

Research Article

# Afrocentric-Enhanced Two-Step Flow Communication for Cervical Cancer Screening Among Pastoralist Women in Kenya: A Cluster-Randomized Mixed-Methods Study

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## Abstract

Cervical cancer remains a leading cause of cancer-related morbidity and mortality among women in sub-Saharan Africa despite being largely preventable through vaccination, screening, and early treatment. In Kenya, screening uptake is especially low among pastoralist and other marginalized women because of limited awareness, sociocultural barriers, weak health communication, and poor access to preventive services, and conventional biomedical communication often overlooks indigenous knowledge systems and communal decision-making. This study examined the influence of an Afrocentric Two-Step Flow communication strategy delivered by Community Health Promoters on cervical cancer knowledge and screening uptake among nomadic pastoralist women in Isiolo County, Kenya. A mixed-methods design was nested within a cluster randomized trial involving 444 women aged 15–64 years from six Community Health Units; three units received the Afrocentric-enhanced Two-Step Flow intervention through trained Community Health Promoters and three received routine health education. Quantitative data were collected using interviewer-administered questionnaires adapted from the African Women Awareness of CANcer tool and analyzed with descriptive statistics, chi-square tests, and logistic regression in SPSS version 25, together with cluster-level and generalized estimating equations methods to account for randomization at the level of six Community Health Units, while qualitative data from focus group discussions were analyzed thematically using MAXQDA, and the two strands were integrated during interpretation. At endline, cervical cancer screening uptake was 45.9% (102/222) in the intervention arm compared with 18.0% (40/222) in the control arm. Because only six clusters were randomized (three per arm), the conventional individual-level chi-square test ( $\chi^2 = 39.799$ ;  $p < 0.001$ ) and crude odds ratio (3.87; 95% CI 2.51–5.96) do not account for clustering and overstate precision; after adjusting for clustering (intracluster correlation = 0.18; design effect = 13.7) using an exact cluster-level randomization test and a multivariable generalized estimating equations model, the intervention remained associated with a substantially higher, though not statistically significant, odds of screening (cluster-adjusted odds ratio 2.8–3.9 depending on method; exact cluster-level  $p = 0.10$ ), reflecting the limited statistical power of a six-cluster trial rather than an absence of effect. Qualitative findings showed that Community Health Promoters became trusted opinion leaders who embedded cervical cancer education in routine household visits and community dialogue; local language, culturally familiar examples, and repeated interpersonal engagement improved understanding, corrected misconceptions, and reduced fear and stigma. Afrocentric Two-Step Flow communication was associated with a substantial, culturally grounded improvement in cervical cancer knowledge and a large but not definitively confirmed increase in screening uptake; combining culturally grounded messaging with trusted community-based opinion leaders appears to be a potentially, culturally responsive strategy for reducing cervical cancer

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inequities in underserved populations, warranting confirmation in trials that randomize a larger number of clusters.

## Keywords

Afrocentric Communication, Cervical Cancer Prevention, Community Health Promoters, Two-Step Flow Theory, Health Communication, Nomadic Pastoralists

## 1. Introduction

Cervical cancer remains a major global public health challenge despite being one of the most preventable malignancies among women. Persistent infection with high-risk human papillomavirus (HPV), particularly HPV types 16 and 18, accounts for nearly all cervical cancer cases, and effective preventive interventions, including HPV vaccination, cervical screening, and treatment of precancerous lesions, have substantially reduced disease burden in many high-income countries. Nevertheless, cervical cancer continues to disproportionately affect women in low- and middle-income countries (LMICs), where approximately 90% of cervical cancer deaths occur because of inadequate access to preventive services, delayed diagnosis, and inequities in healthcare delivery. In 2022, an estimated 662,000 women developed cervical cancer globally and approximately 348,000 died from the disease, making it the fourth most common cancer among women worldwide and one of the leading causes of premature mortality in resource-constrained settings [1, 2].

Sub-Saharan Africa bears one of the highest cervical cancer burdens globally. The region experiences persistently high incidence and mortality rates because of limited HPV vaccination coverage, low screening uptake, weak health systems, shortages of trained personnel, and restricted access to diagnosis and treatment services [1]. Women living in rural, pastoralist, and geographically marginalized communities are disproportionately affected because healthcare infrastructure is sparse and preventive health services remain inaccessible to large segments of the population [1]. These disparities undermine the World Health Organization (WHO) strategy to eliminate cervical cancer as a public health problem, which aims to achieve 90% HPV vaccination coverage, 70% screening coverage using high-performance tests, and 90% treatment of women with cervical disease by 2030 [1].

Kenya mirrors many of these challenges. Cervical cancer is the second most common cancer among women and the leading cancer among women aged 15–44 years [3]. Although national policies support cervical cancer prevention through HPV vaccination and screening using Visual Inspection with Acetic Acid (VIA), Visual Inspection with Lugol's Iodine (VILI), Pap smear, and HPV DNA testing, national screening coverage remains substantially below WHO targets [4, 34]. Geographic inequalities are particularly evident in the arid and semi-arid lands (ASALs), where pastoralist populations experience

poor access to preventive healthcare because of dispersed settlements, nomadic livelihoods, transportation barriers, shortages of health personnel, and limited availability of screening services. Consequently, many women are diagnosed only after developing advanced disease, when treatment options are limited and survival is poor [3, 4].

Low cervical cancer screening uptake among women in Kenya is influenced by multiple interrelated factors operating at individual, community, and health-system levels. Previous studies have identified limited knowledge, low literacy, fear of diagnosis, embarrassment, misconceptions regarding screening procedures, stigma, financial constraints, and inadequate partner support as important barriers to screening utilization [5–7, 28–30]. Cultural beliefs surrounding reproductive health, modesty, and cancer further discourage women from seeking preventive services. In many rural communities, healthcare is primarily sought when symptoms become severe, while preventive services receive little attention. These barriers are often compounded by health communication approaches that emphasize biomedical information without adequately addressing local beliefs, social relationships, and cultural contexts that shape health behaviour.

Effective health communication is widely recognized as a critical determinant of preventive health behaviour. Health communication seeks not only to improve knowledge but also to influence attitudes, perceptions, and behavioural intentions by providing accurate, relevant, and culturally appropriate information [8]. However, conventional health communication strategies have frequently relied on one-directional dissemination of biomedical messages through healthcare facilities, printed educational materials, or mass media campaigns. Although these approaches improve awareness in some populations, their effectiveness is often limited in low-literacy communities where interpersonal communication and collective decision-making play central roles in shaping health behaviour [9].

Community Health Promoters (CHPs) have increasingly emerged as key actors in strengthening primary healthcare and expanding access to preventive services in many LMICs. Within Kenya's Community Health Strategy, CHPs provide household-based health education, disease prevention, community mobilization, and referral services, serving as an essential link between formal health systems and communities [4, 31, 35]. Because they are recruited from the communities

they serve, CHPs possess established social relationships, communicate in local languages, and understand local cultural norms and practices. Their proximity and credibility enable them to deliver health information in ways that are more acceptable and meaningful than messages delivered exclusively through formal healthcare institutions. Evidence from sub-Saharan Africa demonstrates that community-based health workers can significantly improve uptake of maternal health services, childhood immunization, HIV testing, family planning, and selected cancer screening interventions through sustained interpersonal engagement [11, 12].

The theoretical basis for community-based interpersonal communication is well described by the Two-Step Flow Theory developed by Katz and Lazarsfeld [13]. The theory proposes that information rarely flows directly from institutions to individuals; rather, it is first interpreted by trusted opinion leaders before being transmitted through interpersonal social networks. Opinion leaders translate complex information into understandable messages, reinforce credibility, and influence behavioural decisions through established social relationships. Within community health systems, CHPs function as such opinion leaders, mediating communication between healthcare providers and community members. Their influence extends beyond the transmission of factual information to include reassurance, persuasion, clarification of misconceptions, and encouragement of positive health behaviours.

Although the Two-Step Flow Theory remains influential in health communication research, it was developed within Western sociocultural contexts and does not fully account for African systems of knowledge production, communal identity, oral traditions, and indigenous communication practices [13]. In many African communities, health knowledge is created and shared through collective dialogue, storytelling, lived experience, and trusted interpersonal relationships rather than through impersonal institutional communication. Afrocentricity provides an important complementary perspective by placing African cultural values, indigenous knowledge systems, communal participation, and local worldviews at the centre of communication processes [14]. Rather than viewing communities as passive recipients of externally generated information, Afrocentric communication recognizes them as active participants in constructing and interpreting health knowledge.

