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Reaching adolescent girls and young women with HIV self-testing and contraception at girl-friendly drug shops: A randomized trial in Tanzania

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Abstract

Purpose: We hypothesized that an intervention designed to create girl-friendly drug shops would increase access to sexual and reproductive health products and services among adolescent girls and young women (AGYW, ages 15–24) in Tanzania.

Methods: We conducted a 4-month randomized trial at 20 drug shops in Shinyanga, Tanzania from August–December 2019, to determine if the *Malkia Klabu* (“Queen Club”) intervention increased AGYW patronage and provision of HIV self-testing (HIVST), contraception, and health facility referrals to AGYW (primary outcomes). Drug shops were randomized 1:1 to the

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Trials registry: [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT04045912), NCT04045912

Data statement: De-identified data sets used in analyses and accompanying R Markdown script files will be publicly available at the time of publication at the following link: <https://github.com/lauren-hunter/addo>

Implications and contributions: Engaging drug shops in Tanzania to specialize in delivering highly tailored, “girl-friendly” services may be an effective strategy to bolster young women’s access to HIV testing and family planning services.

Declaration of interests: We declare no competing interests.

intervention or comparison arm. All shops were provided with OraQuick HIVST kits to give to AGYW for free. Intervention shops implemented *Malkia Klabu*, a loyalty program for AGYW created using human-centered design through which AGYW could also access free contraception. We compared outcomes in intention-to-treat analyses using shop observations and shopkeeper records.

Results: By endline, shops implementing *Malkia Klabu* had higher AGYW patronage than comparison shops (rate ratio: 4.4; 95% confidence interval: 2.0, 9.8). Intervention shops distributed more HIVST kits (median per shop: 130.5 vs. 58.5, $p=0.02$) and contraceptives to AGYW (325.5 vs. 7.0, $p<0.01$) and provided more referrals for HIV, family planning, or pregnancy services combined (3.5 vs. 0.5, $p=0.02$) than comparison shops.

Conclusions: The *Malkia Klabu* intervention increased AGYW patronage and provision of HIVST kits, contraception, and referrals to AGYW at drug shops, despite HIVST kits being freely available at all participating shops. Enhancing drug shops with girl-friendly services may be an effective strategy to reach AGYW with sexual and reproductive health services.

Keywords

adolescent girls and young women; HIV self-testing; contraception; drug shops; human-centered design; Tanzania

Adolescent girls and young women (AGYW; ages 15–24) in Tanzania experience barriers to sexual and reproductive health (SRH) services which may compromise their long-term health and wellbeing.¹ Although young women bear a disproportionate burden of HIV infection and unintended pregnancy,^{2,3} stigma related to young women's sexual behavior, misinformation about contraception, prohibitive transportation costs, long wait times at clinics, and concern about unfriendly health providers may constrain young women's demand for SRH services.^{1,4,5} While no government policies directly prohibit the provision of family planning services to adolescents, some healthcare providers may believe minors are ineligible or require parental consent to receive contraception.^{6–8} HIV testing is freely available at public health facilities in Tanzania, yet nearly half of HIV-positive young women remain undiagnosed.⁹ To accelerate progress toward ending the HIV/AIDS epidemic, Tanzania lowered the age of consent for HIV testing to 15 and legalized HIV self-testing (HIVST) in 2019.¹⁰ Evidence from other countries in sub-Saharan Africa demonstrates that HIVST is highly acceptable to youth, who value the increased convenience and confidentiality it affords,^{11–13} but little is known about how to ensure that young women will be able to access HIVST kits once they are widely available.

Community drug shops may be one effective distribution channel through which to reach young women with SRH services, including HIV self-testing and contraception.^{14,15} In Tanzania, privately-owned drug shops called Accredited Drug Dispensing Outlets (ADDOs) greatly outnumber health facilities and pharmacies, are ubiquitous in many communities, and enable widespread access to quality-assured pharmaceuticals.^{16–18} These small businesses, often operated by women, are authorized to dispense certain essential prescription medicines (e.g., common antimicrobials), as defined by a government list.¹⁶ Alongside other medicines and health products, many ADDOs provide SRH products

and services such as contraceptives (i.e., combined oral contraception, levonorgestrel oral emergency contraception, condoms), pregnancy tests, informal counseling, and health facility referrals. Notably, although contraceptive services are free at public health facilities, 21% of women in Tanzania obtained their most recent contraceptive method from private sector drug shops,¹⁹ and young women were more likely than older women to rely on private sector method providers.²⁰

For these reasons, expanding and improving the delivery of SRH services offered by drug shops in Tanzania may mitigate some barriers to access among young women. However, demand for SRH services at drug shops among young women may be stymied by fear of discriminatory treatment by shopkeepers, lack of awareness of and/or misconceptions about available SRH products, and pervasive social norms regarding the (in)appropriateness of SRH products for unmarried young women.^{21,22} Thus, novel demand-creation strategies may be necessary to amplify young women's access to SRH services at drug shops.

