







RESEARCH ARTICLE

# Putting youth at the centre: co-design of a community-based intervention to improve HIV outcomes among youth in Zimbabwe [version 1; peer review: 1 approved with reservations]

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## Abstract

### Abstract

#### Background

Youth have disproportionately poor HIV outcomes. We aimed to co-design a community-based intervention with youth to improve HIV outcomes among 16-24 year-olds, to be trialled in Zimbabwe.

#### Methods

We conducted 90 in-depth interviews with youth, family members, community gatekeepers, and healthcare providers to understand the barriers to uptake of existing HIV services. The interviews informed an outline intervention, which was refined through two participatory workshops with youth, and subsequent pilot-testing.

#### Results

Participants considered existing services inaccessible and unappealing: health facilities were perceived to be for 'sick people', centred around HIV and served by judgemental providers. Proposed features of an intervention to overcome these barriers, included: i) delivery in a youth-only community space; ii) integration of HIV services with broader health services; iii) non-judgemental skilled healthcare providers; iv) entertainment to encourage attendance; and v) tailored timings and outreach. The intervention framework stands

## Open Peer Review


### Approval Status ?

1

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1. **Christina A. Laurenzi** , Stellenbosch University, Tygerberg, South Africa

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on three core pillars, based on optimising: i) access: community-based youth-friendly settings; ii) uptake and acceptability: service branding, confidentiality, and social activities; and iii) content and quality: integrated HIV care cascade, high quality products, and trained providers.

### Conclusions

Ongoing meaningful youth engagement is critical to designing HIV interventions if access, uptake, and coverage is to be achieved.

### Keywords

Adolescents, Youth, HIV care continuum, HIV prevention, sub-Saharan Africa

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## Introduction

HIV-associated mortality has declined dramatically globally as a result of antiretroviral therapy (ART) in all age-groups except among youth (UNAIDS, 2019). Youth fare disproportionately poorly across each step of the HIV care cascade: the prevalence of undiagnosed HIV infection is higher, coverage of ART is lower, and treatment adherence is poorer (Figure 1) (Floyd *et al.*, 2018; Hayes *et al.*, 2019). Together these factors result in worse virological outcomes (Vogt *et al.*, 2017).

Youth (defined in this paper as those aged 16–24 years) face substantial personal, social and structural barriers to accessing HIV services in health facilities (Cluver *et al.*, 2018). Community-based HIV testing strategies may be more accessible, resulting in earlier HIV diagnosis, and can be effective at improving virological suppression (Ferrand *et al.*, 2017; Mavhu *et al.*, 2020). Furthermore, approaches that address the entire cascade of HIV care (HIV testing; linkage to care and ART initiation; and adherence support to improve viral suppression) (Figure 1) may reduce attrition that occurs at each step of the care cascade (Shanaube *et al.*, 2021).

A recent systematic review highlighted the scarcity of evidence to inform effective HIV service delivery models for youth, and the urgent need to design and evaluate interventions outside of health facilities (Casale *et al.*, 2019). There is general consensus that effective design of interventions to tackle the health challenges faced by youth requires their involvement (Denison *et al.*, 2017; Melles & Ricker, 2018). However, despite this rhetoric there has been limited adoption of practices which enable the genuine involvement of youth in guiding the design of interventions (Larsson *et al.*, 2018). This is in part hindered by the paucity of critical reflection on implementation of youth co-design, including the opportunities and challenges involved in the process, and whether it can genuinely enhance intervention design and uptake.

In this paper we contribute to this nascent evidence-base by describing the co-design of a community-based intervention aimed at improving HIV outcomes among youth in Zimbabwe, a country that has experienced a severe and sustained generalised

HIV epidemic. In 2020, Zimbabwe's youth HIV prevalence was 3.8% and 2.1% among 15–19 year old women and men respectively, and 6.4% and 2.8% among 20–24 year old women and men respectively (ZIMPHIA, 2020).

Our goal was to co-design the intervention with youth as partners. We share our learning and critical reflection on the intervention design process to contribute to the development of empirically-informed best practice for youth engagement in the design of youth HIV interventions.

This study influenced the design of a protocol for a cluster-randomised trial which can be seen [here](#) (Dziva Chikwari *et al.*, 2022).