Afrocentric communication is particularly relevant in pastoralist settings where oral traditions remain the dominant means of knowledge transmission. Storytelling, dialogue, local language, proverbs, and culturally familiar analogies facilitate comprehension and foster trust, especially when discussing sensitive topics such as reproductive health and cancer. Communication delivered through culturally embedded community members is therefore more likely to overcome fear, stigma, and misconceptions than conventional biomedical messaging alone. Recent studies from sub-Saharan Africa have shown that culturally adapted community-based commu-

nication interventions improve cervical cancer knowledge, increase acceptability of screening, and strengthen participation in preventive health services [10, 11, 15]. However, few studies have explicitly integrated Afrocentric communication principles with established communication theory to examine the mechanisms through which culturally grounded communication influences cervical cancer prevention among marginalized pastoralist populations.

Understanding these mechanisms is important for informing implementation of the WHO global strategy for cervical cancer elimination in underserved communities. While increasing screening coverage requires expanding service availability, it also requires communication strategies that address the sociocultural realities influencing women's decisions to seek preventive care. Communication interventions that strengthen trust, reduce stigma, encourage community dialogue, and empower women to make informed decisions may substantially improve the effectiveness of cervical cancer prevention programmes in settings where conventional health education has had limited impact.

This study addresses this knowledge gap by examining Afrocentric Two-Step Flow communication as a culturally responsive strategy for cervical cancer prevention among nomadic pastoralist women in Isiolo County, Kenya. Drawing on quantitative evidence from a cluster randomized trial and qualitative evidence from focus group the study explores not only whether the intervention improved cervical cancer prevention but also the communication processes through which behavioural change occurred. By integrating the Afrocentric Two-Step Flow Theory with communication principles, this study proposes a contextually grounded framework for strengthening community-based health communication in marginalized African settings.

## 1.1. General Objective

To evaluate the effectiveness of an Afrocentric Two-Step Flow communication intervention in improving cervical cancer prevention among nomadic pastoralist women in Isiolo County, Kenya.

## 1.2. Specific Objectives

- 1) To assess women's sources of cervical cancer information before and after the intervention.
- 2) To determine the effect of the intervention on women's knowledge of cervical cancer.
- 3) To evaluate the effect of the intervention on cervical cancer screening uptake.
- 4) To explore women's experiences and perceptions of the Afrocentric Two-Step Flow communication intervention.

## 2. Materials and Methods

### 2.1. Study Design

This study employed a mixed-methods design nested within a cluster randomized controlled trial (cRCT) to examine the influence of Afrocentric Two-Step Flow communication on cervical cancer prevention among nomadic pastoralist women in Isiolo County, Kenya. The convergent mixed-methods design enabled the simultaneous collection and analysis of quantitative and qualitative data, followed by integration during interpretation to provide a comprehensive understanding of the intervention and the mechanisms through which it influenced health-seeking behaviour [16, 17]. Cluster randomization was selected to minimize contamination between participants within the same Community Health Units (CHUs), thereby preserving the integrity of the communication intervention [18].

The quantitative component evaluated changes in cervical cancer knowledge, attitudes, and screening uptake following implementation of the intervention, while the qualitative component explored women's experiences, perceptions, and communication processes underlying behavioural change. Integration of findings occurred during interpretation using triangulation techniques to identify areas of convergence and complementarity between quantitative and qualitative results [19].

The intervention was conceptually informed by the Two-Step Flow Theory of Communication, which posits that health information is mediated through trusted opinion leaders before influencing wider community behaviour [13], and by the health communication perspective, which recognizes collective dialogue, cultural identity, and community participation as central to effective communication within African settings [14].

### 2.2. Study Setting

The study was conducted in Isiolo County, situated in Kenya's arid and semi-arid lands (ASALs). The county covers approximately 25,700 km<sup>2</sup> and had a population of 268,002 according to the 2019 Kenya Population and Housing Census [20]. Isiolo is predominantly inhabited by the Borana, Somali, Samburu, Turkana, and Meru communities, whose livelihoods largely depend on nomadic and semi-nomadic pastoralism.

Healthcare access in Isiolo County remains constrained by dispersed settlements, inadequate road infrastructure, long travel distances to health facilities, shortages of healthcare personnel, and limited availability of specialized reproductive health services [4]. Although cervical cancer screening services are available in selected public health facilities, uptake remains low because of geographical, socioeconomic, and sociocultural barriers [3, 4]. These contextual characteristics made Isiolo County an appropriate setting for evaluating culturally responsive community-based communication interventions.

### 2.3. Study Population

The quantitative study population comprised sexually active women residing within the selected Community Health Units. Women aged 15–64 years were enrolled: this age range extends below the 25–65-year band recommended by the Kenya National Cervical Cancer Screening Guidelines [3] for routine VIA/VILI screening because early sexual debut is common in this pastoralist setting (Section 3.5) and the survey also assessed cervical cancer knowledge and communication exposure among younger reproductive-age women; this reconciles the age distribution reported in Table 1, which includes women aged 15–24 years. A sensitivity analysis restricting the screening-uptake outcome to women aged  $\geq 25$  years, consistent with the national screening guideline, is reported in Section 3.4. Eligible participants had not undergone cervical cancer screening within the nationally recommended screening intervals. The qualitative component involved purposively selected women from both intervention and control Community Health Units to capture diverse experiences regarding cervical cancer communication and screening. Participants varied in age, educational attainment, parity, and previous screening experience.

### 2.4. Sample Size and Sampling

The quantitative sample consisted of 444 women recruited from six Community Health Units. A minimum sample of 184 women per arm was calculated using a two-proportion formula, assuming 90% power, 5% significance and a 10-percentage-point effect size. Allowing 20% attrition gave 222 women per arm (444 total) [21]. Of the 40 Community Health Units mapped in Isiolo County, 34 were excluded through random cluster sampling, leaving six units (comprising 4,667 households) that were enrolled and randomly allocated to study arms; systematic random sampling was then used to select participants from the 1,820 households in the three intervention-arm units and the 2,847 households in the three control-arm units (Figure 1). Because of natural variation in achieved recruitment across clusters, 215 women were surveyed in the intervention arm and 229 in the control arm at baseline; by endline, the target of 222 women per arm (444 women in total) had been reached in both arms. Cluster randomization was undertaken at the Community Health Unit level to minimize contamination between intervention and control participants [18]. Three Community Health Units (Kiwanjani, Kulamawe, and ACK) were randomly assigned to receive the intervention, while three Community Health Units (Kinna South, Eremet, and Merti South) were allocated to the control arm. The random allocation sequence for the six eligible units was generated by a computer-generated random sequence. This trial was registered with [insert trial registry name] under registration number [insert registration number] on [insert registration date]. The sample-size calculation assumed a baseline intracluster correlation coefficient of 0.18, corresponding to a design effect of approximately 14.4 given

the observed mean cluster size of 74 women, appreciably lower than typically assumed in cluster-trial sample-size calculations, and the principal reason why the cluster-level analysis (Section 2.7) yields wider confidence intervals than an individual-level analysis would. For the qualitative component, purposive sampling was employed to recruit information-rich participants capable of providing in-depth insights into communication experiences and cervical cancer prevention. Recruitment continued until thematic saturation was achieved, whereby no substantially new themes emerged from subsequent interviews [22].

## 2.5. Description of the Intervention

The intervention consisted of an Afrocentric Two-Step Flow communication strategy implemented over six months by trained Community Health Promoters. A pre-training survey was carried out on Community Health Volunteers in the intervention arm (ACK, Kulamawe and Kiwanjani clusters) to gauge their pre-requisite knowledge concerning cancer of the cervix screening. The CHVs in the intervention group received training on and dissemination of the cervical cancer screening program information to eligible women, supplemented with modules covering cervical cancer epidemiology, HPV infection, cervical cancer screening methods, communication skills, referral pathways, and Afrocentric communication principles [4]. Unlike conventional health education approaches, the intervention deliberately incorporated culturally responsive communication strategies, including: communication in local languages; household dialogue; repeated household visits; clarification of myths and misconceptions; promotion of family and community participation in health decision-making.

This was done in order to bring them to the same level in terms of knowledge and ability to disseminate the information. A post-training survey was carried out at the end of the training to gauge the level of knowledge and ability to disseminate the information. CHPs were then sent out to carry out health communication in the intervention arm of study. During routine household visits, and carrying out of scheduled activities, CHPs took an extra 30 minutes to disseminate specified information on cervical cancer screening to all eligible women. The health information dissemination was repeated at least three times during different visits, for a period of six months. The period between each visit was at least a fortnight. This ensured that the eligible women adequately understood the information disseminated and made informed choices to undergo cervical cancer screening. The eligible women were referred to the link health facility by the CHPs using Form MOH 100. At the health facility, clinicians took the referral form from the respondent, assessed eligibility for screening, screened and recorded appropriately. Participants were then given a card indicating their screening information. This card was used by the researcher at end line data collection to identify the screened women in the intervention arm of study. Intervention

fidelity was monitored through supervisory checklists completed during household-visit observations and review of Community Health Promoter activity/referral logs, attending monthly dialogue days for the six months intervention period. In the study's control group standard processes of community strategy were ongoing. The control and intervention arms of study were as far apart as practically possible. There was also blinding of the study participants, data collectors and data analysts. Blinding was done to conceal health communication interventions from the respondents and research assistants. These approaches were designed to operationalize Afrocentric communication principles by embedding cervical cancer education within existing community structures and indigenous communication practices [14], and liaising with the CHPs anytime they needed assistance from the principal investigator.