We employed the established, iterative process of human-centered design (HCD) to develop *Malkia Klabu* ("Queen Club"), a comprehensive loyalty program intervention to motivate young women to obtain HIVST kits and other SRH services at ADDOs while simultaneously meeting the professional and financial needs of drug shopkeepers.²¹ To test the feasibility of our intervention as a precursor to a larger trial, we conducted a 4-month pilot randomized trial at privately-owned drug shops in Tanzania through which we newly introduced HIVST kits in ADDOs. We hypothesized that enhancing drug shops with the *Malkia Klabu* intervention would increase AGYW patronage and the provision and uptake of HIVST kits, contraception, and health facility referrals for AGYW.

Methods

Study design and setting

We conducted a parallel arm randomized controlled trial at 20 ADDOs (drug shops) in Shinyanga, Tanzania, a resource-limited, semi-rural region in Tanzania where we introduced OraQuick HIVST kits in ADDOs. OraQuick, the first HIVST kit to be prequalified by the World Health Organization, is an oral fluid screening test that displays high accuracy in the hands of lay users.²³ Although HIV self-testing was legalized in Tanzania in 2019, HIVST kits are not yet registered or widely available outside of research settings.¹⁰ In Shinyanga, the HIV prevalence is 5.1% among young women, more than twice the prevalence among young men (2.0%), and 34% of women aged 15–19 have begun childbearing, underscoring the importance of the proposed research.^{19,24}

This study was approved by the National Institute of Medical Research in Tanzania and the Human Research Protection Program at the University of California, San Francisco with the University of California, Berkeley Committee for Protection of Human Subjects in reliance. The trial was pre-registered ([clinicaltrials.gov: NCT04045912](https://clinicaltrials.gov/ct2/show/study/NCT04045912)). We report the findings according to the Consolidated Standards of Reporting Trials (CONSORT) Statement checklist.²⁵

Participants

We randomly selected drug shops from four administrative wards in the Shinyanga Region using a registry of ADDOs provided by the Municipal Pharmacist. The Municipal Pharmacist contacted shop owners using phone numbers from the registry and informed them that they would be invited to participate in a study. After this first contact, research staff called drug shop owners to provide information about the study and, if interested, arrange to meet to obtain informed consent. Owners from all participating drug shops provided written informed consent.

The inclusion criteria for drug shop owners were: (1) at least 18 years of age, (2) owns an ADDO, (3) willing to offer HIVST kits and AGYW-friendly services at their shop, and (4) provides written informed consent for the study. The exclusion criteria were: (1) less than 18 years of age, (2) owns a drug shop that is not government-accredited, (3) unwilling to offer HIVST kits and/or AGYW-friendly services at their drug shop, (4) does not provide informed consent. As participating shops were selected from four neighboring wards within a small geographic area, there was potential overlap in the communities they served. We ceased recruitment upon reaching the desired sample size of 20 drug shops.

Randomization and blinding

Drug shops were randomly assigned 1:1 to the intervention or comparison arm through a participatory randomization process intended to increase study engagement. Specifically, at an HIV self-testing training which representatives from all shops attended, each shopkeeper drew a colored ball from an opaque bag in front of all attendees to obtain their study arm assignment. Randomization was stratified by administrative ward. Due to the nature of the intervention, it was not feasible to blind participants or researchers implementing the intervention or assessing the outcomes.

Outcomes

Our study had four primary outcomes:

1. AGYW patronage: the number and proportion of AGYW customers observed by research staff during shop observations.
2. Contraceptive distribution: the number and type of contraceptive products (i.e., condoms, oral contraception, emergency contraception) which shopkeepers reported distributing to AGYW customers during the study period.
3. Health facility referrals: the number of referrals for SRH services (i.e., family planning, prenatal, and HIV testing/treatment services) which shopkeepers reported providing to AGYW customers during the study period.
4. HIVST kit uptake: the number of HIVST kits which shopkeepers reported distributing to AGYW customers during the study period.

Additionally, access to pregnancy tests emerged as an important feature of “girl-friendly” drug shops among AGYW during the design process for the intervention. Thus, although not preregistered, we assessed pregnancy test distribution via shopkeepers’ report as a secondary outcome.

Participants were encouraged to contact the research team if any adverse events occurred. Research assistants also asked about adverse events as part of study close-out procedures.

Procedures

Upon recruitment, shopkeepers completed surveys about shop operations, their sociodemographic characteristics, and their attitudes toward providing SRH services to young women. For shops where the owner was not involved in day-to-day shop operations, we obtained written informed consent from the shop's primary employee to complete the survey.

Regardless of study arm, all participating drug shops completed a half-day group training on HIV self-testing, in which local health officials reviewed HIV/AIDS information; explained the purpose of HIVST; led a hands-on demonstration of the OraQuick HIVST kit; and guided shopkeepers through interactive discussions (e.g., brainstorming ways to prevent social harms among customers), roleplays (e.g., pairing up to practice explaining various test results to a customer), and quizzes. Shopkeepers received an HIV referral plan for customers who required linkage to confirmatory testing or treatment. Throughout the 4-month intervention period, all shops were also freely supplied with OraQuick HIVST kits by the study to provide to AGYW for free and a separate supply of free HIVST kits that they could sell to non-AGYW customers (not included in the present analysis).²⁶ As distribution was restricted to research settings, OraQuick HIVST kits were only locally available at participating study shops during the study period.

