studies were conducted in 10 of SSA countries, namely Kenya [46, 49, 52, 56, 61, 62], Nigeria [36, 37, 47, 48, 54, 58–60], Uganda [23, 38, 53, 57, 67], Zimbabwe [22, 35, 55, 66], South Africa [24, 34, 39, 65], Mozambique [45], Malawi [35], Democratic Republic of Congo (DRC) [50, 51], Lesotho [64], and Botswana [63] and were published over the past 8 years (2017 to 2023) (Table 1).

Among the 18 studies having quantitative findings (12 quantitative alone and 6 mixed method studies), 17 were used to extract findings and one of the mixed methods studies [35] did not report on a quantitative finding relevant to this review. Most of the studies employed a cross-sectional descriptive study design [34, 37, 39, 45, 46, 48–53], two were nested in a cluster randomized controlled trial [64, 66], one was a quasi-experimental cohort [47], and the rest were reported as part of mixed methods studies with a survey or follow up study and qualitative components [38, 65, 67].

Twenty studies were eligible for extraction of qualitative findings and 19 were used to extract qualitative data. One of the 5 studies with mixed data [65] did not have a qualitative data relevant for this review. Most of the studies employed a descriptive qualitative study [22–24, 36, 54, 56–63] while three were nested in a randomized controlled trial [55, 64, 66]. Most of the studies were primarily aimed to explore the experiences, preferences, and perceptions of YP about HIVST [22, 24, 35, 36, 56–58, 60, 62–64], some were aimed to explore perspectives on the

Table 1 Characteristics of the included studies with their overall quality

Studies	Country	Population	Quality
Quantitative studies			
Hector J, 2018	Mozambique	Adolescents 16 to 20	*c
Imani et al., 2021	Kenya	Adolescent girls and young women: 15–24 yrs	*****a
Iwelunmor et al., 2022	Nigeria	Young People 14–24	*****a
Nawazuru U et al., 2019	Nigeria	Young People 14–24	***c
Olakunde et al., 2022	Kenya	High risk young adults, 18–22	*****a
Smith et al., 2016	South Africa	Young adults, 16–25	***b
Serge Tonen-Wolyec et al., 2019, PoseOne	DRC	adolescents 15–19	*****a
Tonen-Wolyec et al., 2019 PanAfricanMedJ	DRC	Young students 15–24	**c
Wilson et al., 2022	Kenya	Adolescents and young adults, 15–24	*****a
Abdulhammed Babatunde et al., 2022	Nigeria	University students 16 and above, 87.8% are between the ages 16–25	**c
Hloniphile R. Mthiyane et al., 2023	South Africa	University students 18 to 29, 83% between 18–24, 17% between 25–29	**c
Segawa et al., 2022	Uganda	Female university students 15–24	*****a
Qualitative studies			
Iwelunmor et al., 2020	Nigeria	Youth 10–24	*****a
Andrea L. Koris et al., 2021,	Zimbabwe	Tertiary school students, 18–24, Qualitative study in RCT	*****a
Robert Lapsley et al., 2020	Kenya	Adolescents and young adults, 15–24	*****a
Carmen H Logie et al., 2021	Uganda	Urban refuge youth, 16–24	*****a
Joseph K. B. Matovu et al., 2020	Uganda	Young people in fishing community, 15–24	*****a
Chisom Obiezu-Umeh, 2021	Nigeria	Young people, 14 to 24	*****a
Crissi Rainer, 2020	Zimbabwe	Adolescents, 16 to 18 years	*****a
Tiarney D. Ritchwood, 2019	South Africa	Youth 18–24	*****a
Kadija M. Tahlil, 2021	Nigeria	Youth 14–24	*****a
Dennis Aizobu et al., 2023	Nigeria	Sexually active youth between 21–25 years	*****a
Mason S et al., 2022	Nigeria	YP 10–24 years living in Lagos city	*****a
McGowan M et al., 2022	Kenya	Young women 16–24	*****a
Neiloy R Sircar, and Allan A Maleche, 2022	Kenya	Young women 18–24, FSW, MSM and people who inject drugs (PWIDs)	****a
Nambusi K et al., 2023	Botswana	Young people 18–24 years and health care workers	*****a
Mixed Methods study			
Amstutz et al., 2020	Lesotho	Adolescents and young adults, Mean, Intervention = 18, control = 17 Range intervention: 15 to 21	****a
Birdthistle et al., 2022	South Africa	Young people 15 to 24	*****a
Indravudh et al., 2017	Malawi and Zimbabwe	Young people, 16 to 25	*****a
Matovu et al., 2020	Uganda	Young people in fishing community, 15–24	**c
Mavodza et al., 2021	Zimbabwe	Youth 16–24	*****a
Rita Nakalega et al., 2023	Uganda	Young women 18–24	*****a

1–2=low quality (c), 5 studies; 3=moderate quality (b), 2 studies and 4–5=high quality(a), 25 studies

design of programs to improve HIVST [23, 38, 54, 59, 60] and three studies were done to explore the acceptability and uptake of HIVST among YP [55, 66, 67].

A summary of the characteristics and major findings from the included studies is available in tables presented as supplementary material (supplementary material file 3, Table S3 and Table S5).

Quality assessment of the included studies

Methodological quality of the papers included in the study was assessed using the MMAT version 2018. Five (15.6%) of the articles included in this review were

regarded as of low quality [37–39, 45, 51], two (6.3%) were of moderate quality [34, 48] and the rest (78.1%) were of high quality (Table 1).