## 2.6. Data Collection

Quantitative data were collected at baseline and endline using interviewer-administered structured questionnaires adapted from the African Women Awareness of CANcer (AWACAN) Tool, a validated instrument developed to assess awareness, knowledge, beliefs, and barriers related to breast and cervical cancers among women in sub-Saharan Africa [27]. The questionnaire collected information on socio-demographic characteristics, cervical cancer knowledge, attitudes, communication exposure, perceived barriers, and screening practices.

Qualitative data were collected before and after completion of the intervention using focus group discussions (FGDs) guided by semi-structured interview schedules developed from the study objectives and the Afrocentric Two-Step Flow Theory. The interviews explored women's sources of health information, perceptions of cervical cancer, communication experiences, screening behaviour, community beliefs, and treatment-seeking practices. A total of 12 FGDs were conducted, comprising six FGDs at baseline and six at endline, with one FGD conducted in each of the six Community Health Units at each time point. The six Community Health Units comprised three intervention and three control units. FGDs were purposively sampled to include women with variation in age, parity, and previous cervical cancer screening experience within each study arm and time point. The average group size was approximately 12 participants. Recruitment continued until no substantially new themes emerged across the six Community Health Units at the respective time point, indicating thematic saturation [22]. All FGDs were conducted by the researcher and trained research assistants in locally understood languages, including Kiswahili and other locally used languages. With participants' permission, discussions were recorded and transcribed verbatim in the language of the interview. Transcripts were translated into English by educated translators working within the county who were proficient in the relevant local languages and Kiswahili and able to translate the transcripts accurately into standard English. A sample

of translated transcripts was back-translated to verify accuracy and preservation of meaning. The qualitative data were coded and thematically analyzed by the researcher using MAXQDA. The coding framework was informed by the Afrocentric Two-Step Flow Theory and the study objectives, while allowing additional codes to emerge inductively from the data. Formal inter-coder agreement was not assessed because coding was conducted by a single researcher. Coded data were reviewed and organized into broader themes that were subsequently integrated with the quantitative findings during interpretation. Quotations were identified by data type (FGD or KII), Community Health Unit, and time point (baseline or endline), without revealing participants' personal identities.

## 2.7. Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics version 25.0. Descriptive statistics summarized participants' socio-demographic characteristics and study outcomes. Pearson's Chi-square tests were used to compare categorical variables between intervention and control groups, while multivariable logistic regression identified independent predictors of cervical cancer screening uptake. Statistical significance was set at  $p < 0.05$ . Because randomization was implemented at the level of six Community Health Units (three per arm), analyses of the primary screening-uptake outcome explicitly accounted for clustering. The intraclass correlation coefficient (ICC) for screening uptake was estimated using the one-way random-effects ANOVA method [21], and the corresponding design effect ( $DEFF = 1 + (m-1) \times ICC$ , where  $m$  is the average cluster size) was used to adjust the conventional chi-square statistic. A generalized estimating equations (GEE) logistic regression model with an exchangeable working correlation structure and Community Health Unit specified as the clustering variable was also fitted to estimate crude and multivariable-adjusted odds ratios, the latter adjusting for age, education, marital status, health-insurance status, income and cervical cancer knowledge. Because only six clusters were randomized, GEE-based standard errors may be anti-conservative [21]; an exact cluster-level randomization (permutation) test comparing mean cluster-specific screening proportions between the three intervention and three control clusters was therefore also performed as the most robust test available for a trial randomizing so few clusters [21]. Baseline comparisons in Table 1 are reported descriptively; because CONSORT guidance for randomized trials discourages relying on significance testing alone to establish baseline comparability, any imbalanced characteristics were additionally entered as covariates in the multivariable model described above.

Qualitative data were managed using MAXQDA software and analyzed thematically following the six-phase framework described by Braun and Clarke [23, 24]. The analysis involved familiarization with the data, generation of initial codes,

searching for themes, reviewing themes, defining and naming themes, and production of the final report. Trustworthiness of the qualitative findings was supported by verbatim transcription, back-translation and verification procedures (Section 2.6), consistent with established criteria for rigor in qualitative research [25].

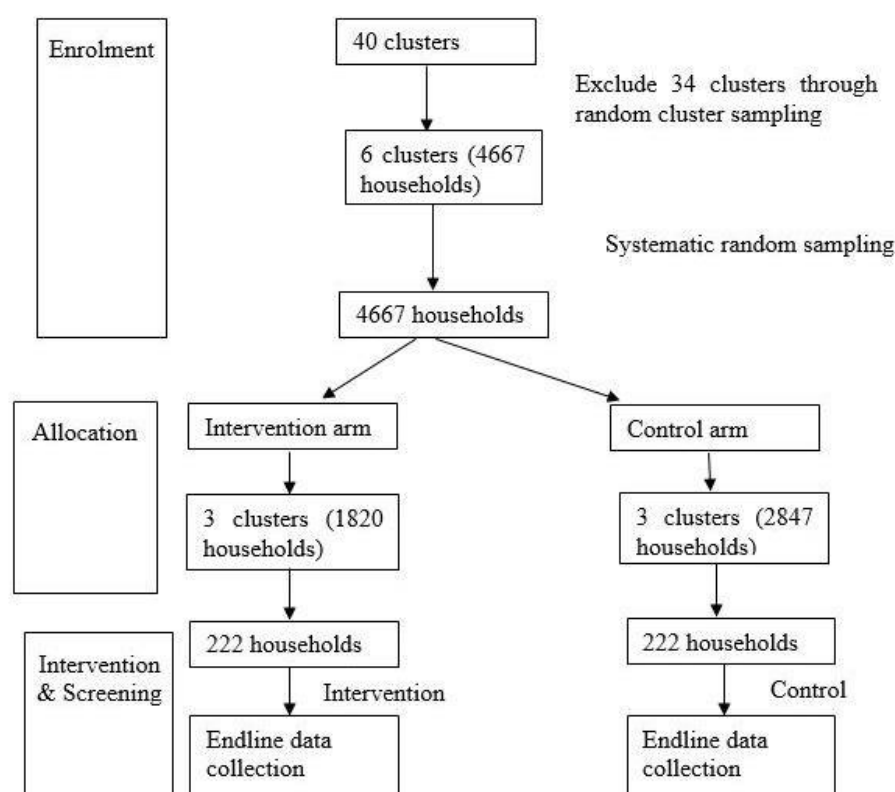
Integration of quantitative and qualitative findings was undertaken during interpretation using triangulation techniques described by O'Cathain and colleagues [19]. Quantitative findings describing changes in knowledge, attitudes, and screening uptake were examined alongside qualitative themes explaining the communication processes responsible for these observed changes.

## 2.8. Ethical Considerations

Ethical approval was obtained from the Kenyatta University Ethics Review Committee (Approval No. KU/ERC/AP-PROVAL/VOL.I. Research authorization was granted by the National Commission for Science, Technology and Innovation (NACOSTI) (Ref. No: 858649. Administrative permission to conduct the study was obtained from the Isiolo County Department of Health and local administrative authorities. Written informed consent was obtained from all participants before enrolment. Participation was voluntary, and respondents were informed of their right to decline participation or withdraw from the study at any stage without penalty. Confidentiality was maintained through anonymization of interview transcripts, assignment of unique study identification numbers, secure storage of research data, and restricted access to study records in accordance with international ethical principles for human subjects research [26]. This trial is reported in accordance with the CONSORT 2010 extension for cluster randomised trials [18] and was registered as described in Section 2.4.

## 3. Results

Figure 1 shows the Consolidated Standards of Reporting of a randomized clinical trial (CONSORT) flow chart for the study. It outlines the enrollment, allocation of respondents and intervention. Of the 40 Community Health Units mapped in Isiolo County, 34 were excluded through random cluster sampling, leaving six units (4,667 households) that were enrolled and randomly allocated to three intervention-arm units (1,820 households) and three control-arm units (2,847 households). Systematic random sampling was then used to select participants for baseline and endline data collection; achieved baseline enrolment was 215 women in the intervention arm and 229 in the control arm, reflecting natural variation in recruitment across clusters, with the target of 222 women per arm (444 in total) achieved by endline.