Additionally, drug shops assigned to the intervention arm implemented a multifaceted loyalty program, *Malkia Klabu* ("Queen Club"), designed for AGYW using HCD and motivational strategies based on behavioral economics (design process described elsewhere).²¹ In brief, participating intervention shops invited AGYW customers to join the *Malkia Klabu* loyalty program to earn mystery prizes (e.g., lotion, menstrual pads) through repeat purchases. At any time, program members could point at symbols on the back of the loyalty card (Figure S1) to discreetly request free SRH products (i.e., HIVST kits, condoms, oral contraception, emergency contraception, and pregnancy tests) without hassle or fear of denial. Intervention shops were also given an SRH display containing sample products, contraceptive method informational cards, and a computer tablet with SRH videos for interested customers to watch (i.e., a video on how to use the HIVST kit and videos of young Tanzanian women discussing their preferred contraceptive methods). Intervention shopkeepers completed a half-day group training on contraceptive counseling for AGYW facilitated by local health officials, which reviewed modern contraceptive methods and principles of adolescent-friendly service provision. Shopkeepers were reimbursed weekly for contraceptives and pregnancy tests provided to AGYW at pre-specified fixed amounts reflective of typical local retail prices (i.e., 1,500 TSh [\$0.65] for three condoms; 2,000 TSh [\$0.86] for oral contraception; 6,000 TSh [\$2.58] for emergency contraception; and 1,000 TSh [\$0.43] for pregnancy tests). Unlike HIVST kits, shops were not directly stocked with these products by the study.

Throughout the study, research staff visited all shops weekly to count and restock HIVST kits (both arms) and *Malkia Klabu* supplies (intervention arm only). Additional visits were conducted whenever shops contacted the research team to request restock.

We relied upon three sources of data to evaluate the *Malkia Klabu* intervention:

1. **Shop observations:** Research staff conducted shop observations at baseline (before randomization), midline (after 2–3 months), and endline (after 3–4 months) to assess AGYW patronage in participating drug shops. Each observation period entailed a 3-hour continuous time block during which research staff documented all customers entering the shop, including their apparent sex and age and products/referrals received. We randomly sampled five observation day/time blocks (e.g., Wednesday from 10 am to 1 pm) per shop per time point, corresponding to 15 observations per shop across the study period (Figure S2). The sampling algorithm required that each set of five day/time blocks included at least one weekend, weekday, morning, and afternoon observation to increase comparability between shops. If a shop was closed during a scheduled observation, the observation was attempted on the same day/time block in the subsequent week(s).
2. **Customer logs:** Participating shopkeepers were trained to fill standardized customer logs provided by the study which tracked transactions with female customers who appeared to be aged 15–24 (i.e., AGYW), including provision of HIVST kits, other SRH products (i.e., oral contraception, condoms, emergency contraception, and pregnancy tests), and health facility referrals for HIV, family planning, and/or pregnancy services. Research staff reviewed and collected completed logs during weekly restocking visits.
3. **Administrative stocking records:** Research staff maintained administrative records of HIVST kits stocked in each shop and counted remaining HIVST kits during weekly shop visits; these records were used to validate shopkeepers' logs of HIVST kit distribution.

Statistical analyses

Data from all participating drug shops were included in intention-to-treat analyses. We conducted two types of analyses to estimate the effects of the intervention on the primary and secondary outcomes. First, we used negative binomial regression to estimate rate ratios comparing the rate of AGYW patronage between study arms via a difference-in-differences approach.²⁷ Models included administrative ward to account for stratified randomization, shops as random effects to account for clustering of observations by shop, and log-duration of observation as an offset term.²⁸ To assess the robustness of our modeling approach, we also ran alternative models (1) using shop fixed effects in lieu of random effects, and (2) using zero-inflated negative binomial regression. Our findings remained consistent and, thus, we present only the first approach.

Second, we compared the mean and median number of HIVST kits, contraceptives, pregnancy tests, and SRH referrals provided over the study period per shop by study arm

using t-tests and Kruskal-Wallis tests.²⁹ We also present several post-hoc secondary analyses conducted to examine the stability of our findings. Specifically, we reran all analyses of SRH product and referral provision excluding one outlier (an intervention shop which accounted for 51% of SRH products and referrals provided in the intervention arm) and reran analyses of HIVST kit provision using administrative stocking records, rather than customer logs. We also calculated descriptive statistics for SRH products and referrals provided to AGYW during post-randomization (midline and endline) shop observations by study arm. While shop observations were not a primary source of data on product/referral provision (due to the low number of SRH-related customer interactions expected to take place during observation windows), these data were used to assess whether trends observed in shopkeeper-reported customer logs are supported by direct observations made by research staff.

Formal power calculations were not performed for this feasibility trial. Analyses were conducted in R, version 4.1.0.³⁰

Results

We randomly selected 41 drug shops, of which 34% were ineligible and 15% could not be contacted (Figure 1). Of the 21 shops that were eligible and could be contacted between July 22 and August 14, 2019, 20 (95%) consented to participate; 10 were randomized to each arm. All completed the study through the predetermined date of December 31, 2019 (four months after implementation) and were included in analyses. Shops were 1.4 kilometers apart on average (range: 0.04 kilometers to 3.7 kilometers). Three-quarters of participating shopkeepers were female (Table 1). Many shopkeepers (60%) had medical training outside of their role at the shop, primarily in nursing or midwifery, and most participating drug shops (85%) were staffed by only one person. At the time of recruitment, most shops sold daily oral contraception (75%) and condoms (80%), but only 20% of shops sold emergency contraception.