## Methods

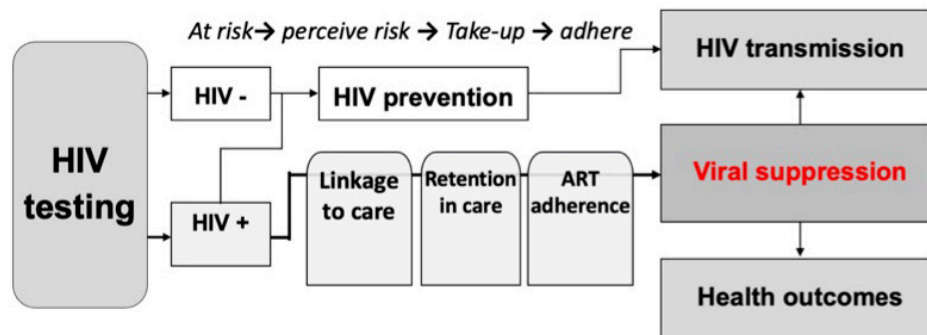
### Study design

CHIEDZA stands for community based interventions to improve HIV outcomes in youth: a cluster randomised trial in Zimbabwe. At conceptualisation, the proposed CHIEDZA intervention was defined by three main components, namely: 1) addressing the entire HIV care cascade (HIV testing; linkage to care and ART initiation; and adherence support to improve viral suppression); 2) combining HIV prevention and the HIV care cascade; and 3) delivering it in a community-based setting. The trial is currently being conducted in 24 communities in three provinces in Zimbabwe (Harare, Mashonaland East and Bulawayo), with the outcome, HIV viral suppression, to be ascertained at population level.

The CHIEDZA intervention was co-designed with youth in Zimbabwe in three phases conducted over 12 months in 2018. This co-design process was carried out in three of the 24 communities where the CHIEDZA trial would be conducted, purposefully selected to represent the variation in study communities.

### Phase 1: In-depth Interviews

Ninety in-depth interviews (IDIs) were conducted with seven groups of participants who were recruited by referral from primary care clinics and community-based organizations, presented



**Figure 1. The HIV care cascade.** HIV care outcomes are disproportionately worse across the care continuum for youth.

in [Table 1](#). Eligibility was based on whether participants fit into the seven respondent categories outlined in [Table 1](#). These aimed first to understand the barriers and facilitators youth face in accessing existing services, and elicit suggestions for an intervention that would optimise access, uptake, and coverage. Participants were purposefully sampled for maximum variation. For example, within the group of youth living with HIV, participants represented a range of ages, gender, mode of HIV acquisition, length since HIV diagnosis, and their level of participation in HIV support services ([Table 1](#)). Interviews were conducted by trained qualitative researchers using semi-structured topic guides, tailored to each participant group. Interviews were conducted in community spaces, in Shona or English depending on participant preference, and were audio recorded.

Detailed summaries of each interview were written and checked against the audio recording. Interview summaries are an effective method of documenting interview content and interviewer reflections, and can serve as an initial stage of analysis ([Rutakumwa et al., 2020](#)). Data collection and analysis were iterative, informing the refinement of sampling approaches, topic guides and the emerging draft intervention. Summaries were manually coded for themes and organised by participant group. Analysis included reflexive memos, the synthesis of emerging findings and identified areas for further follow-up in subsequent interviews. Analytical documents were shared weekly for discussion among the research team. Detailed data analysis enabled us to identify the key components of what would constitute an accessible and acceptable intervention and formed a working outline of the intervention design.

### Phase 2: Participatory workshops

The outline of the intervention was presented to youth in two participatory workshops, with a total of 45 youth aged 16–24 years. The workshops aimed to create a collaborative decision-making space to refine the components of the intervention and check interpretation of phase 1 data. Specifically, the workshops focused on the detail of intervention, including what services and commodities the intervention would

offer, the mode of delivery, branding, and the look and feel of the space. Activities included brainstorming, ranking, and discussion exercises. The workshops were facilitated in a mixture of Shona and English (depending on participant preference) by the research team and external facilitators.

Workshop participants included youth who had participated in phase 1 IDIs and youth who had not previously been involved. The latter group were recruited to extend the range of views and improve generalisability of the intervention design. The first workshop was conducted with youth who had negative or unknown HIV status (n=11 males and 13 females), and the second with a group HIV positive youth (n=10 males and 11 females). This separation was done to avoid unintentional HIV status disclosure, and to enable more detailed exploration of the lived experience of HIV treatment and care.