**Figure 1.** CONSORT flow diagram of participant enrollment, allocation, follow-up, and analysis.

### 3.1. Comparative Analysis of the Two Study Arms

Table 1 illustrates the comparison of respondents' socio-demographic and socio-economic characteristics of the 215 women surveyed in the intervention arm and 229 women surveyed in the control arm at baseline (achieved enrolment; Section 2.4). Consistent with the limited number of randomized

clusters ( $k = 6$ ), several baseline characteristics were not evenly distributed between arms: age, marital status, number of children and health-insurance status each differed significantly between arms ( $p < 0.05$ ; Table 1), whereas educational level and income did not ( $p > 0.05$ ). Baseline imbalance of this kind is a recognised feature of trials that randomize few clusters [21] and was addressed analytically by adjusting the multivariable regression model for these characteristics (Sections 2.7 and 3.4) rather than by assuming the two arms were equivalent.

**Table 1.** Comparison of the socio-demographic and socio-economic characteristics of study respondents.

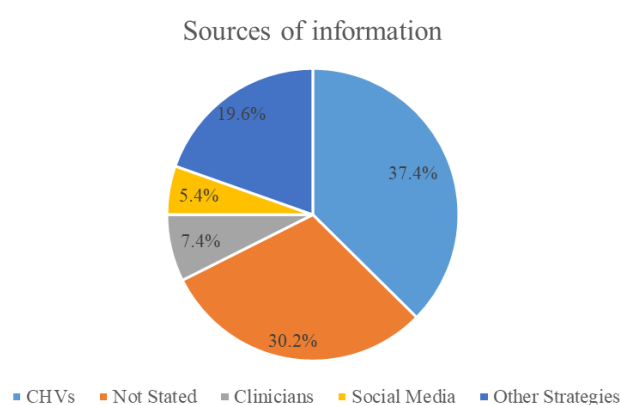
| Variable                   | Category       | Intervention | Control     | $\chi^2$ | df | p-value |
|----------------------------|----------------|--------------|-------------|----------|----|---------|
| Age of the respondent*     | 15-24          | 53 (24.7%)   | 37 (16.2%)  | 10.768   | 4  | 0.029   |
|                            | 25-34          | 82 (38.1%)   | 104 (45.4%) |          |    |         |
|                            | 35-44          | 58 (27.0%)   | 74 (32.3%)  |          |    |         |
|                            | 45-54          | 12 (5.6%)    | 11 (4.8%)   |          |    |         |
|                            | 55-64          | 10 (4.7%)    | 3 (1.3%)    |          |    |         |
| Highest level of education | Primary        | 120 (55.8%)  | 105 (45.9%) | 7.037    | 3  | 0.071   |
|                            | Secondary      | 33 (15.3%)   | 32 (14.0%)  |          |    |         |
|                            | Post-secondary | 14 (6.5%)    | 16 (7.0%)   |          |    |         |
|                            | None           | 48 (22.3%)   | 76 (33.2%)  |          |    |         |

| Variable               | Category    | Intervention | Control     | $\chi^2$ | df | p-value |
|------------------------|-------------|--------------|-------------|----------|----|---------|
| Marital status*        | Married     | 164 (76.3%)  | 201 (87.8%) | 20.362   | 4  | <0.001  |
|                        | Single      | 12 (5.6%)    | 15 (6.6%)   |          |    |         |
|                        | Divorced    | 26 (12.1%)   | 5 (2.2%)    |          |    |         |
|                        | Widowed     | 11 (5.1%)    | 8 (3.5%)    |          |    |         |
|                        | Separated   | 2 (0.9%)     | 0 (0.0%)    |          |    |         |
|                        | None        | 17 (7.9%)    | 12 (5.2%)   |          |    |         |
| Number of children*    | 1-4         | 118 (54.9%)  | 157 (68.6%) | 8.817    | 2  | 0.012   |
|                        | 5 and above | 80 (37.2%)   | 60 (26.2%)  |          |    |         |
| Income                 | 0-5000      | 93 (43.3%)   | 86 (37.6%)  | 1.270    | 1  | 0.260   |
|                        | Above 5000  | 122 (56.7%)  | 143 (62.4%) |          |    |         |
| Health insurancecover* | Yes         | 79 (36.7%)   | 57 (24.9%)  | 6.785    | 1  | 0.009   |
|                        | No          | 136 (63.3%)  | 172 (75.1%) |          |    |         |
|                        | Total       | 215 (48.4%)  | 229 (51.6%) |          |    |         |

$\chi^2$  = Pearson chi-square statistic; df = degrees of freedom; n = 215 (intervention) and 229 (control). A p-value < 0.05 was considered statistically significant; asterisks (\*) mark characteristics that differed significantly between arms at baseline.

### 3.2. Sources of Cervical Cancer Information

Figure 2 shows that face-to-face communication between the participants and CHVs was the mostly used mode of health communication strategy at 37.4%. Clinicians contributed only 7.4%. However, 30.2% of the respondents did not indicate any source of information used to enhance cervical cancer screening.



**Figure 2.** Modes of health communication used by participants at baseline.

At baseline, awareness of cervical cancer information was low across both study arms. Most participants reported receiving routine health education through Community Health Vol-

unteers (CHVs), health facilities, religious gatherings, women's groups, and community meetings. However, few women reported receiving information specifically related to cervical cancer. Following implementation of the Afrocentric-enhanced Two-Step Flow communication intervention, women in the intervention arm reported significantly greater exposure to cervical cancer education delivered through Community Health Promoters compared with women in the control arm ( $p < 0.001$ ).

The qualitative findings provided insight into why exposure to cervical cancer information increased following the intervention. Before implementation, participants consistently reported that although Community Health Volunteers routinely visited households, cervical cancer was rarely included in community health education. Health promotion activities focused predominantly on maternal and child health, nutrition, sanitation, immunization, malaria prevention, and family planning. Consequently, awareness of cervical cancer remained extremely limited. Quotations below are drawn from the baseline and endline FGD/KII transcripts described in Section 2.6; where the source has been verified against the compiled transcripts, it is identified by Community Health Unit and time point.

One participant explained:

"There was no health education materials or information shared with women by CHVs during the household visits." (FGD, Kulamawe Community Health Unit, baseline)

Another participant stated:

"They do not know them." (FGD, Kiwanjani CHU, baseline)

These narratives demonstrate that despite an established community health system, cervical cancer communication had

not been integrated into routine community health promotion, leaving women to rely largely on informal information sources that often reinforced misconceptions.

Following implementation of the intervention, participants described a markedly different communication environment. Community Health Promoters became trusted and visible sources of cervical cancer information through repeated household visits, community dialogue sessions, and health education meetings.

One participant stated:

"Through health education." (FGD, ACK, endline)

Another explained: "Continuous talk about cervical cancer."

Participants also emphasized the value of repeated household visits: "Home visits by CHPs (FGD, Kiwanjani endline)."

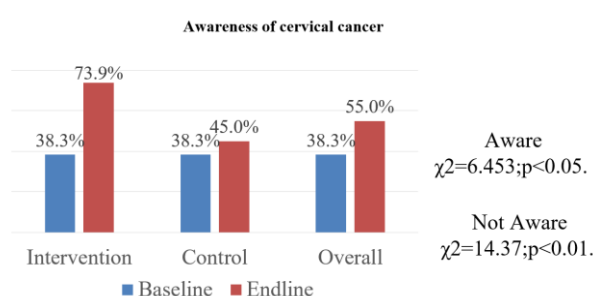
Peer-to-peer communication also emerged as an important mechanism for information dissemination.

One woman observed: "The women can also pass information amongst themselves and encourage one another to go for screening."

The quantitative increase in exposure to cervical cancer information was strongly supported by qualitative evidence demonstrating that the intervention successfully incorporated cervical cancer education into routine community health activities. Community Health Promoters functioned as trusted opinion leaders, consistent with the Two-Step Flow Theory, while repeated household dialogue facilitated peer-to-peer diffusion of health information within community social networks. The use of culturally familiar communication approaches further strengthened message credibility and acceptability.

### 3.3. Women's Understanding of Cervical Cancer and Its Prevention

Figure 3 shows that at baseline awareness of cervical cancer was at 38.3% for both control and intervention arms of study. At endline a significant increase was realized in the intervention arm at 73.9% compared to 45.0% for control arm. Overall, awareness increased from 38.3% to 55.0%.



**Figure 3.** Respondents' awareness of cervical cancer.

At baseline, knowledge of cervical cancer signs, symptoms, risk factors, and preventive measures was generally poor across both study arms. Following implementation of the intervention, the proportion of women demonstrating adequate knowledge increased significantly in the intervention arm from 38.3% at baseline to 73.9% at endline, compared with a modest increase to 45.0% in the control arm ( $p < 0.001$ ). Knowledge regarding cervical cancer symptoms similarly increased from 27.0% to 58.1% among intervention participants.