In baseline shop observations conducted *before* randomization, drug shops averaged one AGYW customer per 3-hour observation with no differences in AGYW patronage by study arm (Figure 2, Table 2, Figure S3). At midline, intervention drug shops implementing *Malkia Klubu* had somewhat higher AGYW patronage relative to comparison shops (rate ratio [RR]: 1.47; 95% confidence interval [CI]: 0.65, 3.32). By endline, the rate of AGYW patronage at intervention shops was 4.38 times that of comparison shops (95% CI: 1.96, 9.77). In contrast, trends in patronage by non-AGYW customers over the study period did not differ by study arm (Table 2). Thus, the percentage of AGYW customers in intervention shops increased over the study period (17% at baseline vs. 39% at endline), while the percentage of AGYW customers in comparison shops remained steady (12% at baseline vs. 11% at endline).

Based on shopkeeper-completed customer logs, the 10 intervention shops distributed more HIVST kits (1,456 vs. 596), contraceptives (6,649 vs. 199 products), and pregnancy tests (1,822 vs. 281) and made more referrals for SRH services (661 vs. 67) to AGYW during the study period than the 10 comparison arm shops (Figures S4, S5). The mean and median

number of SRH products and referrals provided to AGYW per shop over the 4-month study period were higher among intervention shops than comparison shops (Table 3).

Notably, emergency contraception comprised 69% of contraception which shopkeepers reported providing to AGYW by intervention shops, compared to 20% of contraception provided to AGYW by comparison shops. This was partially attributable to one outlying shop, which accounted for 65% of emergency contraception and 55% of all contraception distributed in the intervention arm (Figure S6). Counterintuitively, the increase in variance caused by this positive outlier reduced the significance of t-tests comparing mean contraceptive product distribution by study arm (Table 3). In post-hoc secondary analyses excluding this shop, HIVST kit and contraceptive distribution remained higher in the intervention arm, with all mean comparisons reaching statistical significance due to reduced variance (Table S1). However, this shop accounted for 77% of SRH referrals in the intervention arm, and when excluded, differences in SRH referral by study arm were attenuated.

In secondary analyses, differences in HIVST kit distribution were similar when using data from administrative stocking records, rather than shopkeepers' logs (Table S2), and during post-randomization shop observations, more contraceptives were provided to AGYW in intervention shops than comparison shops (26 vs. 2), although referrals were similar (4 vs. 3) (Table S3).

No adverse events were reported over the study period.

Discussion

The *Malkia Klabu* intervention was associated with increased distribution of HIVST kits, contraceptives, and health facility referrals to young women in drug shops. In the absence of the *Malkia Klabu* intervention, comparison shops distributed nearly 600 HIVST kits to young women over the study period, suggesting that free provision of HIVST kits in drug shops may lead to uptake even when young women are not otherwise incentivized to access SRH services. However, drug shops which offered *Malkia Klabu* distributed more than twice as many HIVST kits and 33 times as many contraceptive products than comparison shops during the study, demonstrating the potential value of comprehensive interventions to create girl-friendly drug shop environments.

Malkia Klabu drew upon myriad complementary approaches to promote, optimize, and expand the range of SRH products and services available to AGYW. The intervention was designed to act upon both demand-side *and* supply-side barriers to services (e.g., by normalizing SRH product provision to AGYW among participating shopkeepers). Several intervention components were specific to contraception, such as additional training for shopkeepers on AGYW-friendly contraceptive service provision, free contraceptive products for AGYW club members, non-verbal pathways through which AGYW could discreetly request contraceptive products, and hands-on contraceptive displays with informational videos. However, unlike HIVST kits (which were free in both study arms), it is not possible to disentangle the effect of contraceptive subsidies from the other intervention components.

Regardless, the dramatic increase in contraceptive distribution at intervention shops suggests that implementing programs which are tailored to young women in drug shops may be an effective strategy through which to reach them with contraceptive products.

Notably, emergency contraception accounted for most of the contraceptive products distributed to young women at intervention shops. This finding aligns with existing research suggesting that emergency contraception is especially desirable to young women, who may prefer methods that can be used post-coitally and/or on an as-needed basis.^{31,32} The high demand for emergency contraception observed among young women in drug shops may offer the opportunity to build upon these shop interactions by integrating timely HIV-related interventions (e.g., bundling emergency contraception with condoms, post-exposure prophylaxis [PEP], and/or an HIVST kit). Fostering trusted relationships between young women and shopkeepers may also pave the way for shopkeepers to link AGYW to more proactive methods for HIV and pregnancy prevention, such as pre-exposure prophylaxis (PrEP) and long-acting reversible contraception.