Results from quantitative studies

Acceptability of HIVST among YP in SSA

Thirteen of the 17 papers with quantitative data had reported on acceptability of HIVST, considering willingness or preference to self-test as an acceptance rate, either during the study or in the future when HIVST becomes available to them [38, 39, 46, 48, 49, 51–53, 65,

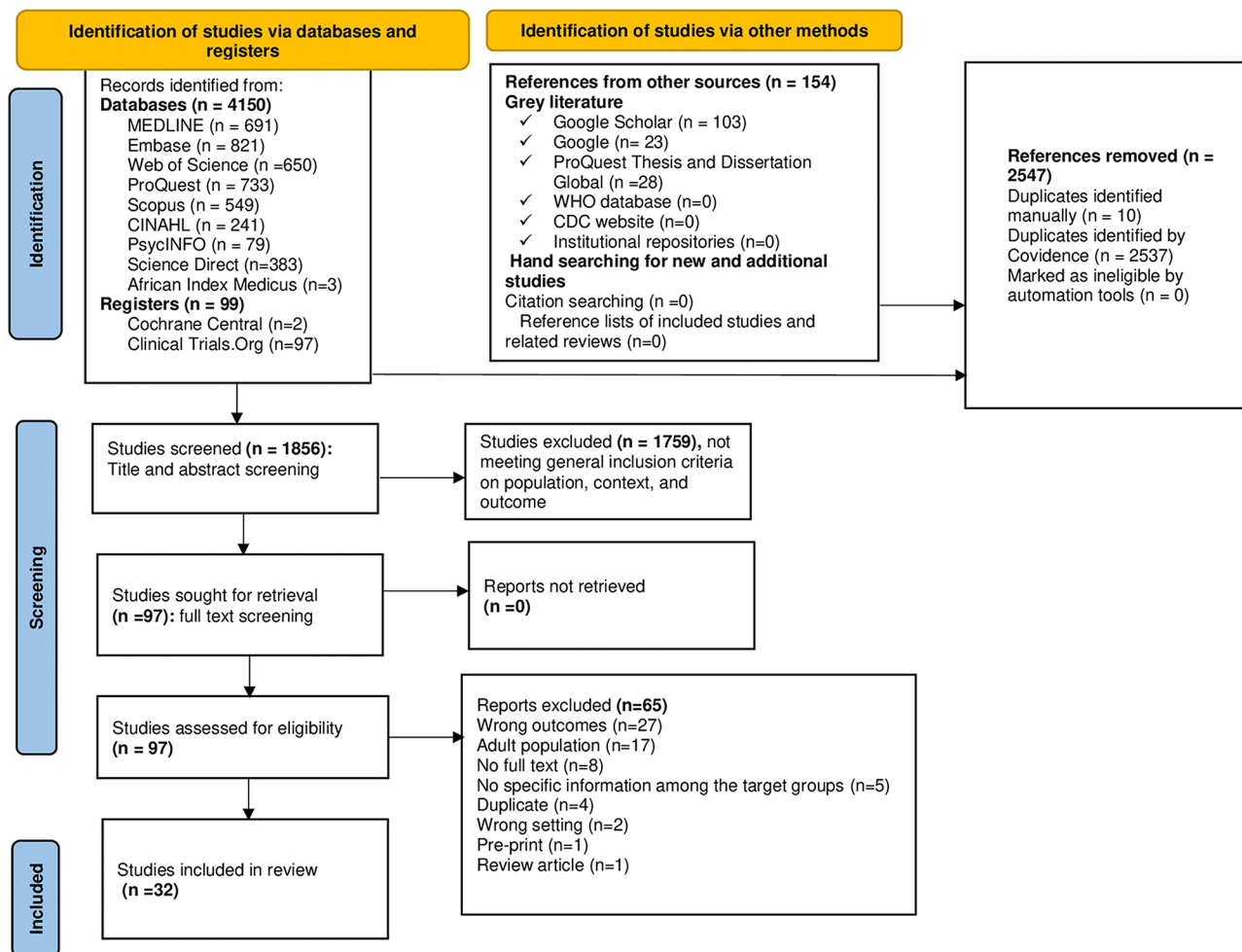


Fig. 1 PRISMA flow diagram

66]. Various approaches to measurement were employed. Most of the studies conceptualized acceptability as participants’ anticipated willingness or actual acceptance of self-test [37–39, 46, 49, 52, 53, 66, 67], demand to screen self for HIV [65], choosing HIVST as a testing option [51], consent and use of the self-test kits [50], and rating of their preference for self-testing device [34]. Nine of the thirteen papers measured acceptability as the prime objective of the study [34, 37, 38, 50–53, 66, 67]. In two articles, acceptability was measured as a composite score from three items in a 5-point Likert scale which rated the participants’ preference for self-testing, putting off self-testing, and the likelihood of telling others about HIVST [34] and from 8 items in a “yes” and “no” response options [39]. In the remaining three studies, data on acceptability was extracted from the results section of the papers while the objectives of the study were to determine recruitment and testing approaches [46], to assess awareness and willingness to self-test for HIV [49], and to investigate the effect of a multimedia campaign on HIV prevention outcomes [65]. Further details

of definitions and measurements is presented in supplementary material file 3.

Acceptability ranged from 48.7% among youth aged 14–24 years in Nigeria to 100% among young fishing community members in Uganda [38]. Where acceptability was measured differently, for instance, as consenting to or willing to use and use together, it was still high among YP. For instance, 95.1% of adolescents in the DRC consented and used the kits at their homes [50] and 96.6% of YP and young adults of fishing community received and used the kits from peer leaders at their homes [38]. Using a composite measure of acceptability (from 8 items with a “yes” or “no” responses) among YP in Nigeria one study showed a relatively low general acceptability (56.9%) and willingness to use HIVST(62.6%) [37]. Further details are available in Supplementary materials 2 and 3.

Use of HIVST among YP in the SSA

Five of the included studies investigated use or uptake of HIVST as their prime objective [39, 45, 47, 52, 53].

However, data on use or uptake of HIVST was extracted from further studies reporting on use [37, 46, 48, 64–67].

Use of HIVST ranged from 0.8% [48] to 100% [67]. However, definitions varied across studies and the scope of the studies also had contextual differences. For example, Nwaozuru et al. reported 0.8% ever use of HIVST in their assessment of the hypothetical preferences of HIV testing modalities among young people in Nigeria (HIVST being one among the options) in a context where young people were asked about their anticipated preferences and who were predominantly unaware of HIVST (14.0% ever heard about HIVST) [48]. Use of HIVST based on “history of use or ever use” from the eligible was 14.9% [39], 16.8% [37], 19.0% [53] among university students in South Africa, Nigeria and Uganda respectively.