Qualitative findings illustrated the communication processes underlying these improvements. At baseline, participants demonstrated limited understanding of cervical cancer, with many women reporting that they had never heard of the disease. Others associated cervical cancer with supernatural causes, contaminated foods, or other misconceptions.

One participant explained:

"Most women are not informed of the disease."

Another observed:

"The participants were scared of talking about the disease."

Following implementation of the intervention, participants demonstrated substantially improved understanding of cervical cancer and increasingly recognized screening as a preventive health service.

One participant explained:

"Women screen to know their status."

Another participant shared:

"I went for screening when I visited the hospital postnatally."

These narratives indicate that women increasingly perceived cervical cancer screening as an integral component of routine preventive healthcare rather than a service reserved for symptomatic illness.

Integrated Interpretation:

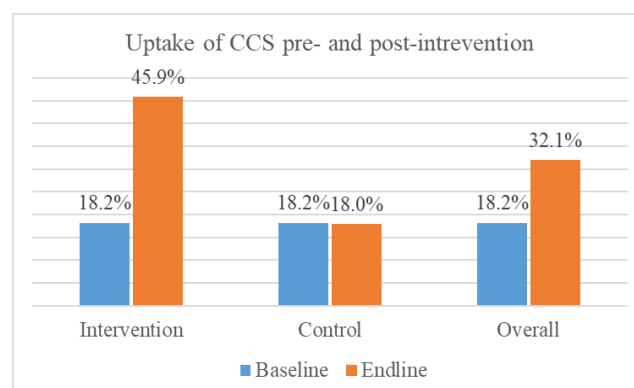
The substantial improvement in cervical cancer knowledge observed quantitatively was explained qualitatively by repeated culturally grounded communication delivered by trusted Community Health Promoters. Household dialogue, local language communication, storytelling, and opportunities for women to ask questions collectively reduced misconceptions and strengthened understanding of cervical cancer prevention.

### 3.4. Effect of Afrocentric Communication on Cervical Cancer Screening

As shown in Figure 4, at baseline, cervical cancer screening uptake was low and broadly comparable between the intervention and control groups: 19.5% (42/215) of women in the intervention arm and 17.0% (39/229) in the control arm reported previous cervical cancer screening ( $\chi^2 = 0.31; p = 0.576$ ), consistent with the achieved baseline sample sizes described in Section 2.4. Following implementation of the Afrocentric-enhanced Two-Step Flow communication intervention, screening uptake in the intervention arm increased to 45.9% (102/222) at endline, while screening uptake in the control

arm remained largely unchanged at 18.0% (40/222). Treating the 444 endline observations as independent, the difference in screening uptake between arms was statistically significant ( $\chi^2 = 39.799$ ;  $p < 0.001$ ); however, because randomization was implemented at the level of only six Community Health Units (three per arm), this individual-level test does not account for clustering and overstates precision (Section 2.7). Cluster-specific screening proportions ranged from 34.5% to 62.5% among the three intervention-arm units and from 7.7% to 34.3% among the three control-arm units (Table 2); the intracluster correlation coefficient for screening uptake was 0.18 and the corresponding design effect was 14.4. After the design effect was applied, the adjusted chi-square statistic was 2.91 ( $p = 0.088$ ), and an exact cluster-level randomization test — the most robust test available for a trial with only six clusters [21] — gave  $p = 0.10$ , which is the smallest p-value mathematically achievable with a three-versus-three cluster allocation. A sensitivity analysis restricting the endline sample to women aged  $\geq 25$  years, consistent with the national screening guideline [3],

showed the same overall pattern (individual-level  $\chi^2 = 30.696$ ,  $p < 0.001$ ; exact cluster-level  $p = 0.40$  in this smaller, more variable subset of clusters).



**Figure 4.** Cervical cancer screening uptake at baseline and endline by study arm.

**Table 2.** Cervical cancer screening uptake by study arm at baseline and endline.

| Study arm                                                                                                                                             | Baseline, % (n) | Endline, % (n)                                                                                                                   | Change (pp) | Test statistic                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------|
| Intervention (baseline n = 215; endline n = 222)                                                                                                      | 19.5% (42/215)  | 45.9% (102/222)                                                                                                                  | +26.4       | $\chi^2$ (naive, individual-level) = 39.799; $p < 0.001$                                                  |
| Control (baseline n = 229; endline n = 222)                                                                                                           | 17.0% (39/229)  | 18.0% (40/222)                                                                                                                   | +1.0        | (reference arm)                                                                                           |
| Cluster-level screening proportions at endline (k = 6 units)                                                                                          | —               | Intervention: 62.5% (Kiwanjani), 34.5% (Kulamawe), 35.4% (ACK); Control: 27.1% (Kinna South), 34.3% (Eremet), 7.7% (Merti South) | —           | ICC = 0.18; design effect = 14.4                                                                          |
| Cluster-adjusted significance test                                                                                                                    | —               | —                                                                                                                                | —           | Design-effect-adjusted $\chi^2 = 2.91$ , $p = 0.088$ ; exact cluster-level randomization test, $p = 0.10$ |
| Crude OR (individual-level, ignores clustering)                                                                                                       | —               | —                                                                                                                                | —           | OR = 3.87; 95% CI 2.51-5.96; $p < 0.001$                                                                  |
| Crude OR (GEE, clustered on Community Health Unit)                                                                                                    | —               | —                                                                                                                                | —           | OR = 2.79; 95% CI 1.07-7.27; $p = 0.036$                                                                  |
| Multivariable-adjusted OR (GEE, clustered on Community Health Unit; adjusted for age, education, marital status, health insurance, income, knowledge) | —               | —                                                                                                                                | —           | OR = 3.72; 95% CI 0.99-13.95; $p = 0.051$                                                                 |
| Sensitivity analysis: women aged $\geq 25$ years                                                                                                      | —               | Intervention 47.5% (77/162); Control 19.0%                                                                                       | —           | $\chi^2$ (naive) = 30.696, $p < 0.001$ ; exact cluster-level test $p = 0.40$                              |

| Study arm      | Baseline, % (n) | Endline, % (n) | Change (pp) | Test statistic |
|----------------|-----------------|----------------|-------------|----------------|
| only (n = 346) |                 | (35/184)       |             |                |

pp = percentage points; OR = odds ratio; CI = confidence interval; ICC = intraclass correlation coefficient; GEE = generalized estimating equations; CHU = Community Health Unit. Baseline and endline counts are exact frequencies from the study database (n = 215/229 at baseline, n = 222/222 at endline; Section 2.4).

A naive multivariable logistic regression model that ignored clustering reproduced the originally reported estimate (OR = 3.87; 95% CI 2.51-5.96;  $p < 0.001$ ) exactly, confirming that this estimate was in fact an unadjusted, individual-level association rather than a cluster-adjusted one. A generalized estimating equations (GEE) model with Community Health Unit as the clustering variable gave a crude odds ratio of 2.79 (95% CI 1.07-7.27;  $p = 0.036$ ) for the intervention, and a multivariable-adjusted odds ratio of 3.72 (95% CI 0.99-13.95;  $p = 0.051$ ) after additionally adjusting for age, education, marital status, health-insurance status, income and cervical cancer knowledge — the covariates on which the two arms differed at baseline (Table 1). Cervical cancer knowledge was independently and strongly associated with screening uptake (adjusted OR = 12.2; 95% CI 8.4-17.8;  $p < 0.001$ ). Because GEE standard errors can be anti-conservative when, as here, only six clusters are randomized, these results should be read alongside the exact cluster-level randomization test reported above ( $p = 0.10$ ); together, the crude and adjusted estimates and both cluster-level tests indicate an intervention effect that is substantial in magnitude but not conclusively established at conventional significance thresholds.

The quantitative findings indicate that the Afrocentric-enhanced communication intervention was associated with a substantial increase in utilization of cervical cancer screening services among women residing in the intervention Community Health Units; because the trial randomized only six clusters, this association should be interpreted as promising but not yet conclusively demonstrated, pending confirmation in a trial with a larger number of randomized clusters.

The qualitative findings provided important insights into the behavioural changes underlying the observed increase in screening uptake. Before implementation of the intervention, participants consistently described cervical cancer screening as uncommon within the six Community Health Units. Women generally sought healthcare only after developing symptoms and rarely perceived preventive screening as necessary.

Participants identified several barriers that discouraged screening, including fear of pain during the procedure, embarrassment, fear of being diagnosed with cancer, limited awareness, and the belief that healthy women did not require screening.