Workshops were held in a private room and were audio recorded. Written outputs from the workshops, such as ranking lists, were photographed. Workshop summaries were produced, informed by the audio recordings. After each workshop, detailed summaries of both the workshops and de-brief meetings with the research team were written up for analysis. This enabled further refinement of the key priorities and components of the intervention. A draft manual of operations detailing the pilot intervention was produced.

### Phase 3: Pilot

The intervention was piloted over three months in one of the selected intervention communities. Based on uptake data and feedback from youth clients, the intervention design was then further adapted. The manual of operations was refined and the final version is available on request.

### Ethical approval

Ethical approval was granted by Medical Research Council of Zimbabwe (MRC/A/2266), London School of Hygiene and Tropical Medicine (14652) and Biomedical Research and Training Institute (AP144/2018). All participants provided written informed consent. A waiver for the need of guardian

**Table 1. In-depth interview sample.**

Type of IDI Respondent	Total Number of Participants	Male	Female	Age Range (years)
CBO representatives	9	3	5	34–53
Healthcare Providers (Facility-Based)	8	1	7	29–40
Healthcare Providers (Community-Based)	7	0	7	34–51
Youth (HIV Negative)	25	12	13	16–25
Youth (HIV Positive)	26	14	12	16–24
Parents and Family Members of Youth	11	2	9	37–58
Community Gate Keepers	4	1	3	39–62
<b>Total</b>	<b>90</b>	<b>33</b>	<b>56</b>	<b>16–62</b>

consent was granted for participants aged 16–18 years to enable them to share their views without censure from guardians.

## Results

### Barriers to youth accessing existing health services

To design the intervention, we first sought to understand why current services were failing to meet the needs of youth. A consistent finding was that existing services (largely facility-based) were both inaccessible and unappealing to youth, translating into low uptake. See [Table 2](#) for quotes.

#### 1) Appeal barrier 1: Existing health services were considered for ‘sick people’ and centered on HIV

Youth participants considered that health facilities existed to treat ‘sick people’, and were not places for them as they considered themselves a healthy age-group. There was a perception that health services that did target youth were almost exclusively focused on HIV. Despite availability of effective treatment, HIV was associated with being ill, which clashed with youth perceptions’ of their invulnerability to ill-health. In addition, there was a disconnect for many between their knowledge of risk behaviours for acquiring HIV and recognition of their personal risk, which reduced the pertinence of HIV prevention services for them as individuals. However, simultaneously they feared an HIV diagnosis, which they considered would “*be the end of the world*” (young man living with HIV, 18 years), leading to a reluctance to test for HIV. Distancing themselves from HIV services, youth prioritised services which maintained their health, including contraception, support for managing menstruation, general health information and counselling for relationship problems, preventing substance abuse harms, and mental health: all services which largely were not available.

#### 2) Appeal barrier 2: Fear of judgement

Fear of social disapproval was cited as a key barrier to accessing existing health services targeted at youth, as attendance

was tantamount to advertising that they were sexually active. Youth feared being judged by adults who were attending health facilities. They were also distrustful of healthcare providers’ assurances of confidentiality. Many assumed that their attendance for HIV testing or prevention might lead to community gossip, revealing their sexual behaviour which they had otherwise been hiding from the significant adults in their lives. There was also a widespread expectation that as some healthcare providers held judgmental attitudes, youth might be refused services even if they did attend.

#### 3) Accessibility barriers

Even if youth participants considered that their perceived need for healthcare out-weighed the services’ lack of appeal, they described substantial logistical and financial barriers that impeded their access. Transport and user fees made it difficult for youth to afford to attend the clinic. The options to overcome these financial barriers were limited; even among families that could afford clinic user fees and transport costs, many youths feared asking caregivers for money to access services associated with sexual health. Long waiting times and clinic opening hours that did not align with youth’s schedules and schooling hours were additional barriers to access.

### CHIEDZA intervention- co-design

In the IDIs, participants were asked to define the main components of accessible and appealing services, described below. This led to an outline intervention with a range of possible options, that was further refined through prioritisation exercises during the workshops. Adjustments to address feasibility and logistical constraints were identified in the piloting stage. [Figure 2](#) details the iterative process of co-design, and the adaptations and refinements that were made to the intervention at each stage.