In an intervention or follow up context (recent use), use of HIVST ranged from 3.7% [66] to 100% [67]. In the former, Mavodza et al.'s study reported that 53 youths used HIVST out of 1415 eligible youths for HIV testing over a 12 months period (unlike 67.2% in case of provider testing) in a community-based intervention aimed to improve HIV outcome among Zimbabwean youths [66]. In the latter study, Nakalega et al. followed 30 randomly selected young women in their pilot study in Uganda that aimed to assess feasibility and acceptability of a peer supported HIVST where all participants performed HIVST and interpreted their results with peer support [67]. Recent use of HIVST (in the last 12 months) was 10.0% [65], 20.9% [46], 60.3% [45], 84.4% [52] among YP who received HIVST kits and reported that they have tested themselves for HIV in three of SSA countries (South Africa, Kenya, and Mozambique). For example, Iwelunmor et al. examined HIVST uptake at 3 and 6 months after baseline in an intervention context where they followed young people in Nigeria by delivering different sexual and reproductive health services and found an increase in proportion of use from 3 to 6 months (19.2% versus 89.2%) [47]. In an intervention study by Amstutz et al. that employed secondary distribution of HIVST kits for YP in Lesetho, uptake of the distributed HIVST kits was 62.0% (487/785) in the intervention households where an HIVST kit was put for those who were absent or refused to test in a home-based HIV testing campaign [64].

Factors associated with HIVST acceptability and use in SSA

Three studies from three countries (Kenya, DRC, and Uganda) assessed factors associated with acceptability or willingness to use HIVST [49, 51, 53]. Similarly, two studies from two countries (South Africa and Uganda) assessed factors associated with use of HIVST [39, 53]. Factors assessed and showing a significant association with acceptability and use of HIVST varied from study to study.

Socio-demographic factors

Age of YP was one of the factors that have shown a significant association with willingness to use HIVST in SSA. In the Kenyan study by Olakunde et al. [49], older young adults aged 20–22 (aOR:2.00 [95% CI:1.13, 3.56]) were more likely to be willing to use HIVST than those in the younger age category of 18–19 years. This contrasted with a study from the DRC [51] where younger students were more likely to be willing to use HIVST (aOR: 3.6 [95% CI: 2.4–5.4]).

Educational status and gender showed a significant association with willingness to use HIVST in the same Kenyan study [49] where young adults who were in secondary school or higher level of study (aOR:2.02 [95% CI:1.18, 3.45]), and who were female [aOR=1.99, 95% CI (1.18, 3.33)] were more likely to be willing to use HIVST than their primary school and male counterparts respectively. Partnership and civil status was shown to have a significant association with acceptability of HIVST in the DRC study where single students were less likely to accept supervised HIVST (aOR: 0.1, [95% CI: 0.01–0.6]) but more likely to accept unsupervised HIVST (aOR:5.7 [95% CI: 1.6, 20.8]) compared with those who were married or partnered [51].

In Uganda, college type also affected university students' willingness to self-test. Students from art-based colleges were more likely to be willing to self-test (aPR: 0.92, [95% CI: 0.88–0.97]) than those from science-based colleges [53].

Having had awareness about HIVST was another factor which showed association with acceptability of HIVST. In the Kenyan studies, having had awareness showed a negative association (aOR: 0.53, [95% CI: 0.29, 0.97]) [49] while it showed a positive association in the study from the DRC (aOR:2.8, [95% CI: 2.0-3.8]) [51].

HIV testing, sexual and drug-use history

History of HIV testing was one of the factors that showed a significant association with acceptance of HIVST. In the DRC study among university students, the odds of accepting HIVST were nearly twice as high among students with no prior history of HIV testing (aOR:1.8, [95% CI 1.0,3.1]) compared with those having a prior history of testing [51]. In contrast, female university students with recent aPR: 1.12, [95% CI 1.02–1.22]) and past history of HIV testing (aPR:1.13, [95% CI: 1.03–1.24]) were more likely to be willing to use HIVST than those having no prior history of testing in the study in Uganda [53].

Sexual history or behaviour was also a factor that affected acceptability of HIVST. Interestingly, young adults with recent high risk sexual behaviour were less likely to be willing to use HIVST (aOR:0.33 [95% CI : 0.12, 0.90]) compared with those having no high-risk sexual behaviour in the Kenyan study [49]. Being sexually active

or number of sexual partners did not show a statistically significant association in the study from the DRC [51]. On the other hand, Ugandan female university students with one or more sexual partner (one, aPR: 1.07, [95% CI: 1.03–1.12] or ≥ 2 (aPR: 1.08 [95% CI: 1.04–1.19]) were more likely to be willing to self-test compared with those with no partner. Segawa et al.'s study examined more behavioural factors. Those female students with history of alcohol (aPR: 1.04, 95% CI: 1.00–1.09) or injection drug (aPR: 1.04, [95% CI: 1.00–1.09]) use, and a recent history of sexually transmitted infections (aPR: 1.05, [95% CI 1.01–1.09]) [53] were more likely to self-test.

Age of young people as the only factor significantly associated with use of HIVST in both the studies in the universities from South Africa and Uganda. In both cases an increase in age was associated with higher likelihood of using HIVST among young university students (aOR: 3.43, [95% CI: 1.7, 77] and (aPR: 1.23 per year, [95% CI: 1.07–1.43, $p=0.01$) respectively [39, 53].

HIVST experiences and preferences of young people in SSA

As an additional outcome and to complement the qualitative component of the review, we also examined preferences and experiences of young people reflected in the quantitative studies. Hence, a narrative summary of key findings on the experiences and preferences of young people on HIVST is presented below.

As reported from studies in Kenya (19%) [49], Nigeria (15%) [48], DRC (19.9%) [50], there was generally little awareness about HIVST among YP though a relatively higher proportion of university students (45.5%) were informed about HIVST in another study done in the same year in the DRC [51].

Preference to HIVST and the reasons for this varied from study to study. 80% of YP in Mozambique preferred supervised oral HIVST to the standard finger-prick test [45]. Only 20% of Nigerian YP preferred the oral fluid-based HIVST while 38.8% and 23.8% preferred the blood-based HIVST and the conventional facility-based venipuncture HIV testing respectively [48]. In the study on oral HIVST in Mozambique, most YP (76%) preferred testing at the health centre and few (20%) preferred to test at their home. Reasons cited for choosing HIVST included novelty of the testing approach, confidentiality, privacy, and freedom from pain; and for preference to testing at the health centre were presence of counsellor, enhanced security and privacy [45]. In a home and peer-based approach using a blood-based self-test in the DRC, reasons for preference to HIVST over voluntary counselling and testing included perception that the test was easy and the rate of acceptability to recommend the test to others increased after performing the test compared with the one before performing the self-test [50]. In two studies from Kenya, contrasting findings were reported

regarding preference to HIVST. In the Inwani et al.'s study [46], youths who had not chosen HIVST did not trust that HIV can be found from saliva samples and were not confident that they would perform the test without assistance from a trained person. On the contrary, in Wilson et al.'s study, most YP believed that it was very easy to use HIVST (83%), were confident to interpret the results by themselves (87%) though 15% reported difficulty with at least one step [52]. Few of the YP in the latter study who chose provider-delivered testing (16%) cited its accuracy (95%), trustworthiness (93%) and use by friends (77%) as major reasons [52]. Practicability studies on HIVST from Nigeria [50] and Mozambique [45] showed a high percentage of accuracy on test interpretation (93.5% accurately interpreted their test results) and inter-rater agreement (kappa 0.93).