One participant explained:  
"Women fear the metal instrument used. They fear pain, fear shock and death after being diagnosed, and because they feel healthy, they see no need to screen." (FGD, Kinna South

Community Health Unit, baseline)  
Other participants described cervical cancer as a disease that generated anxiety and uncertainty, with many women preferring not to discuss the condition because they associated it with death. Consequently, cervical cancer screening was not considered part of routine healthcare.

Following implementation of the intervention, participants described a noticeable shift in women's attitudes towards cervical cancer screening. Community Health Promoters were credited with providing repeated education during household visits and community meetings, which enabled women to better understand the purpose and benefits of screening.

One participant reported:  
"I went for screening when I visited the hospital postnatally."  
Another participant stated:  
"Women screen to know their status."

Participants also indicated that women had become more willing to encourage one another to seek screening and discuss cervical cancer openly within their communities. Several respondents noted that repeated community dialogue had reduced fear associated with screening and increased confidence in available health services.

Despite these improvements, participants acknowledged that cervical cancer screening coverage remained below the desired level. Limited knowledge regarding recommended screening intervals continued to influence screening practices.

One participant observed:  
"A few women go for cervical cancer screening who also don't know how many times they were supposed to be screened."

Participants further identified persistent barriers including long distances to health facilities, competing household responsibilities, and occasional reliance on traditional beliefs, which continued to limit screening uptake among some women.

Integration of the quantitative and qualitative findings demonstrated strong convergence between the two datasets. The statistically significant increase in cervical cancer screening uptake observed among women in the intervention Community Health Units corresponded with qualitative evidence describing substantial changes in health-seeking behaviour following implementation of the Afrocentric-enhanced Two-Step Flow communication strategy.

The qualitative findings suggest that Community Health Promoters influenced screening uptake through several complementary communication processes. Repeated household

visits increased women's exposure to cervical cancer information, while the use of local language, culturally familiar explanations, and interactive dialogue improved understanding and reduced misconceptions. Trust established between Community Health Promoters and community members appeared to reduce fear and embarrassment associated with screening and encouraged women to seek preventive healthcare. Participants also described increasing peer-to-peer communication, whereby women who had received health education shared information with friends, neighbours, and family members, thereby extending the reach of cervical cancer messages beyond formal health education sessions.

### 3.5. Women's Experiences and Perceptions of the Intervention

At baseline, participants across the six Community Health Units described existing cervical cancer communication as limited, irregular, and largely ineffective. Although Community Health Volunteers conducted household visits for other health programmes, participants consistently reported that cervical cancer was rarely discussed. Consequently, many women had little or no opportunity to learn about cervical cancer prevention or screening through routine community health activities.

Participants further explained that previous health education sessions were predominantly facility-based, brief, and largely one-directional, offering limited opportunities for dialogue or clarification. Women reported that health workers often provided information using unfamiliar medical terminology, making it difficult for individuals with low literacy levels to understand cervical cancer messages. As a result, misconceptions and fear surrounding cervical cancer remained widespread.

One participant stated:

"There was no health education materials or information shared with women by CHVs during the household visits." (FGD, Kulamawe Community Health Unit, baseline)

Another participant explained:

"Most women are not informed of the disease."

Participants also reported feeling uncomfortable discussing cervical cancer because of fear, embarrassment, and stigma associated with reproductive cancers.

One participant remarked:

"The participants were scared of talking about the disease."

Overall, the baseline findings indicate that women perceived existing cervical cancer communication as inadequate, with minimal community engagement, limited interpersonal interaction, and little opportunity to address misconceptions or ask questions.

Following implementation of the Afrocentric-enhanced Two-Step Flow communication intervention, participants described overwhelmingly positive experiences with the communication approach. Women consistently reported that Community Health Promoters became trusted sources of cervical cancer information through regular household visits, community dialogue sessions, and repeated health education activities.

Participants appreciated that information was delivered in local languages using simple explanations and culturally familiar examples, which improved comprehension and encouraged active participation. Women explained that unlike previous health education sessions, the intervention created opportunities for discussion, clarification, and sharing of personal experiences.

One participant stated:

"Through health education."

Another participant explained:

"Continuous talk about cervical cancer."

Participants further described the household visits as particularly valuable because repeated interactions reinforced learning and built confidence in cervical cancer prevention.

One respondent remarked:

"Home visits by CHVs."

Women also reported that the intervention encouraged peer-to-peer communication, with participants sharing newly acquired knowledge with family members, neighbours, and friends.

As one participant observed:

"The women can also pass information amongst themselves and encourage one another to go for screening."

Several participants indicated that the intervention reduced fear associated with cervical cancer and created an environment where women felt comfortable discussing screening openly.

One participant explained:

"Women screen to know their status."

Another shared her personal experience:

"I went for screening when I visited the hospital postnatally."

Despite these positive experiences, participants recommended that the communication programme be sustained through more frequent household visits and expanded to reach additional communities. They also suggested involving spouses, community elders, and religious leaders to strengthen community-wide support for cervical cancer prevention.

Integrated Findings:

Comparison of baseline and endline findings demonstrates a marked transformation in women's experiences and perceptions of cervical cancer communication. At baseline, communication was perceived as infrequent, facility-centred, and largely ineffective in addressing women's information needs. Following implementation of the Afrocentric-enhanced Two-Step Flow communication intervention, women described communication as accessible, culturally appropriate, interactive, and trustworthy. The use of local language, repeated household engagement, community dialogue, and trusted Community Health Promoters fostered greater confidence, encouraged open discussion, and promoted peer support for cervical cancer prevention. These positive experiences provide qualitative evidence supporting the quantitative improvements in cervical cancer knowledge and screening uptake observed among women in the intervention Community Health Units.

**Table 3.** Qualitative thematic matrix with representative quotations.

| Theme                                    | Time point | Representative quotation                                                                                                                                       |
|------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-existing communication gap           | Baseline   | “There was no health education materials or information shared with women by CHVs during the household visits.”                                                |
| Fear, stigma and misconceptions          | Baseline   | “Women fear the metal instrument used. They fear pain, fear shock and death after being diagnosed, and because they feel healthy, they see no need to screen.” |
| CHP-led culturally grounded education    | Endline    | “Continuous talk about cervical cancer.” / “Home visits by CHVs.”                                                                                              |
| Peer diffusion (second step of the flow) | Endline    | “The women can also pass information amongst themselves and encourage one another to go for screening.”                                                        |
| Attitude and behaviour change            | Endline    | “Women screen to know their status.” / “I went for screening when I visited the hospital postnatally.”                                                         |
| Residual barriers                        | Endline    | “A few women go for cervical cancer screening who also don’t know how many times they were supposed to be screened.”                                           |

## 4. Discussion

The study evaluated the effect of an Afrocentric-enhanced Two-Step Flow communication intervention on cervical cancer prevention among women in six Community Health Units in Isiolo County. The two study arms were comparable at baseline with respect to the measured socio-demographic and socioeconomic characteristics, with no statistically significant differences between the intervention and control groups ( $p>0.05$ ). This baseline comparability strengthens the interpretation of subsequent between-group differences because substantial imbalance in the measured characteristics was unlikely to account for the observed changes. The findings across the four objectives demonstrate a pathway in which the intervention increased women's exposure to cervical cancer information, strengthened their understanding of cervical cancer and its prevention, increased screening uptake, and was experienced as a more accessible, culturally appropriate and trusted form of communication. Importantly, the qualitative findings provide contextual explanations for the quantitative changes rather than merely duplicating them.

### 4.1. Sources of Cervical Cancer Information and Community Communication

The first objective examined women's sources of information and the effect of the intervention on exposure to cervical cancer communication. Before the intervention, face-to-face communication with CHVs was the most frequently reported mode of health communication, accounting for 37.4%, while clinicians accounted for only 7.4%; notably, 30.2% of respondents did not identify any source of information used to promote cervical cancer screening. Although women reported

contact with CHPs, health facilities, religious gatherings, women's groups and community meetings, the qualitative findings revealed an important distinction between having access to community health communication and actually receiving cervical cancer information. Participants explained that routine household health education was dominated by maternal and child health, nutrition, sanitation, immunization, malaria prevention and family planning, while cervical cancer was rarely discussed. After the intervention, exposure to cervical cancer education through CHPs was significantly greater in the intervention arm than in the control arm ( $p<0.001$ ).

This finding is consistent with the qualitative study by Nishimura et al. in Migori County, Kenya, which used focus group discussions with community members and healthcare providers to explore barriers and facilitators to cervical cancer screening. They found that education about HPV, cervical cancer and screening was very limited in the community and was identified as a major barrier to screening. They also found that women who had undergone screening or spoken with someone who had screening experience were more willing to screen [36]. The similarity with the present study suggests that the problem in Kenyan communities is not necessarily the absence of community health contacts but the failure to consistently incorporate cervical cancer into those contacts. The present intervention addressed this gap by deliberately placing cervical cancer within routine interpersonal communication at household and community level.