When designing *Malkia Klabu*, we sought to move beyond surface-level service availability to understand and address the complex structural and sociocultural factors which interact to determine young women's engagement with health services. There has been increasing interest by the global health community in applying human-centered design to solve public health challenges, including SRH challenges faced by young women in sub-Saharan Africa. Despite HCD's growing use as a tool for global health,³³ few HCD-derived programs have been formally evaluated, a gap we sought to address through the present study. This study's rigor is bolstered by random selection of drug shops from government registries, high participation rates among contacted shops, randomization of shops into study arms, and no loss-to-follow-up among participating shops. Although only shops that were willing to offer AGYW-friendly services were eligible to participate, all but one shop that met the other eligibility criteria and could be contacted enrolled in the study, limiting potential bias due to self-selection. In combination, these strengths increase the likelihood that the drug shops included in each study arm are representative of drug shops within the targeted communities. Additionally, HIVST kits were free to AGYW in *both* study arms, allowing for direct comparison of HIVST kit distribution between study arms. Finally, data on AGYW patronage was collected via repeated, systematic observations by research staff at randomly determined times, reducing information bias.

One potential limitation of the study is our reliance on visual assessment of customer age by both research staff conducting shop observations and shopkeepers completing customer logs. As the study was designed to reduce hassle and stigma experienced by AGYW at drug shops, this approach was chosen to avoid potentially intrusive questioning of AGYW customers. However, this increases the potential for misclassification of AGYW customers. The use of shopkeeper-completed customer logs to assess the distribution of HIVST kits, other SRH products, and health facility referrals raises other limitations. Shopkeepers' record-keeping is of uncertain and likely variable quality, and because shopkeepers were not blinded, measurement error may be differential by study arm. For example, shopkeepers in the intervention arm, who received more products via the study, may have been more motivated to record product distribution and referrals to AGYW, biasing the results in favor

of the intervention. However, because research staff provided all participating shops with HIVST kits, we were able to triangulate research staff's own administrative records on HIVST kits stocked at shops during weekly stocking visits with shopkeepers' customer logs to evaluate the degree to which their record-keeping aligned with our own; we found high concordance. Nevertheless, our reliance on shopkeeper customer logs to measure other SRH product distribution and referrals remains a limitation. We did not collect data on customers' use of HIVST or contraception after leaving the shop or their uptake of shopkeeper referrals for confirmatory HIV testing or other facility-based services. Thus, we cannot ascertain the effect of the intervention on HIV diagnoses or other downstream SRH outcomes among AGYW.

To contextualize the findings of this trial, we conducted a mixed-methods evaluation to better understand various stakeholders' experiences with the intervention. Through in-depth interviews with AGYW customers, shopkeepers, and HIV referral counselors, we found high acceptability of HIVST provision at drug shops and evidence that multiple intervention features drawn from behavioral economics worked in concert to motivate AGYW and shopkeepers' engagement with *Malkia Klabu*.^{34,35} Future studies are needed to evaluate the performance of this intervention in other settings and to develop strategies to efficiently tailor the intervention to local contexts during broader implementation. This pilot trial included only 10 intervention shops, all located within the specific context in which the intervention was designed. The small size of this study made it possible to provide shops with extensive support while they implemented the multifaceted intervention components. However, we noted significant heterogeneity in intervention shops' performance, with several shops standing out as high and low responders. While we can qualitatively describe preliminary characteristics associated with performance level in this limited sample (e.g., a high-performing shop was located near a secondary school and had an enthusiastic shopkeeper), larger-scale implementation is necessary to quantitatively evaluate which factors are most predictive of performance.

Although this pilot provides strong preliminary evidence of the *Malkia Klabu* intervention's feasibility and acceptability, additional research is necessary to understand its adaptability, scalability, and down-stream impacts. Accordingly, our next step is to conduct a 5-year cluster randomized trial and mixed-method implementation science study among drug shops in two regions of Tanzania (NCT05357144). Through this larger-scale implementation, we will evaluate *Malkia Klabu*'s effects on the number of HIV diagnoses and antenatal care registrations (i.e., as a proxy for pregnancies) among AGYW at the population level, link these outcomes to demand-side pathways leading to impact (e.g., recent HIV testing, met need for contraception), and identify supply-side factors influencing effectiveness (e.g., shop implementation models). In parallel, we will explore strategies for sustainability as scaling *Malkia Klabu* will likely require streamlining the intervention to the core components most critical for its success and identifying the minimum levels of support and product subsidies necessary for shops to effectively implement and sustain it.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of abbreviations:

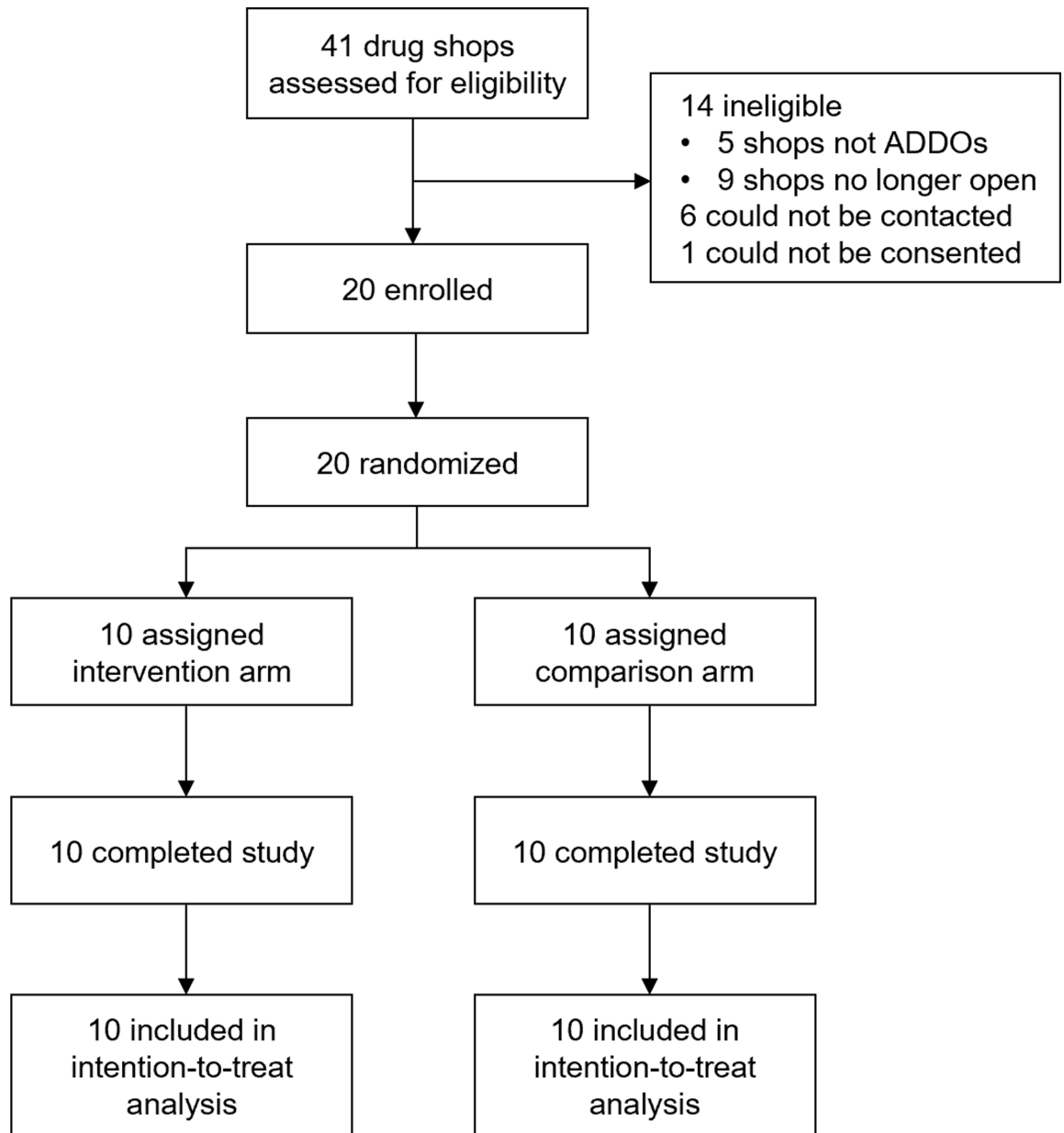
ADDO	Accredited Drug Dispensing Outlet
AGYW	adolescent girls and young women
CI	confidence interval
HCD	human-centered design
HIVST	HIV self-testing
RR	rate ratio
SRH	sexual and reproductive health

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ADDOs = Accredited Drug Dispensing Outlets

Figure 1.
Trial profile for the randomized trial evaluating the Malkia Klabu intervention.