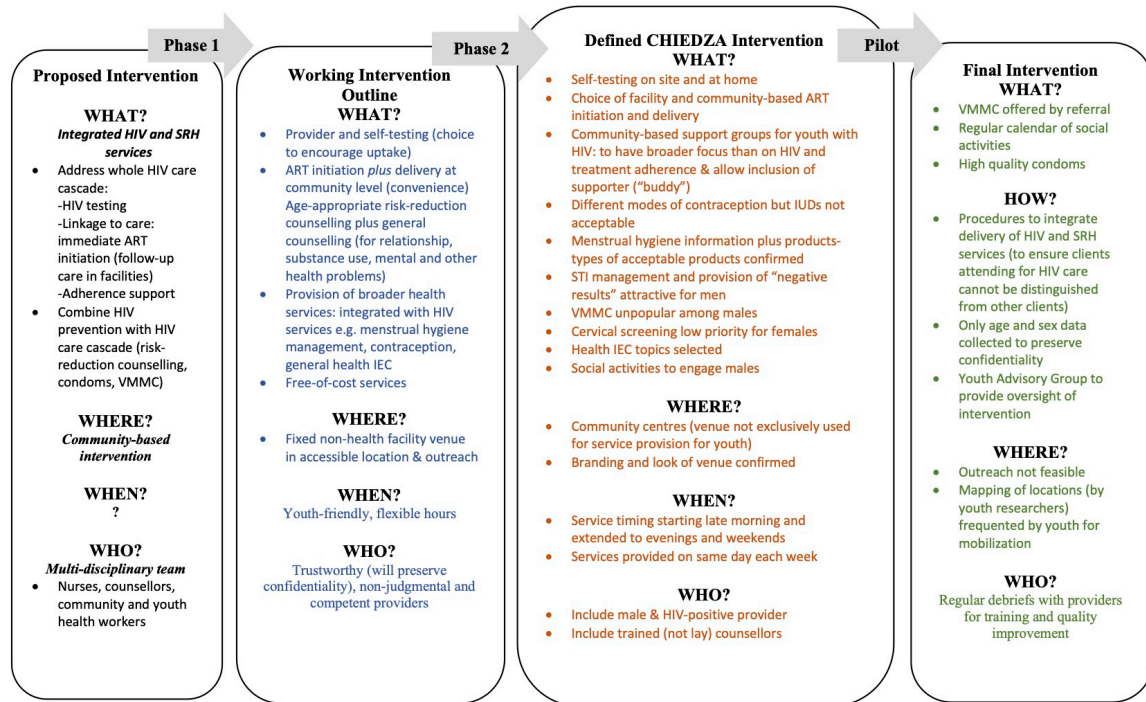
#### 1) Distinct space for youth

In the IDIs, many youth and adult participants noted that intervention spaces should be separate from health facilities

**Table 2. Appeal and accessibility factors undermining access to existing health services: quotes.**

Appeal barrier 1: Health services were considered for ‘sick people’ and centring on HIV	<ul style="list-style-type: none"> <li>• “For those who are HIV negative, they find it difficult to come and access these services at the facility: they don’t think the services are for them.” (Healthcare provider)</li> <li>• “People are given wrong information by peers; that if you test HIV positive you are going to die. So, someone will be afraid of getting tested and knowing their status.” (Young man, HIV-negative, 24 years)</li> </ul>
Appeal barrier 2: Fear of judgement, which could spread around the community	<ul style="list-style-type: none"> <li>• “If I visit the clinic, the nurses will know that so and so is now engaging in sexual activities. People will say you are promiscuous” (Young woman, HIV-negative, 23 years).</li> <li>• “When a 15 year old goes to the clinic to ask for contraceptives, they may be turned away because there is a belief that youth are too young for sex.” (Family member)</li> <li>• “When you tell them your problem, you will hear them say, ‘at your age how come you contracted that disease?’” (Young man living with HIV, 18 years).</li> <li>• “Youths need their own place for accessing services where they are not interrupted by adults, otherwise, they shy out” (Community based organisation)</li> </ul>
Accessibility barriers	<ul style="list-style-type: none"> <li>• “Even for those youth who are willing to come to the clinic, they don’t have money to access services” (Family member)</li> <li>• “If you come at 7 and only get the service at 1, a small service, then that person will never come back again.” (Young man living with HIV, 24 years)</li> </ul>





**Figure 2. Process of CHIEDZA intervention design, including refinement of the intervention at each phase.**

and distinct from those used by adults, to avoid potential judgment and their attendance being the subject of gossip within the community. During the workshops, youth participants decided that the best location for the intervention would be in an accessible community venue, such as a community hall. This was preferable to either a health facility or as a standalone mobile intervention, which might attract unwelcome attention due to existing associations with HIV. Outreach including evening events, was proposed, to increase awareness and demand of health interventions especially among young men.