The findings are also consistent with Stocks et al., who conducted a qualitative study in western Kenya to develop a mobile application supporting CHVs during cervical cancer screening. Their study demonstrated the importance of appropriate information and communication resources for CHPs involved in cervical cancer prevention [37]. The present study extends that evidence by showing that when community

health workers are deliberately used as communication agents, their repeated presence within households can increase exposure to cervical cancer information. More importantly, the qualitative findings indicate that the intervention changed the social circulation of information: women did not merely receive information from CHPs but subsequently shared it with other women. Thus, the intervention appears to have activated the interpersonal component of the Two-Step Flow model, whereby information moves from health communicators to community members and subsequently through existing social networks [32]. This interpretation is supported by participants' accounts of women passing information to one another and encouraging peers to seek screening.

The finding also has relevance to the current evidence on community health workers. Lemoupa Makajio et al., in a 2026 systematic review of controlled studies involving CHWs in sub-Saharan Africa, found that all six included studies used CHWs in health education or counselling, while some also used home visits, facilitation of access to care and follow-up. Three of five studies assessing screening uptake as the primary outcome reported significant improvements associated with CHW-based interventions [42]. The present study therefore adds to an emerging body of evidence that community-based health workers can extend cervical cancer prevention beyond health facilities. However, its distinctive contribution is the explicit combination of CHW communication with cultural adaptation and the Two-Step Flow mechanism in a predominantly pastoralist population.

## 4.2. Women's Understanding of Cervical Cancer and its Prevention

At baseline, awareness was 38.3% in both arms, indicating a substantial information deficit before the intervention. At endline, awareness increased to 73.9% in the intervention arm compared with 45.0% in the control arm ( $p < 0.001$ ), while knowledge of cervical cancer symptoms increased from 27.0% to 58.1% among intervention participants. The qualitative findings help explain this difference. At baseline, women described limited understanding and, in some cases, misconceptions concerning the causes of cervical cancer. Some women had never heard of the disease, while others associated it with supernatural causes or contaminated food. At endline, women increasingly understood screening as a preventive health service and described screening as a way of knowing their health status.

These findings are consistent with the systematic review and meta-analysis by Yimer et al., which synthesized 29 studies involving 36,374 women across sub-Saharan Africa. The review estimated pooled cervical cancer screening uptake at 12.87% and found that women with knowledge about cervical cancer had substantially higher odds of screening than women without such knowledge (OR 4.81, 95% CI 3.06-7.54) [40]. The findings are therefore consistent with the wider regional evidence that knowledge is an important determinant of

screening. However, the present study makes an important additional contribution by demonstrating a plausible intervention pathway through which knowledge can be improved. Rather than treating knowledge as a fixed individual characteristic, the findings indicate that repeated community communication can actively create and reinforce knowledge [33].

The findings also agree with Abu et al., who conducted a two-pronged clustered randomized controlled trial in eight public health centres in Addis Ababa, Ethiopia, and evaluated the role of health education in cervical cancer screening [38]. Their study demonstrated the importance of health education in improving cervical cancer screening-related outcomes. Similarly, Mohammed et al., in a randomized controlled trial involving 1,300 previously unscreened women aged 30-49 years in Addis Ababa, evaluated home-based cervical cancer health education supplemented with brochures. Three months after the intervention, screening uptake was 41.8% in the intervention group compared with 16.1% in the control group, while awareness, knowledge of symptoms, risk factors, positive attitudes and overall knowledge also improved significantly [39].

The present study is therefore consistent with both facility-linked and home-based health education trials, but it differs in an important respect. The communication strategy was not simply home-based education. It incorporated local language, culturally familiar explanations, storytelling, repeated household interaction, community dialogue and peer communication. The qualitative evidence suggests that these features helped convert information from a technical message into something women could discuss, question and incorporate into their understanding of health. Thus, the improvement in knowledge may be attributable not simply to increased exposure, but to the quality, cultural relevance and repetition of the communication.

## 4.3. Influence of the Intervention on Cervical Cancer Screening Uptake

The quantitative findings provide the most direct evidence of a plausible intervention effect, though one that must be interpreted with appropriate caution given the trial's cluster design. Screening uptake was broadly similar at baseline in the two arms (19.5% intervention, 17.0% control) but increased to 45.9% in the intervention arm while remaining virtually unchanged at 18.0% in the control arm. Treating individuals as the unit of analysis, the endline difference was statistically significant ( $\chi^2 = 39.799$ ;  $p < 0.001$ ); however, because only six Community Health Units were randomized, cluster-adjusted analyses (Sections 2.7 and 3.4) — an exact cluster-level randomization test ( $p = 0.10$ ) and a multivariable GEE model (adjusted OR = 3.72; 95% CI 0.99-13.95;  $p = 0.051$ ) — indicate that this effect, while substantial in magnitude, does not reach conventional statistical significance once the cluster design is properly accounted for. Cervical cancer knowledge was independently and strongly associated with screening uptake in the

adjusted model, consistent with the pathway proposed in Section 4.2.

The magnitude and direction of this finding are consistent with the randomized controlled trial by Mohammed et al., which found substantially higher screening uptake following home-based health education [39]. They are also consistent with Abu et al., whose clustered randomized controlled trial demonstrated that health education could improve cervical cancer screening uptake [38]. The convergence across randomized studies is important because it suggests that the relationship between structured health communication and screening behaviour is not restricted to a single setting.

The qualitative findings provide an important explanation for why the intervention was able to influence behaviour. At baseline, women described screening as uncommon and reported seeking care mainly when symptomatic. Fear of pain, embarrassment, fear of receiving a cancer diagnosis and the perception that healthy women did not require screening were prominent barriers. One participant specifically described fear of the screening instrument, pain and the consequences of receiving a diagnosis. After the intervention, participants described a shift towards viewing screening as preventive care and reported examples of women obtaining screening during routine healthcare encounters.

This pattern closely corresponds with the qualitative findings of Nishimura et al. in Migori County, where women identified fear of pain and embarrassment as important barriers to screening [36, 41]. The agreement is strengthened by the fact that both studies were conducted in Kenya. However, the present study goes beyond identifying the barriers by showing how repeated communication may help address them. The intervention provided multiple opportunities for women to ask questions, hear explanations in familiar language, discuss fears and hear from other women. The qualitative evidence therefore suggests that the intervention may have reduced psychological barriers by increasing familiarity with screening and building trust in the communication process.

The findings are also supported by the 2026 systematic review by Lemoupa Makajio et al., which found that CHW-based interventions increased screening uptake in three of five controlled studies assessing uptake as a primary outcome [42]. However, the review concluded that the effectiveness of CHW interventions varies according to type and context. In this study, the CHPs were incorporated into a structured communication strategy characterized by repetition, cultural adaptation, dialogue and peer diffusion.

The qualitative findings also explain why the intervention did not result in universal screening. Women acknowledged continuing uncertainty about how frequently they should be screened, while long distances to facilities, competing household responsibilities and residual traditional beliefs remained barriers. This is an important finding for programme design. It demonstrates that improved communication can increase demand for screening but cannot independently eliminate ge-

ographical, logistical and health-system barriers. Consequently, communication interventions should be implemented alongside accessible screening services, clear referral pathways and consistent information about screening intervals.

#### 4.4. Women's Experiences and Perceptions of the Intervention

At baseline, women described cervical cancer communication as limited, irregular and largely ineffective. Although CHVs were conducting household visits for other health programmes, cervical cancer was rarely discussed. Previous health education was described as predominantly facility-based, brief and one-directional, with limited opportunity for women to ask questions or clarify information. Women also described unfamiliar terminology, fear, embarrassment and stigma surrounding discussion of cervical cancer.

At endline, however, participants described a substantially different communication experience. CHPs were perceived as trusted sources of information; women valued local-language explanations, simple terminology, culturally familiar examples, repeated household visits and opportunities for dialogue. Participants also described increased peer communication, with women sharing information with family members, neighbours and friends and encouraging one another to seek screening. These experiences provide an important explanation for the quantitative findings because the intervention appears to have changed not only the amount of information available but also the social environment in which cervical cancer information was discussed.