Regarding preference of location to get HIVST kits, most youths in two studies from Kenya [52] and Uganda [38] preferred bars/clubs and home of a local distributor at the neighbourhood respectively. Secondary distribution of kits to those who have refused or were absent during a standard home-based testing in Lesotho resulted in an increase in 36% in use of HIV testing [64].

Young people saw counselling as an essential procedure that needs to accompany HIVST service in studies in Uganda [38], the DRC [50, 51], Zimbabwe [66] and Kenya [49, 52]. In Uganda, most of the fishing community young people and young adults (84.9% and 68%) wanted to have pre- and post-test counselling [38]. In the DRC, adolescent's demand for post-test counselling increased by 21.5% after self-testing for HIV compared with before performing the test [50]. Among university students in the DRC the majority (77.9%) reported that post-test counselling is essential for HIVST use [51]. In Zimbabwe, most YP (94.4%) opted out from HIVST because of their desire for immediate counselling [66]. In Kenya, lack of pre-test and post-test counselling was one of the reasons for being against HIVST among youths [49], and 75% of YP wanted post-test counselling, and 89% of them preferred it be in-person [52]. Likewise, face-to-face counselling was the most preferred counselling approach compared with other modes of counselling among youths in the DRC [50].

Results from qualitative studies

In the qualitative papers a range of factors were reported as barriers and facilitators for the acceptability and uptake of HIVST. Perceived enablers included ensuring privacy and confidentiality; ease of use and convenience; autonomy and empowerment; enhancing HIV prevention and care behaviour; adaptability for kit distribution; social return; curiosity for new things; and perception of HIV as highly risky. The key perceived barriers were low awareness about HIVST; lack of counselling and

consequences of testing positive while being alone; physical discomfort; perceived imprecise results, high cost of test kits, discrimination, and concern on data privacy; low risk perception for HIV; fear of unfriendly health services; social coercion; resource constraints; and supply issues with kits. Further details about these synthesized themes are outlined below.

Facilitators of HIVST acceptability and uptake among young people in SSA

Ensuring privacy and confidentiality

HIVST was seen as acceptable as it ensures privacy in nine studies across six of SSA countries: Botswana [63], Kenya [61, 62], Nigeria [36], South Africa [24], Uganda [23, 57, 67] and Zimbabwe [22] and confidentiality in four countries: Uganda [23, 38, 67], Lesotho [64], Malawi and Zimbabwe [35]. This theme varied depending on delivery of testing. Home testing particularly was seen as the most confidential. For example, refugee youth and adolescents in Kampala Uganda preferred HIVST since they did not trust health professionals [57]: *‘They don’t trust health workers, and they need privacy. (Focus group young men, 20 to 24 years, ID#8)*. A study in Uganda reported that young women from Kampala city valued the privacy and confidentiality of peer delivered HIVST services [67]. This was mirrored in another study in Malawi: *People can’t be going to the hospital for an HIV test . Once I go there today, the news is going to spread everywhere, and people will know that so and so is HIV positive.” (22-year-old woman, FGD with female youth peer group, Malawi)* [35]. In Nigeria, YP also highlighted the importance of testing with someone they trust in some cases since friends could provide support to them, though they did not recommend group testing, for fear of breach in confidentiality in the latter case [58].

Ease of use and convenience

HIVST was identified as an easy-to-use HIV testing method in six of SSA countries; Uganda [23, 50], South Africa [24], Lesotho [64], Kenya [61], Zimbabwe [66] and Malawi and Zimbabwe [35]. One YP from Zimbabwe said: *“I was surprised being told [...] that we have an easier way of testing for HIV. The community health worker showed me how it’s done. Whilst we are busy talking about other issues, the process will be happening and after some minutes the results will be ready and it’s easy” (FGD2, 17 years, female, provider tested)* [66]. In terms of the test itself, unlike oral-fluid based HIVST, blood-based HIVST was considered more difficult to perform [24]. In Uganda, YP pointed out the presence of having easy and clear instructions as facilitator for use of HIVST [50]. In a Kenyan study, young women reported that they are highly confident to instruct and, assist their friends and

anticipate that they would be able to use the HIVST correctly where there are appropriate instructions [61].

The convenience of HIVST was highlighted in different contexts across seven countries: Uganda [23], Zimbabwe [55], Kenya [56, 62], Nigeria [36, 60], Botswana [63], Lesotho [64], Malawi and Zimbabwe [35]. The convenience associated with HIVST was mostly reflected in the location and timing of testing. Home based HIVST was consistently described as convenient in four studies since it avoids long waiting times in the facilities [35, 36, 55, 56, 60]. Owing to this and other reasons YP preferred home-based and community-based testing over facility-based HIVST [23, 56, 58], though one study identified that homes are usually shared and crowded with other family members and not suitable to maintain privacy [24]. HIVST was also deemed convenient in the private pharmacy context in Nigeria particularly at the stages of purchase where tests could be purchased and used at customers’ convenience and as people already had experience in buying condoms from private pharmacies [36]. In another study in the same country, youths preferred privately owned registered pharmacies to public facilities because of perceived accuracy of testing, and also cited supermarkets, online stores, and youth friendly centres as alternative locations to access HIVST [58]. In Zimbabwe, students found HIVST convenient through a campus set-up for it allowed them to manage their sexual health and study with tight examination schedules [55]. Public locations or pop-up booths with a private place to test such as faith-based centres (churches and mosques), schools, youth friendly centre, local halls and other frequented community venues were also deemed suitable for HIVST [24, 60, 63].

However, among some participants in some studies, facility based HIVST, while less convenient, was the preferred method to ensure accuracy, alleviate the anxious reaction to positive test and warrant linkage into care and support [22, 35, 55, 58, 62, 66].