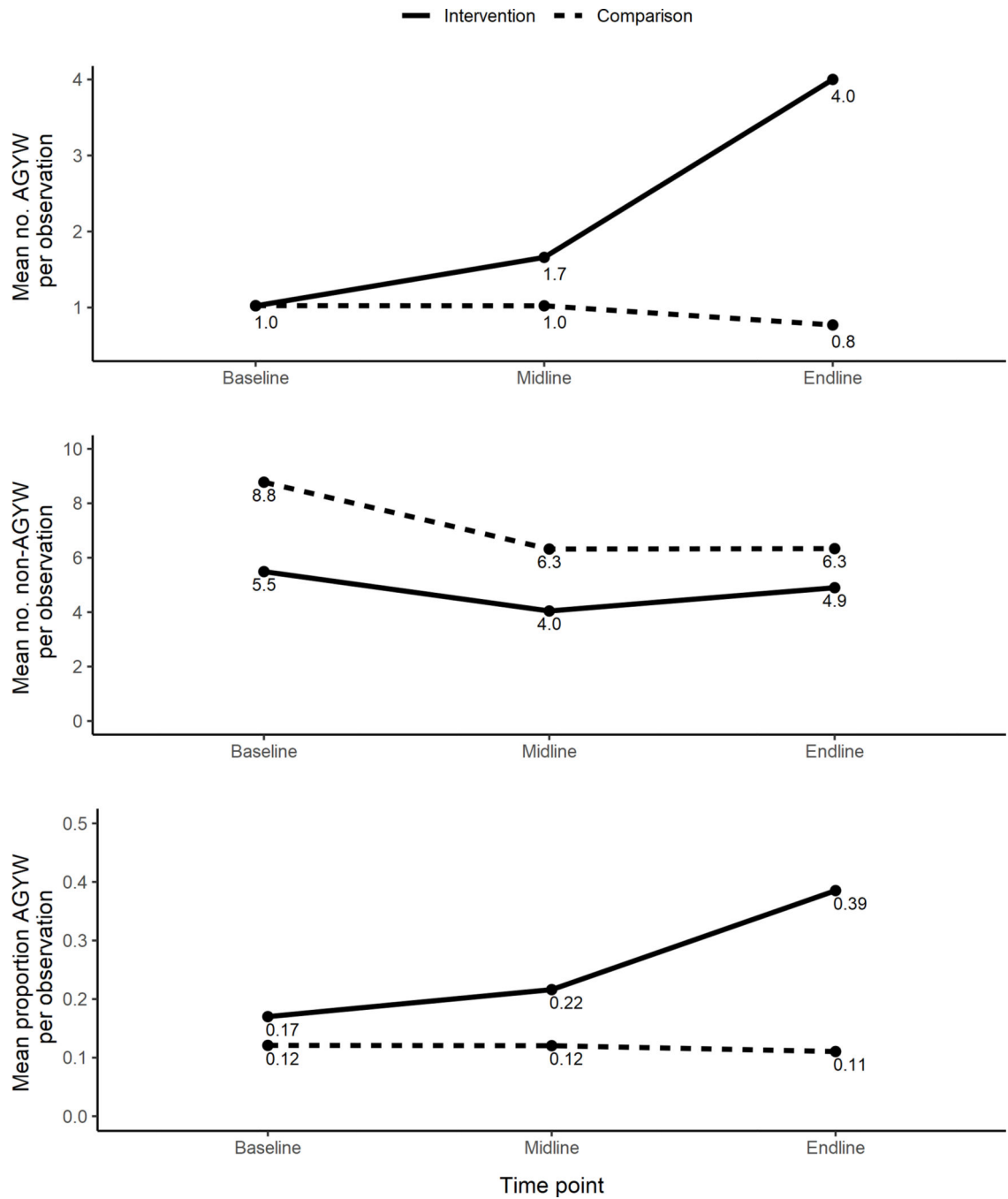


Figure 2. Patronage of adolescent girls and young women (AGYW) compared to other customers (non-AGYW) at 20 drug shops, assessed via multiple three-hour shop observations per shop, by time point and study arm.

Table 1.

Baseline characteristics of 20 shopkeepers and drug shops participating in the randomized trial evaluating the *Malkia Klabu* intervention.

	Comparison arm (n=10)	Intervention arm (n=10)	Combined arms (n=20)
Sex, n (%)			
Female	8 (80%)	7 (70%)	15 (75%)
Male	2 (20%)	3 (30%)	5 (25%)
Age (years), mean (SD)	38.7 (15.7)	48.5 (15.3)	43.6 (15.9)
Education, n (%)			
Primary school	2 (20%)	1 (10%)	3 (15%)
Any secondary school	4 (40%)	3 (30%)	7 (35%)
Diploma course	1 (10%)	4 (40%)	5 (25%)
Other certificate	3 (30%)	2 (20%)	5 (25%)
Years worked in a drug shop, mean (SD)	9.0 (6.2)	14.7 (13.6)	11.8 (10.7)
Medical training beyond shop, n (%)			
Doctor	0 (0%)	1 (10%)	1 (5%)
Nurse or professional midwife	4 (40%)	4 (40%)	8 (40%)
Other	2 (20%)	1 (10%)	3 (15%)
None	4 (40%)	4 (40%)	8 (40%)
Owens participating shop, n (%)	4 (40%)	8 (80%)	12 (60%)
Response to: "Unmarried women should be ashamed to ask their provider for contraceptives," n (%)			
Strongly agree or agree	3 (30%)	2 (20%)	5 (25%)
Undecided	1 (10%)	0 (0%)	1 (5%)
Disagree or strongly disagree	6 (60%)	8 (80%)	14 (70%)
Response to: "Unmarried women should not be given contraceptives because they should not be having sex," n (%)			
Strongly agree or agree	2 (20%)	2 (20%)	4 (20%)
Undecided	1 (10%)	1 (10%)	2 (10%)
Disagree or strongly disagree	7 (70%)	7 (70%)	14 (70%)
Location of shop, [†] n (%)			
Ward 1	3 (30%)	3 (30%)	6 (30%)
Ward 2	3 (30%)	3 (30%)	6 (30%)
Ward 3	2 (20%)	2 (20%)	4 (20%)
Ward 4	2 (20%)	2 (20%)	4 (20%)
No. people who work in shop, n (%)			
1 person	10 (100%)	7 (70%)	17 (85%)
2 people	0 (0%)	2 (20%)	2 (10%)

	Comparison arm (n=10)	Intervention arm (n=10)	Combined arms (n=20)
3 people	0 (0%)	1 (10%)	1 (5%)
Years shop in business [*] , mean (SD)	8.2 (8.1)	9.0 (7.7)	8.6 (7.7)
Shop sells condoms, n (%)	10 (100%)	6 (60%)	16 (80%)
Shop sells oral contraception, n (%)	9 (90%)	6 (60%)	15 (75%)
Shop sells emergency contraception, n (%)	1 (10%)	3 (30%)	4 (20%)
No. customers last work shift ^{**} , mean (SD)	27.7 (15.2)	20.0 (11.5)	24.1 (13.8)
No. AGYW customers last work shift, mean (SD)	7.7 (4.8)	7.5 (7.5)	7.6 (6.1)

SD: standard deviation, No.: number, AGYW: adolescent girls and young women (ages 15–24 years).

[†] Randomization stratified by administrative ward.