### 2) Integration of HIV services with broader health services

Participants in the IDIs suggested the integration of HIV services with broader health services that were pertinent to the needs of youth, resulting in the inclusion of additional services that were suggested in interviews, and whose content was refined in the workshops. For example, youth participants prioritised the provision of menstrual hygiene products, which were proposed to generate demand among young women, while ensuring the intervention did not mark clients out as being sexually active. Young men particularly desired high-quality condoms. This integrated approach would additionally ameliorate fears regarding HIV testing that were raised in the interviews. Workshop participants suggested that youth clients' need not test for HIV the first time they accessed the intervention, rather they could initially develop rapport with and trust in providers when they accessed the intervention for another reason, which would then encourage them to test on a

subsequent visit. In the workshops, youth participants emphasised that public branding of the intervention should focus on youth's general health and wellbeing and not on HIV, to counter potential negative community perceptions. This emphasis would enable youth to justify accessing the intervention according to its pertinence to their age, rather than attendance being indicative of potentially 'transgressive' sexual behaviour.

### 3) Non-judgemental and qualified healthcare providers

Across stakeholder groups in the IDIs, the main topic on which views diverged was who should deliver the intervention. Although adult participants largely argued that youth involvement in delivery was necessary to increase uptake, youth participants preferred experienced adult providers that prioritised non-judgemental attitudes and confidentiality. They envisaged youth having a valuable but more limited role, with responsibility for mobilising potential clients and supporting client navigation through the intervention. In the workshops, when presented with the option of youth or adult providers, youth participants suggested that healthcare providers should be selected on the following attributes: being competent, non-judgemental, approachable, trustworthy and respectful of confidentiality. On this point of disagreement, the views of youth were prioritised over those of adults and so age was not a key criterion in staff recruitment. In the workshops, participants further refined the composition of the provider team to include male healthcare providers and providers living with HIV.

#### 4) Entertainment and social activities to encourage attendance

To enable the intervention to have a broader appeal to youth, many youth and adult participants suggested that youth-friendly entertainment should be organised at the sites. This should include music, games such as pool and darts, dancing and fashion. The rationale was that by attracting youth for whom health was not a priority, particularly young men, this would incidentally expose them to opportunities to access health services.

#### 5) Tailored timings and outreach for youth

In the IDIs, youth and adult participants mentioned the importance of the intervention being open at times which would fit within the routines of youth. What the ideal timings would be were defined in workshops, with preference for delivery in the afternoon and evenings, to enable attendance of youth outside of school, work, and house chores but not too late so that they would be forbidden to leave home. Youth suggested that the intervention should be delivered on the same day every week.

#### Continued refinement of intervention during the pilot

After the workshops, youth engagement continued to inform the intervention design, and refinement through the pilot phase. A youth advisory group was established: workshop participants were invited to put their names forward, and the research team purposefully selected 12 youth with diverse experiences and backgrounds. This group met on an ad-hoc basis during the final stages of intervention design and piloting. This included working closely with a marketing team to brand the intervention and specifically to ensure that outward-facing branding did not focus on HIV or SRH. The youth advisory group were included as panellists in the interviews to select healthcare providers, so that they could input into the decision-making process regarding the choice of appropriate providers.

Learning from the pilot led to a number of adjustments to the final package of services for the main intervention. Instead of delivering the intervention through evening outreach, which was not feasible due to recourse constraints, areas frequented by youth were mapped by trained youth researchers and became targeted for sensitisation activities by youth mobilisers to improve coverage. Instead of providing the same condoms as those delivered within the national program, which had a low uptake during the pilot due to perceptions of them being oily and malodorous, higher quality flavoured and textured condoms, which were branded to focus on pleasure, were provided in the main study. Voluntary medical male circumcision, which had low uptake in the pilot and was reported to discourage young men from attending, was not provided as part of the intervention services but was instead offered as a referral service. Cervical cancer screening was also removed from the package of intervention services, in line with changes to national guidelines. The final package of services included: HIV testing, linkage to treatment, adherence support, counselling, menstrual hygiene management, branded condoms, family planning, pregnancy testing, testing and treatment of sexually transmitted infections, referral services, and social activities.