Autonomy and empowerment

YP in five of SSA countries including Botswana [63], Kenya [61], Nigeria [36, 58, 60], Malawi and Zimbabwe [35] felt that HIVST empowers them. The empowerment was described in various ways as it pro-actively engaged them in to their sexual and reproductive health matters [60], enabled them to care for themselves [58], enabled them choose the timing and location of HIV testing [35, 58], and led them to better sexual health outcomes through early treatment seeking [63]. One study of use of HIVST in private pharmacies among sexually active youths in Nigeria examined enablers and barriers along cascade of stages at the attract, purchase, use, confirmation, linkage, and reporting. Self-confidence, self-efficacy,

and autonomy to test were enablers for HIVST take up at the use stage [36].

Enhancing HIV prevention and care behaviour

YP perceived HIVST as facilitator to general HIV prevention and testing in five studies [36, 54, 56, 58, 63] from three countries, namely, Kenya, Nigeria, and Botswana. For example, Kenyan youth perceived HIVST as a facilitator of positive behavioural change for HIV prevention like use of condom during sexual exposure [56] as the ease in access to testing and a negative result would further motivate them to prevent themselves from HIV infection. *“Let us say you have tested with the self-test kit and you find it is negative, when you go to have sex, you will protect yourself so that you don’t get it because you are sure you don’t have [HIV] (18–24-year-old female)”*. In Nigeria, YP highlighted that HIVST would facilitate testing among couples, disclosure of HIV status between couples, testing with friends and subsequent linkage into care [54]. Moreover, in two other Nigerian studies, HIVST was deemed as an alternative means of HIV prevention [58] and easing linkage to HIV treatment and prevention [36] among YP. *“Let’s say for a girl and boy, they’re about to have sex if you meet a girl in a night club and ask what your HIV status is, you already seem unsure, but this is very fast and you can use this to know if the person is HIV positive” (#02, Male, ever tested for HIV)* [58]. In another study, Botswanan youths expressed HIVST as a protective practice that enables them take care of unfaithful friends and advocated the occasional use of it as a means of check-up of friends’ HIV status [63].

Adaptability for kit distribution

In terms of kit distribution, in multiple studies YP said that peer-led delivery of HIVST, where peers or lay counsellors who received a special training provide HIVST in their social networks, were a facilitator for HIVST [23, 35, 55, 56, 67]. Peer-led HIVST was preferred for reasons of ease of access to kits, perceived privacy, and confidentiality, as well as ease of reaching the peer leaders [23]. Secondary distribution of HIVST either through partners [55] or by leaving it at the homes of those who were absent or declining to test during standard home based HIVST [64] was also described as facilitating acceptability. Nigerian YP also suggested that HIVST kits be provided as a total package in the form of a prevention box consisting of STI kits, youth-friendly health products including personal hygiene products, pregnancy test kits, malaria, and tuberculosis test kits [58]. Two other Nigerian studies also found YP suggesting that HIVST be combined with other medical services such as STI services or bundled with other self-care health products (e.g. condoms, lubricants, and panty liners) or

complemented with nutritional supplements or selling two in one pack [59] and bundled with and purchased with any other health products [36].

Social returns

YP raised various issues in relation to HIVST and its social returns to them. In some studies, from Uganda [23, 57] and Nigeria [58], HIVST was generally expressed as socially valued and trusted. In Uganda, YP reported a belief that HIVST will also be acceptable among their friends [23, 57]. YP from Nigeria [58, 60], Uganda [57], Botswana [63] and Kenya [62] also reported believing that HIVST reduces HIV related stigma [58, 60, 63, 67], self-stigma [57] and discrimination [62] that could arise from testing in the health facilities. “ [57].

Curiosity for new thing

Regarding their intention to use, in three studies from two countries, Uganda and Nigeria [23, 36, 57], YP expressed that they are eager to use HIVST as they were curious about something new or to have alternative ways of testing. In the study from Uganda by Logie et al. [57], a key informant expressed this as *“If you have explained [HIVST] to someone, they will be eager to see how it works. I mean it is a characteristic of YP to try out new things” (key informant, HIV service provider)*.

High risk of HIV infection

A perceived high risk of HIV infection was identified as a facilitator for HIVST. Young women who engaged in sex work and believed that they were at high risk of HIV infection in Kampala city, Uganda, reported being motivated for continued use of HIVST as well as Pre-exposure prophylaxis (PrEP) [67].

Barriers to HIVST acceptability and use among YP in SSA

Low awareness about HIVST

Lack of awareness about HIVST was reported as a barrier for both acceptability and uptake of HIVST in six studies from Lesotho [64], Nigeria [36, 58, 60], Uganda [23], and Zimbabwe [22]. Notably, the Nigerian journey map study by Aizobu et al. identified various knowledge-related barriers to HIVST acceptability and utilization. Youths had concerns about lack of awareness on the availability of kits in the pharmacies, HIVST among their peers, where to acquire HIVST kits, and the next step for non-reactive results as well as perceived knowledge of HIV prevention strategies, and thought that HIVST is needed at all [36]. A lack of knowledge about the actual procedures to the test was also highlighted as a barrier to HIVST including not knowing how to use the test more generally in Lesotho [64], incorrect use of the test in Uganda and Zimbabwe [22, 23] and incorrect interpretation of results in Uganda [23]. Emphasizing on the need for awareness

creation through pre-test counselling, a 15-year-old girl who was HIVST non-user in Lesotho reflected as “I was not able to use it and it was not explained to me how it is used, so I was only told that it is there, but I was not explained how it is used when I get home” [64].

Lack of counselling and consequences of testing positive while being alone

YP stressed the importance of support and counselling before, during and after HIVST in multiple studies [22, 23, 35, 36, 58–60, 62, 63], where a lack of counselling and concern of consequences of testing positive alone were reported as a barrier to HIVST. For example, the importance of pre-test counselling was highlighted by YP in Lesotho who reported that they were not ready to test or afraid of the outcome [64]. Lack of post-test counselling was also mentioned as a concern for those YP testing positive [23, 55, 58]. This included the risk of not linking to care [36, 38, 55, 58, 60], anxiety [23, 38, 64, 66], risk of suicide [22–24, 58, 60, 62] and more generally a bad mental health outcome [63], particularly when testing positive in an unsupported situation.