^{*} Missing: 2 drug shops in comparison arm.

^{**} Missing: 1 drug shop in intervention arm.

Patronage of adolescent girls and young women compared to other customers at 20 drug shops during 3-hour shop observations by time point and study arm.

Table 2.

	Baseline	Midline	Endline	Midline/endline combined
Total no. observations (range per shop)				
Comparison arm	40 (2-5)	44 (3-5)	48 (4-5)	92 (8-10)
Intervention arm	45 (3-5)	47 (4-5)	49 (4-5)	96 (9-10)
Mean no. AGYW per observation (SD)				
Comparison arm	1.03 (1.14)	1.02 (1.22)	0.77 (1.22)	0.89 (1.24)
Intervention arm	1.02 (1.27)	1.66 (2.87)	4.00 (5.24)	2.85 (4.39)
Mean no. non-AGYW per observation (SD)				
Comparison arm	8.78 (8.00)	6.32 (4.71)	6.33 (5.77)	6.33 (5.26)
Intervention arm	5.49 (3.50)	4.04 (3.50)	4.90 (3.86)	4.48 (3.69)
Mean proportion AGYW per observation [†] (SD)				
Comparison arm	0.12 (0.13)	0.12 (0.12)	0.11 (0.21)	0.12 (0.17)
Intervention arm	0.17 (0.19)	0.22 (0.28)	0.39 (0.31)	0.31 (0.31)
RR (95% CI) [*] : No. AGYW				
Comparison arm	Reference	Reference	Reference	Reference
Intervention arm	1.03 (0.50, 2.13)	1.47 (0.65, 3.32)	4.38 (1.96, 9.77)	2.81 (1.34, 5.91)
RR (95% CI) [*] : No. non-AGYW				
Comparison arm	Reference	Reference	Reference	Reference
Intervention arm	0.74 (0.47, 1.15)	0.99 (0.70, 1.41)	1.09 (0.77, 1.53)	1.04 (0.77, 1.41)

No.: number, SD: standard deviation, AGYW: adolescent girls and young women (ages 15-24), RR: rate ratio, CI: confidence interval.

[†]Number of AGYW customers ÷ total number of customers, excluding 12 observations with 0 customers.

^{*} Estimated via difference-in-differences approach using negative binomial regression models adjusted for ward with random effects for shops and log-duration of observation as an offset term.

Table 3.

Number of sexual and reproductive health products and health facility referrals provided to adolescent girls and young women during the 4-month study period by study arm.

	Comparison arm shops (n=10)	Intervention arm shops (n=10)	P-value*
HIV self-test kits			
Total	596	1,456	
Mean per shop (SD)	59.6 (30.4)	145.6 (107.6)	0.03
Median per shop (IQR)	58.5 (43.8, 70.0)	130.5 (97.0, 166.2)	0.02
Condoms			
Total	123	1,289	
Mean per shop (SD)	12.3 (25.8)	128.9 (142.7)	0.03
Median per shop (IQR)	1.0 (0.0, 7.8)	92.5 (58.2, 111.8)	<0.01
Daily oral contraception			
Total	36	773	
Mean per shop (SD)	3.6 (5.3)	77.3 (60.5)	<0.01
Median per shop (IQR)	1.0 (0.2, 5.5)	74.0 (31.0, 128.8)	<0.01
Emergency contraception			
Total	40	4,587	
Mean per shop (SD)	4.0 (4.9)	458.7 (904.4)	0.14
Median per shop (IQR)	1.0 (0.0, 6.5)	148.5 (72.0, 332.2)	<0.01
Contraception (all)			
Total	199	6,649	
Mean per shop (SD)	19.9 (27.4)	664.9 (1,073.5)	0.09
Median per shop (IQR)	7.0 (1.0, 33.0)	325.5 (210.5, 539.0)	<0.01
Pregnancy tests			
Total	281	1,822	
Mean per shop (SD)	28.1 (29.0)	182.2 (236.0)	0.07
Median per shop (IQR)	16.5 (5.8, 43.0)	136.0 (87.7, 164.3)	<0.01
HIV referrals			
Total	2	82	
Mean per shop (SD)	0.2 (0.4)	8.2 (20.0)	0.23
Median per shop (IQR)	0 (0.0, 0.0)	0 (0.0, 3.5)	0.19
Family planning referrals			
Total	49	495	
Mean per shop (SD)	4.9 (15.1)	49.5 (120.0)	0.27
Median per shop (IQR)	0.0 (0.0, 0.0)	2.0 (0.2, 19.2)	0.03
Pregnancy referrals			
Total	16	84	

	Comparison arm shops (n=10)	Intervention arm shops (n=10)	P-value*
Mean per shop (SD)	1.6 (4.0)	8.4 (17.8)	0.27
Median per shop (IQR)	0.0 (0.0, 1.0)	1.0 (0.2, 3.2)	0.14
Referrals (all)			
Total	67	661	
Mean per shop (SD)	6.7 (19.1)	66.1 (157.5)	0.27
Median per shop (IQR)	0.5 (0.0, 1.8)	3.5 (1.0, 23.8)	0.02

SD: standard deviation, IQR: interquartile range.

* P-value for comparison of means by Welch's two-sample t-test, for comparison of medians Kruskal-Wallis rank sum test.

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