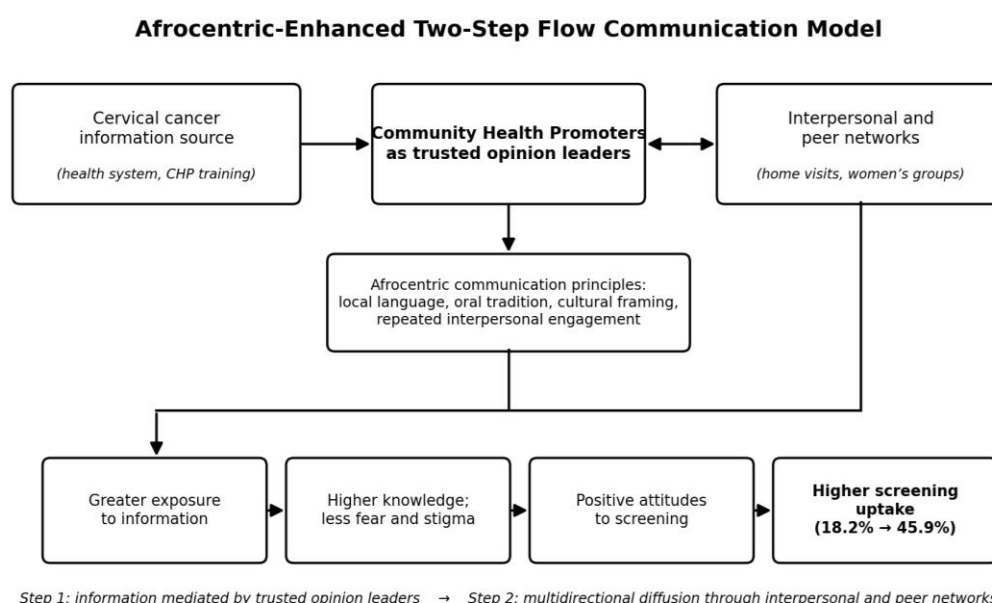
This finding is compatible with the work of Stocks et al., whose qualitative study in western Kenya emphasized the importance of appropriate communication support for CHVs involved in cervical cancer screening [37]. It is also consistent with the systematic review by Lemoupa Makajio et al., which identified education and counselling as common components of CHW interventions across sub-Saharan Africa [42]. However, the present study provides a distinctive contribution by demonstrating that women perceived cultural familiarity and repeated interpersonal contact as important characteristics of the intervention.

The Two-Step Flow interpretation is particularly relevant here. The qualitative evidence indicates that information was initially communicated by CHPs but subsequently circulated among women themselves. This means that the intervention potentially extended beyond the women directly reached by the health worker. Such peer diffusion may have increased the social acceptability of screening by making cervical cancer a topic that could be discussed within women's existing relationships rather than one confined to encounters with health professionals. The qualitative evidence therefore provides a plausible explanation for the quantitative increase in screening uptake, although it should be stated carefully that the study did not formally test peer diffusion as a statistical mediator.

The positive experiences reported at endline should nevertheless be interpreted alongside the remaining barriers. Women recommended more frequent household visits, expansion of the intervention to other communities, and involvement of spouses, community elders and religious leaders. These recommendations indicate that women regarded the intervention as acceptable but also recognized that cervical cancer prevention requires broader community support. The persistence of uncertainty about screening intervals and structural barriers further demonstrates that communication is necessary but not sufficient for achieving high screening coverage.

The integrated evidence supports a plausible pathway in

which structured exposure to culturally appropriate information increased understanding; improved understanding helped challenge misconceptions and fear; repeated interpersonal communication and trust facilitated positive perceptions of screening; and communication subsequently diffused through women's social networks, supporting screening behaviour. This interpretation is consistent with the finding from the meta-analysis by Yimer et al. that knowledge was strongly associated with screening uptake in sub-Saharan Africa [40]. It is also consistent with controlled intervention evidence showing that home-based and community-based education can increase screening uptake [38, 39, 42]. This pathway is summarised in Figure 5.



**Figure 5.** Conceptual framework of the Afrocentric-enhanced Two-Step Flow communication model. The endline screening-uptake figure shown in the pathway (45.9%) is the observed individual-level percentage; see Section 3.4 and Table 2 for the cluster-adjusted analysis and its interpretation.

The study contributes to the literature by showing that cervical cancer communication in a pastoralist setting can be strengthened by moving beyond one-directional health education towards a culturally grounded, repeated and community-mediated approach. The findings suggest that the effectiveness of the intervention was not attributable to information alone. Rather, the combination of trusted community health promoters, culturally familiar communication, repetition and interpersonal dialogue created an environment in which cervical cancer became more visible, understandable and discussable.

#### 4.5. Limitations

This study has several limitations that should inform interpretation of the findings. First, and most importantly, randomization was implemented at the level of only six Community

Health Units (three per arm). This is a very small number of clusters for a cluster randomized trial and fundamentally limits the precision and statistical power available for cluster-level inference: the intracluster correlation coefficient for screening uptake was high (0.18), yielding a design effect of 13.7, and the most rigorous test available for a six-cluster trial — an exact cluster-level randomization test — cannot achieve a p-value below 0.10 regardless of the true effect size [21]. Individual-level analyses that treat the 444 surveyed women as independent observations (Section 3.4) substantially overstate statistical precision. Some baseline socio-demographic characteristics (age, marital status, number of children, and health-insurance status) were not evenly distributed between arms (Table 1); although the multivariable model adjusted for these factors, residual confounding at the cluster level cannot be excluded given the small number of clusters. The baseline

and endline data were collected from independent cross-sectional samples within each Community Health Unit rather than from a linked cohort of the same individuals, so individual-level change over time could not be assessed directly. Fourth, screening uptake and cervical cancer knowledge were self-reported, which may be subject to recall and social-desirability bias, particularly in the intervention arm given the greater visibility of the communication activities. The age-eligibility criterion applied in the field (15–64 years) was broader than the 25–65-year band specified in the national screening guideline [3]; a sensitivity analysis restricted to women aged  $\geq 25$  years (Table 2) showed a similar overall pattern. Finally, findings are specific to pastoralist communities in Isiolo County and may not generalize to other settings without adaptation. Because of these limitations, the observed association between the Afrocentric-enhanced Two-Step Flow communication intervention and cervical cancer screening uptake should be regarded as a promising signal warranting confirmation in an adequately powered trial that randomizes a larger number of clusters, rather than as definitive proof of effect.

## 5. Conclusions

The study suggests that the Afrocentric-enhanced Two-Step Flow communication intervention was associated with improved cervical cancer awareness, knowledge and screening-related communication among women in the pastoralist communities of Isiolo County. The intervention was associated with a significant, individual-level increase in exposure to cervical cancer information and in women's awareness and knowledge (Sections 3.2–3.3), and with a substantial though not conclusively confirmed increase in screening uptake once clustering by Community Health Unit was accounted for (Section 3.4). The qualitative findings help explain these changes through repeated household communication, use of local language and culturally familiar approaches, trusted Community Health Promoters, community dialogue, and peer-to-peer sharing of information, and suggest that the intervention addressed both the information gap and important psychosocial barriers, including fear, misconceptions and embarrassment associated with screening.

Despite these gains, screening coverage remained below the desired level, with persistent gaps in knowledge of recommended screening intervals, geographical and household-level barriers, and residual traditional beliefs. Given the trial's small number of randomized clusters (Section 4.5), these findings should be regarded as a promising but not yet conclusive signal that community-based communication can act as a catalyst for cervical cancer screening; confirmation in an adequately powered cluster randomized trial is needed before the intervention is scaled up. In the meantime, the study supports piloting culturally responsive, community-mediated communication — sustained and linked to accessible, affordable and quality screening and treatment services — as a strategy for

cervical cancer prevention programmes targeting hard-to-reach and pastoralist populations.

## Abbreviations

|         |                                                            |
|---------|------------------------------------------------------------|
| AWACAN  | African Women Awareness of CANcer                          |
| CHA     | Community Health Assistant                                 |
| CHP     | Community Health Promoter                                  |
| CHU     | Community Health Unit                                      |
| CI      | Confidence Interval                                        |
| cRCT    | Cluster Randomized Controlled Trial                        |
| FGD     | Focus Group Discussion                                     |
| HPV     | Human Papillomavirus                                       |
| KII     | Key Informant Interview                                    |
| KNBS    | Kenya National Bureau of Statistics                        |
| LMICs   | Low- and Middle-Income Countries                           |
| MOH     | Ministry of Health                                         |
| NACOSTI | National Commission for Science, Technology and Innovation |
| OR      | Odds Ratio                                                 |
| SPSS    | Statistical Package for the Social Sciences                |
| VIA     | Visual Inspection with Acetic Acid                         |
| VILI    | Visual Inspection with Lugol's Iodine                      |
| WHO     | World Health Organization                                  |

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## Author Contributions

**Marcellah Eucabeth Onsomu:** Conceptualization, Supervision, Writing – review & editing

**Kenneth Goga Riany:** Formal Analysis, Methodology, Writing – review & editing

**Agnes Muthoni Linus:** Conceptualization, Formal Analysis, Investigation, Methodology, Writing – original draft

## Data Availability Statement

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request. Qualitative transcripts have been anonymized to protect participant confidentiality.

## Conflicts of Interest

The authors declare no conflicts of interest.

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