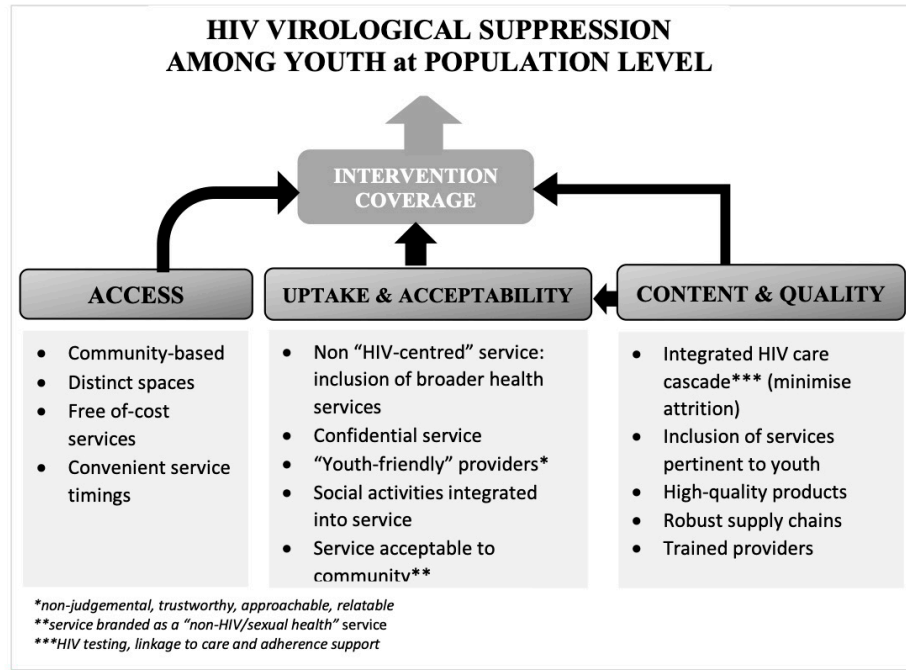
## Discussion

The process of co-design with youth facilitated the development and refinement of the CHIEDZA intervention to improve youth HIV outcomes. This process included listening to a range of views on existing healthcare services from youth and adults. Then, in collaboration with youth, designing the ingredients and formula of an intervention that would maximise access, uptake, and coverage. Through this co-design process the intervention was optimised in respect to three core aspects: i) access: community-based youth-friendly settings; ii) uptake and acceptability: service branding, confidentiality, and social activities; and iii) content and quality: integrated HIV care cascade, high quality products, and trained providers. These three pillars underpinned the CHIEDZA intervention, with the intention that such a design would lead to intervention engagement and coverage, and ultimately improvement of HIV outcomes among youth at a population level (Figure 3).

The co-design process enabled us to configure the intervention based on the values and preference of youth. Competence, approachability and a non-judgemental attitude, as well as a commitment to confidentiality, were identified as key attributes of providers, supporting previous research that highlights interpersonal skills, respect, expertise, and communication (Garrido-Fishbein & Banikya-Leaseburg, 2015). While we had decided *a priori* that the intervention would be delivered in a community-based setting, the exact location (community halls) was defined by youth. Notably, youth highlighted the importance of configuring the intervention so that it was perceived as ‘acceptable’ by adults, who serve as critical gatekeepers to youth’s access to healthcare. Central to the co-design process was to create an ethos that youth matter and one that celebrates them rather than judges them. This goes beyond current conceptualisations of youth-friendly interventions, where quality of care can be de-prioritised and a lack of appeal impedes access (Chandra-Mouli *et al.*, 2013; Hoopes *et al.*, 2016). Trust is built through this ethos, supporting uptake and continued engagement with interventions.

To facilitate the adoption of meaningful co-design, Greenhalgh and colleagues demand for the rigorous reporting of approaches (Greenhalgh *et al.*, 2019), while Larsson and colleagues push the importance of critical reflection on the opportunities and challenges in implementing such approaches in practice (Larsson *et al.*, 2018). In this vein, we share three key lessons from the co-design process.

Firstly, the co-design process requires considerable time, flexibility, and expectation management. Genuine engagement of youth required the study team and funder to relinquish the need for pre-determined intervention design, and intellectual courage to trust in the co-design process. This is a departure from normative practices in which adults’ assumptions too often determine how we define youth’s needs. Simultaneously, co-design requires explicit discussion about what is ideal and



**Figure 3. Conceptual framework of CHIEDZA intervention.**

feasible within resource constraints, with all actors prepared to share power and exercise compromise (Larsson *et al.*, 2018). Here, youth played an integral role in identifying priority services. Additionally, allocating sufficient time for iterative, inclusive, and reflective co-design was critical (Kime *et al.*, 2013).