In the study among students in a campus setting in Zimbabwe, perceived inadequacy in post-test counselling was found to be a motivating factor to opt out HIVST in the campus [43]. “I’ve heard so many cases of when people come out positively and think that’s the end of it. But if you are around qualified people who can tell you that it is not the end of life, people who encourage you to take the medication that they give you that help maintain your healthy body, I would prefer for that person to go to a clinic and do the self-test there.” (Male, opted out of HIVST). The journey map study by Aizobu et al. further detailed this barrier by illustrating absence of clear instructions on the next steps, and follow-up from health professionals, delay from shock and denial, being comfortable with non-reactive results, and lack of money for transportation as barriers at the confirmatory testing stage [36].

Physical discomfort

As it involves needle prick, blood based HIVST was regarded as painful and leading to discomfort in multiple studies [24, 35, 48, 58, 63, 65]. This meant that most preferred the oral test: “Most people, like me, have a phobia of needles and even going to hospital to get treatment and all that, they don’t really like the idea of injections [...]. So, I think I’ll prefer using a swab in the mouth to test for HIV.” (#65, Female, ever tested for HIV) “ [58]. Another study with Botswanan youths highlighted concerns about their confidence to accurately test and interpret results of a dual blood based HIVST and STI kit because of nervousness arising from sight of blood and fear of injections [63]. Moreover, the risk of potential cross infection was also expressed as a concern among young Nigerians for

not choosing blood-based HIV testing: “Because maybe I will get infected since they are going to use a needle and inject me, so there is fear that the needle will get infected ... I am scared that [the needle] it’s not sterile ...” (#46, Male, never tested for HIV) [58].

Perceived imprecise results

A number of studies identified concerns about the precision of the result after HIVST in South Africa, Nigeria, Malawi and Zimbabwe [24, 35, 36, 58], particularly for oral fluid based HIVST [35, 36, 58]. In the study on concerns and issues regarding HIVST rollout in South Africa [24], YP were concerned about a false positive result when there is no HIV infection. Concerns with accuracy was particularly the case for oral fluid tests for Zimbabwean youths in one study done in Malawi and Zimbabwe, where a 16-years old woman highlighted: “Many said [oral-fluid tests were not] reliable because . the virus is in the blood. So many were not satisfied with this self-testing.” [16-year-old woman, FGD, Zimbabwe] [35]. In the South African study, some participants doubted the validity of the oral fluid based HIVST based on a belief that that HIV is best detected only from blood samples [24]: “How sure are you about this kit? I don’t trust this kit. Why should I have to go back to the clinic and get tested again after using [the HIVST kit] and [to potentially] test positive?” (18-year-old male) [24].

In the case of the multicounty study in Malawi and Zimbabwe [69], YP showed a mixed feeling regarding oral-fluid based HIVST, balancing perceived convenience benefits and accuracy concerns.

High cost of test kits

YP highlighted the high cost of HIVST kits as a barrier to their acceptability and uptake [24, 35, 36, 54, 58–60], thus recommending it to be of low cost or free of charge. Similarly, youths in the South Africa recommended that HIVST be freely available in local clinics or at reduced costs in pharmacies [24]. Another study in Malawi and Zimbabwe found that YP said that HIVST will be highly accepted if provided at no or low cost [35]. On the other hand, other studies found that youths in Uganda, Malawi and Zimbabwe also reflected that HIVST reduces costs incurred indirectly for transport to health facilities when particularly given in the home or community setup [23, 35, 38].

Discrimination from buying kits and concern on data privacy

Even though it was consistently reported that HIVST avoids HIV-related stigma and discrimination, concerns about buying kits in public places was also highlighted. For example, sexually active youths who participated in the journey map study by Aizobu et al. highlighted the

discrimination that could arise from buying kits in public places like private pharmacies at the attraction stage and concern on data privacy of their results at the reporting stage, if data is carelessly handled by NGO workers, health care facilities and other organizations as someone could see their results [36]. Stigmatization in association with HIV and HIVST testing was also noted by YP in Nigeria, whose concern were centred on privacy of results and the prevailing typecasting of an individual with HIV as an outsider [60].

Fear of unfriendly health service

In a Nigerian study, a fear of negative health facility experiences test was a barrier to opt-in to take up HIVST. This included concern about delays that can happen because of shock and denial and at the linkage to HIV care and treatment stage; delays caused by stress and embarrassment; fear of facing an unfriendly health care staff; avoidance of being treated as someone sick and fear of status definition were barriers to take up and use of HIVST in a private pharmacy context [36].

Low risk perception for HIV

Just as a high-risk perception for HIV was identified as a potential facilitator for HIVST acceptability and uptake, low risk perception for HIV was reported as barrier. Aizobu et al.'s study from Nigeria among sexually active youths revealed that YP's low-risk perception among peers and avoidance of being identified as a sick person were barriers use of HIVST [43].

Social coercion

Social coercion was reported as a concern in campus-based HIVST in tertiary education institutions in Zimbabwe [55] which occurred between groups of friends who tested together and among young women pressuring their male partner for testing. One woman reported her friend coming to her after getting a self-test kit who said, "I tested, and I think you should do it." Then I am like, "I don't think I am ready yet." I said this probably, because I wanted to do it later, I was going to save it. Then she was like, "No, just do it. just close the doors and make sure that no one is around." So, then I did it." (Female, HIV+).

Resources constraints and supply issues with tests

One study which aimed to assess feasibility and acceptability of a peer delivered HIVST and PrEP among young women in Uganda identified staff shortages for requisitioning kits and stock outs of HIVST kits as a barrier to HIVST use [67].

Discussion

This review aimed to synthesise the available evidence on acceptability, use and perspectives of YP aged 10–24 years about HIVST in SSA.