Secondly, the co-design process involved listening to multiple voices, identifying consensus and reconciling divergent views. This realignment of power was largely achieved through widening the expertise beyond the research team (Goodyear-Smith *et al.*, 2015; Larsson *et al.*, 2018). Within youth and adult participant groups, power dynamics also played a role: where opinions did diverge, we intentionally privileged the voices of youth where possible. Co-design involves being prepared to be surprised and listening to what youth say they want, rather than using it to affirm expectations. However, it is important to not unwittingly instigate a presumption that youth should, or even want to, be given sole responsibility for designing youth-centred interventions (Kim & Free, 2008), hence the need for diverse community representation.

Thirdly, co-design needed to include the marginalised and less heard within the youth population (Marsh *et al.*, 2019). A waiver was applied for and granted to avoid the requirement for parental consent for 16–17 year olds. However, we did not manage to recruit youth from every key groups, for example youth with disabilities or sexual minority youth were not represented.

Even with extensive youth participation, it was necessary to try to balance between the ideal and the feasible. While the

intervention design was unstructured from the beginning, the outcome measure, HIV viral load suppression, was pre-determined. Youth participants were therefore asked to design a pathway to an already defined destination, and a destination that they did not decide or necessarily agree on. Pragmatism may be necessary to balance openness in intervention design with the ability to leverage the significant funds required for such work.

To facilitate meaningful youth engagement and co-design of HIV interventions, we support Oliveras and colleagues who argue that youth engagement must be adequately resourced with time, training, and funding (2018). We additionally suggest that funders should support flexibility in intervention design at the proposal stage, and that ethics committees consider flexibility in requirements of parental informed consent to enable younger adolescents to participate more freely as was done in the design of CHIEDZA (Goodyear-Smith *et al.*, 2015; Marsh *et al.*, 2019). Through such iterative engagement, we provide lessons learned and key features of co-designing an intervention with youth, that they wanted, and to meet their needs.

The CHIEDZA trial (registered in clinical trials.gov: NCT03719521) is currently being implemented and will be evaluated through an endline population-based survey of youth HIV viral load and process evaluation.

### Data availability

#### Underlying data

Data are available upon request. Data underlying our findings cannot be made public for ethical reasons, as they contain



information that could compromise the privacy and consent of research participants. Data requests may be sent to the corresponding author including information about how the data will be used and for what purpose, as well as whether specific details of the trial will be included in analytical outputs.

### Extended data

LSHTM Data Compass: Community based interventions to improve HIV outcomes in youth: a cluster randomised trial in Zimbabwe (CHIEDZA), <https://doi.org/10.17037/DATA.00002718> (Dziva Chikwari, 2022).

This project contains the following extended data:

- CH01b\_CHIEDZA\_16\_IDI\_Consent
- CH02b\_CHIEDZA\_HealthWorker\_IDI\_Consent
- CH03b\_CHIEDZA\_HealthcareProvider\_IDI\_Consent
- CH04b\_CHIEDZA\_CommunityOrg\_IDI\_Consent

- CH05b\_CHIEDZA\_FamilyMember\_IDI\_Consent
- CH06b\_CHIEDZA\_Adolescent\_HIV\_IDI\_Consent
- CH07b\_CHIEDZA\_CommunityMembers\_IDI\_Consent
- CHIEDZA\_Adolescent\_IDI\_TopicGuide
- CHIEDZA\_CommunityGateKeeper\_IDI\_TopicGuide
- CHIEDZA\_CommunityHealthWorker\_IDI\_TopicGuide
- CHIEDZA\_FacilityHealthWorker\_IDI\_TopicGuide
- CHIEDZA\_CommunityOrg\_IDI\_TopicGuide
- CHIEDZA\_FamilyMember\_IDI\_TopicGuide

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

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# Open Peer Review

Current Peer Review Status: ?

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## Version 1

Reviewer Report 17 March 2022

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**Christina A. Laurenzi**

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Thank you for the opportunity to review this exciting work, which shares findings and reflections from the co-design of a youth HIV intervention in Zimbabwe. I have a few comments, questions, and suggestions to strengthen this manuscript, all relatively minor.