Rate of acceptability and use of HIVST

Acceptability of HIVST was found to be moderate [37, 46, 48] to high [34, 38, 39, 49–53, 65, 66] among YP in SSA. Variation in acceptability was also found in a previous scoping study on HIVST in SSA that considered any population irrespective of age [20] and a global literature review among key populations and general population [41]. This variation could partly be attributed to inconsistencies in the concept and definition of acceptability that has been used across the included studies. Most of the studies used a single item that asked participants to report on their willingness [37–39, 46, 49, 53, 65], acceptance [52, 66, 67], choice [51], and preference to use HIVST [48], while two used multiple items [34, 37] and two other studies used consenting to use and actual use of HIVST as acceptability [38, 50]. According to Seckhon et al.'s recent recommendations, acceptability is a multi-faceted concept that needs to be measured from multiple constructs comprising of affective attitude, burden, perceived effectiveness, intervention/service coherence, ethicality, self-efficacy and opportunity cost [70]. This suggests the need for a uniform definition of acceptability and constructing appropriate items for measurement of acceptability. Somefun et al. made a similar recommendation in their exploration of decades of research experience with acceptability of interventions aimed to improve adolescent and youth health [71].

Despite high rates of acceptability in most studies, use of HIVST was generally low among YP in SSA. For studies that reported use based on ever use or history of use, this is particularly low ranging from 0.8 to 19% [37, 39, 48, 53]. In a context where recent use (in the last 12 months) is reported based on direct follow-up, the use rate was relatively higher, between 3.7 and 100% [45–47, 52, 64–67]. The low use in the case when YP were asked about their history of use was because reports on such use can potentially be impacted by memory loss or little awareness about HIVST. Low uptake or use despite high acceptability suggests a high unmet need for HIVST among YP in SSA and calls for enhanced efforts to meet it.

Factors associated with HIVST acceptability and use

The current review has also identified some socioeconomic and HIV testing and sexual and drug use history factors that have shown association with the acceptability and use of HIVST among YP [39, 49, 51, 53], though few studies specifically aimed to investigate this. These included mixed findings on age [39, 49, 51], educational

status and prior knowledge about HIVST [49, 51], prior history of HIV testing [51, 53], and sexual risk behavior [49, 53]. The variations in findings are likely attributable to differences in population as well as in relation to acceptability versus use. For example, whether participants were students or not - older young adults and younger students were more likely to be willing to self-test for HIV in Kenya [49] and the DRC [51] respectively. But in terms of actual use in a South African university context older students were more likely to use than their younger counterparts [39]. Young adults living in the Kenyan community with high level of education and having had a prior awareness about HIVST were more likely to be willing to self-test while the reverse was the case among students in the DRC study.

In contrast to previous evidence from a scoping review in SSA [20], one study found that Kenyan female YP were more likely to use HIVST than their male counterparts [49]. Other factors identified were that single students had greater willingness for unsupervised HIVST [51], students with a history of HIV testing were less willing to use HIVST [53] and risky sexual behavior was associated with less willingness to use HIVST [49]. The body of evidence from the qualitative studies did not indicate any pattern in relation to age, gender, sexual or HIV testing history regarding use, interest, or willingness to use HIVST. The impact of factors associated with acceptability and use require further examination and is an important area of future research.

Key facilitators and barriers for HIVST acceptability and use

The review found that HIVST was preferred for its ease of use, convenience, privacy, confidentiality, stigma reduction, adaptability for place of test and kit distribution, autonomy, empowerment, and enhancement of HIV prevention and care behaviour. These are consistent with global evidence on HIVST [21, 72, 73], and other recent qualitative reviews from Africa among the general population [27] and men [29] [29]. These qualities of HIVST appear to contribute to the moderate to high acceptability of HIVST in this review as well as across different population groups, in different settings and over a decades period globally [41, 74, 75], making its practice promising and sustainable. The appropriateness of HIVST to YP can be particularly underscored by its safeguarding of their privacy and confidentiality which in turn avoids the added stigma and discrimination they experience in their family, community to institutional circles [26] owing to their young age and the misperceived connection between HIV testing and promiscuousness [76, 77]. This is particularly the case in the SSA region where they are at the highest risk of HIV [78] and the barriers are widespread [26]. The less likely willingness to use HIVST [49] or use of HIVST [39, 53] from younger

youths than their older counterparts with in the YP's age groups might reflect this since adolescents do not expect as they are eligible for HIV testing as age of consent is one of the barriers to testing, and peer and family support is required [79].

Prior awareness about HIVST was found to be minimal as presented in both quantitative findings [48–52], and the qualitative studies [36, 58, 60, 64] in this review. This aligns with recent reviews among men in SSA [28, 29], and highlights the need for wider promotion of HIVST particularly among YP and men in the region. Papers included in the review also reported that young people suggested various strategies to improve knowledge among their peers and to promote the HIVST program widely in the community of youth that ranged from direct face-to-face explanations and provision of culturally adapted print materials and mass media advertisements to online assistance using social medias and video tutorials [23, 24, 36, 52, 54, 58–60]. The strategic suggestions may imply that HIVST promotion activities need to be contextualized and appealing to youths' needs and indicate that YP have solutions for their problems.

Absence of pre-test and post-test support and counseling was repeatedly highlighted in this review in both the quantitative and qualitative studies as a concern among YP because of perceived social harm, inadequacy of information about HIVST procedures, inaccuracy of results, non-attendance to confirmatory test and linkage to care. This is further strengthened by most YP's preference to receive counselling [38, 51] and to make it in person (face-to-face) [50, 52]. This was consistent with previous global literature [20, 21, 27–29, 73, 80]. Solutions to this from YP in some of the articles included in this review includes support from friends, family members, health professionals, and through provision of clear instructions and technological assistance [56, 58, 64]. While reviews of literature by Brown et al., 2014 [81] and Johnson et al., 2017 [82] showed a reassuring finding of no reports on suicide or minimal social harm after HIVST [20, 83], concerns related to self-harm and social harm after testing positive particularly in unsupported situations was one of the themes that emerged in this review.

Mixed findings were reported between the choices of oral and blood based HIVST with accuracy and physical discomfort respectively mentioned as concerns. Doubts on accuracy of HIVST (mostly the oral fluid based) were related to the perception that HIV is only available in blood samples, seeking additional test for confirmation, false positive results, and concern on possible error from misuse. A similar concern has been highlighted in a review targeted at other populations [29, 41, 73] and in a quantitative studies of young people [52, 66] though inaccurate results were not as such a concern in practicality studies which observed the performance of HIVST

amongst YP [45, 50]. This suggests the need for disseminating adequate information about the sensitivity and specificity of the test as per the evidences from the US food and drug administration [84]. Likewise, pain or discomfort from needle or distress from sighting of blood was consistently raised as a concern for blood based HIVST in this review [24, 35, 48, 58, 63, 65]. A previous review in the more general population and men also highlighted similar concern [27, 29]. This might imply that the oral-fluid HIVST will be more acceptable among YP if they get well informed about its accuracy through adequate awareness creation and promotion. Generally, YP favored the blood-based HIVST as accurate and the oral saliva-based test as painless and of no risk for cross-contamination.