### Abstract:

- I think it is great to share the pillars and sub-themes up front – but I’d recommend a re-formatting for clarity of reading. Perhaps something like: “The intervention framework stands on three core pillars, based on optimizing access (community-based youth-friendly settings); uptake and acceptability (service branding, confidentiality, and social activities); and content and quality (integrated HIV care cascade, high quality products, and trained providers).”

### Introduction:

- “Community-based HIV testing strategies may be more accessible”: can the authors say a bit more about this for readers unfamiliar with the subject/area? What do these kinds of strategies entail, and what makes them more accessible? Are they accessible in terms of physically accessible or also accompanied by less stigma?
- The idea of youth involvement, and genuine youth involvement, is raised without describing what this might look like; guiding the design is referred to but it is not clear if this is where it ends (or what that actually is). Can the authors say a bit more about this process and what levels or areas youth ideally would be involved with?
- “This is in part hindered by the paucity of critical reflection on implementation of youth co-design”: this sentence could be simplified and streamlined to read more clearly. Linked to the comment above, I might suggest a brief framing of concepts or ideas linked to youth

involvement, youth co-design.

- A general question on age of eligibility – much of the evidence on HIV is grouped by 15-19, 20-24, but I noted youth in this paper refers to ages 16-24. Is there a reason for this discrepancy?
- As you state the goal, I would add the name of the intervention here – it currently reads a bit awkwardly.
- The “goal of the study” final paragraph reflects the premise that the papers’ findings will include learnings and critical reflections on the intervention design process, making this sound like more of a methodology paper. However, in the results above (in abstract) this reads like a more traditional approach to qualitative inquiry and distilling of themes to inform an intervention. I realize these are very closely linked but perhaps you can refine the goal and description of the paper in the closing part of the introduction, to more accurately reflect the data that you will be sharing? If “describing the co-design” is the main aim of this paper, I think this gets a bit lost when you move on to HIV stats and overarching goals.

#### **Methods:**

- A small point but I would refrain from using “it” on its own—third point of CHIEDZA’s aims. “delivery in a community-based setting” or “delivering the intervention”, etc.
- The methods read very well, and clearly. Can it be clarified what “community spaces” means (where IDIs took place) and whether these were sufficiently private?

#### **Results:**

- A very minor point, I would keep the order of themes consistent – so “inaccessible and unappealing” as summarised above should appear as themes in that same order.
- Can you say a bit more about the health services which were described as largely not available/which youth prioritised? Are all of these equally hard to obtain (e.g. contraception as hard to access as substance use counseling)? It might be worth adding a bit more detail to this statement to help contextualize for your reader.
- Can the authors add a bit more context on user fees? Are these prohibitive or can most families afford them? This might be contextualized with a small note/description.
- To mirror the first sub-head of Results, maybe the second one (CHIEDZA intervention- co-design) might be cast as “Key features of an acceptable intervention” or something like this? This might help to distinguish the individuals’ data and inputs at this stage from the finalised, emergent intervention as it was manualised.
- This sentence could be clarified: “Outreach including evening events, was proposed, to increase awareness and...” – suggest something like “Outreach activities, including evening events, were proposed to increase awareness and demand...”.
- Really interesting findings on the discrepancy between adult and youth preferences for delivery agents!

- The “continued refinement” header seems to be formatted differently than the others, flagging this for the journal.
- Can the text/size of Figure 2 be made bigger/more legible? This is more a query for the journal.

**Discussion:**

- This section reads very well and the reflections are excellent.

**Minor typos/fixes:** I would encourage the authors to proofread for small punctuation /grammar errors, a few examples include:

- Abstract: “Proposed features of an intervention to overcome these barriers, included” should not have a comma.
- Intro: “age-groups” should be two words, same with “evidence-base”.
- Methods: “Community based” should be hyphenated for consistency.
- Results: “out-weighed” should be “outweighed”.
- Discussion: These sentences should be merged to be grammatically correct: “This process included listening to a range of views on existing healthcare services from youth and adults. Then, in collaboration with youth, designing the ingredients and formula of an intervention that would maximise access, uptake, and coverage.”
- Discussion: sharing a revised version of this sentence here- “However, we did not manage to recruit youth from every key group; for example, neither youth with disabilities nor sexual minority youth were represented.”

**Is the work clearly and accurately presented and does it cite the current literature?**

Yes

**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**

Not applicable

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes



**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** HIV, adolescent mental health, participatory engagement, qualitative research, implementation science

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

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