The high cost of kits was mentioned as one of the potential barriers in the present review. This aligns with previous reviews in SSA [20, 27, 28, 85] and globally [21, 73] among different populations groups consisting of the general population and men. YP recommended the availability of HIVST kits in reduced price or free of charge [59]. This might be related to low willingness to pay for HIVST kits in low-income countries [73], and price reduction is deemed one of the strongest factors to increase demand for HIVST in SSA [69]. This is particularly true for young women in SSA who are more likely to be economically dependent on their families, and unemployed [86]. This suggests the need for HIVST be accessed at no or reasonable cost to YPs.

Despite perceived benefits of HIVST regarding privacy and confidentiality, there was also evidence, limited to two studies from Nigeria [36, 60], where some YP had concern about discrimination from buying the kits from a private pharmacy setup and potential breach in confidentiality of data about their test result in the early attraction stage and final reporting stages respectively. Concerns about breaches of confidentiality and unfriendly attitude was not only limited in the community and societal circles but also from health care providers in the health system where stigma and discrimination was mentioned as one of the barriers to access HIVST service [36, 67]. This suggests that there is a widespread stigma and discrimination on people seeking to test for HIV to the extent of purchasing items related to HIV testing, and the necessity of increasing public awareness about the disease and expanding youth friendly HIV testing service. Despite this concern, many YP reflected their preference of making wider availability of the kits using off-line distribution channels including pharmacies, shopping centers, schools, bars, sporting venues and clubs in the same study [36] and elsewhere in Nigeria [59] and other SSA countries [63]. Additional research is needed to illustrate setting preferences and the stigma and discrimination concerns related to accessing HIVST kits.

The perception of being at less risk for HIV deterred YP from using HIVST in this review of evidence on perspectives of YP on HIVST [36], and having a high-risk perception motivated young female sex workers to use HIVST and PrEP [67]. Low risk perception is reported as a significant factor to completion of voluntary counselling and testing in quantitative studies among YP in Nigeria [48] and rural residents in Tanzania [87] and adolescent population [88]. Not surprisingly, YP who consider themselves as safe from acquiring HIV may not get committed to self-test. Since testing is the only means to rule out HIV positivity [89], enhanced efforts are needed to shape the risk perception among YP. Because of limited evidence, the connection between risk perception and HIVST use among YP needs further investigation.

Strength and limitations

This review has explored existing evidence about HIVST among YP in SSA. The use of both qualitative and quantitative information makes it the first of its kind on HIVST and among YP in SSA that enabled it to show a comprehensive picture of the acceptability, use and perspectives of YP on the enablers and barriers for accepting and using HIVST.

However, the review is limited in not having pooled data on acceptability and use because of substantial heterogeneity among the studies in definition and aims. Acceptability of HIVST was defined differently in different papers and use of HIVST is also defined in different time spans as ever use and recent use over 3 to 12 months. Moreover, relatively few quantitative studies have investigated factors associated with acceptability and use of HIVST in SSA. Those that did explore this have focused largely on individual characteristics, but acceptability and use are also dependent on many factors related to family, community, and institutions, as highlighted in the qualitative studies. This meant it was difficult to synthesise the findings across the qualitative and quantitative studies. Future research should further explore the role of factors such as age, gender, having or not having prior information about HIVST, HIV testing history and risky sexual behavior. Given the high burden of HIV in SSA, only a few countries examined the acceptability and use of HIVST which calls for further investigation among YP in the region. This can particularly be effective through use of a uniform definition of acceptability and contextualized items that needs to be validated in the region. More generally, relatively few countries in SSA countries were represented in the studies, limiting understanding of HIVST acceptability and use more broadly across the region.

Conclusion

The review indicated that there is a high level of acceptability and a relatively low use of HIVST among YP in SSA. The review points to key perceived benefits of HIVST as well as barriers to acceptability and uptake and suggested solutions to these. While there were consistent findings across some themes, for example, about the privacy and confidentiality benefits of HIVST, there were also different views about preferred types of HIVST and location of testing as well as variations in factors associated with acceptability and use. Further research is required across SSA and future studies need to use consistent measures of acceptability and utilization and consider further the factors that will provide further insights into improvement of acceptability and use of HIVST in order to meet the 2025 UNAIDS 95-95-95 targets.

Abbreviations

DRC	The Democratic Republic of Congo
HIV	Human Immune Deficiency Virus
HIVST	HIV self-testing
PLWHA	People Living With HIV/AIDS
PrEP	Pre-exposure Prophylaxis
SSA	Sub-Saharan Africa
WHO	World Health Organization
YP	Young people

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12875-024-02612-0>.

Supplementary Material 1
Supplementary Material 2
Supplementary Material 3

Acknowledgements

We would like to extend our sincere appreciation and warmest thanks to Flinders University Librarian, Shannon Brown, who assisted in the search of databases for articles.

Author contributions

E.A.Z., H.A.G. and B.H.G. conceptualized the review idea, refined research questions and designed search strategy. EAZ and HAG conducted screening and retrieval of articles with oversight from A.Z. and J.S. E.A.Z. conducted quality appraisal with J.S. on the quantitative and mixed method articles, and A.Z. on qualitative articles, with oversight from H.A.G. JS, H.A.G, and A.Z. mentored, and verified data extraction, analysis, and synthesis; and read and remarked on the original and final draft manuscript. E.A.Z. searched literatures, conducted data extraction, analysis, synthesis, and written the original and final draft manuscript. H.A.G. majorly guided on protocol write up. B.M.G. remarked on protocol writing, assisted in synthesis of findings, and read and approved the final manuscript. A.Z. mentored the overall conduct of the review as principal and senior supervisor. J.S. assisted in search of literatures. All authors have read and approved the final manuscript.

Funding

No specific fund was obtained to conduct this review. However, the review is part of EAZ's PhD thesis at Flinders university who has got a tuition fee and living cost fund from Flinders university, the Flinders International Postgraduate Research Scholarship.

Data availability

Data is provided within the manuscript or supplementary information files.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 25 January 2024 / Accepted: 30 September 2024

Published online: 15 October 2024

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