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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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ABSTRACT

Objectives: The Smart-LyncAges project was piloted in Bulawayo city and Mt Darwin district of Zimbabwe, to increase utilization of Adolescent Sexual Reproductive Health (ASRH) services through referral of Voluntary Medical Male Circumcision (VMMC) clients to youth centres. Since its inception in 2016, there has been no assessment of performance of the referral system. Thus, this study aimed to assess the proportion of VMMC clients getting 'successfully linked' to ASRH services and factors associated with not being linked.

Design: This was a cohort study using routinely collected secondary data.

Setting: All three VMMC clinics of Mt Darwin district and Bulawayo metropolitan city.

Primary outcome measures: The proportion of 'successfully linked' was summarized as percentage with 95% confidence interval (CI). Adjusted relative risks (aRR) using generalized linear model was calculated as a measure of association between client characteristics and not being linked.

Results: Of the 1478 VMMC clients referred, 463 (31.3%, 95% CI- 30.0-33.8) were 'successfully linked' to ASRH services and the median (IQR) duration for linkage was 6 (0-56) days. Receiving referral from Bulawayo circumcision clinic (RR-1.4 (95% CI-1.2-1.7)) and undergoing circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently associated with not registering for ASRH services.

Conclusion: Linkage to ASRH services from VMMC is feasible as one-third referred of VMMC clients were successfully linked. However, there is need to explore reasons for not accessing ASRH services and take corrective actions to improve the linkages.

Keywords: HIV prevention; Adolescent Health; Sexual and Reproductive Health; Youth centres; SORT IT; Operational Research

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Article Summary:

Strengths and Limitations:

- First study to have assessed the extent of linkages with Smart-LyncAges project
- No selection bias as we included all the young people (10-24 years) who registered for circumcision services in the VMMC clinics of two project districts
- Routine programmatic data of large cohort was used and thus reflected the field realities in project implementation
- There might have been an underestimation in proportion of young people ‘successfully linked’ to ASRH services as only those who produced referral slip from VMMC clinic were considered as ‘successfully linked’
- Study was conducted only during two months of the year and thus might have failed to account for seasonal variations in seeking ASRH services

84 INTRODUCTION

85 Young people (aged 10-24 years) are disproportionately affected by Human
86 Immunodeficiency Virus (HIV) infection with an estimated 3.9 million living with HIV
87 worldwide in 2017.(1,2) Globally, approximately 1600 youths acquire HIV every day and a
88 youth dies every 10 minutes because of AIDS related illness.(1) In contrast to decline in HIV
89 related death rates in other age groups during 2000 to 2015, there has been a rise among
90 young people.(3) In young people, HIV is the second leading cause of death globally and is
91 the leading cause of death in Africa.(4) In 2017, of all the new adult HIV infections globally,
92 about 16% were among adolescents (15-19 years).(5) About 84% of young people living
93 with HIV are in Sub-Saharan Africa and it is estimated that an additional 7.4 million young
94 people might become infected with HIV in Sub-Saharan Africa region alone by 2030.(6)

95 Unprotected sex is the most common route of HIV infection among young people
96 and is largely due to low knowledge on HIV and how it can be prevented, early sexual debut,
97 multiple sexual partners, and low condom use.(7) This highlights the need for
98 comprehensive sexuality education (CSE) for adolescents before they become sexually
99 active.[8] In 2001, the United Nations General Assembly Special Session (UNGASS) on HIV
100 set a goal of providing 95% of young people access to information, youth-specific HIV
101 education and life skills development to reduce their vulnerability to HIV infection.(8)
102 Following this, most Sub-Saharan African countries implemented Adolescent Sexual and
103 Reproductive Health (ASRH) services. However, recent studies from various countries in the
104 region have reported poor utilization of ASRH services with only about 21%-51% of
105 adolescents accessing it.[9,10] Acknowledging the importance and poor utilisation of ASRH
106 services, the World Health Organization (WHO) recommends the strengthening of the

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linkages between various HIV prevention and ASRH programmes and services and also to integrate the ASRH services with general health services.(11)

Zimbabwe, a landlocked Sub-Saharan country has a high burden of HIV with an estimated prevalence of 14% among people aged 15 to 49 years.(12) The country has ASRH indicators showing risky behaviours with about 40% girls and 30% boys having sex before age eighteen and 62% of males aged 15-24 not using a condom in their last sexual encounter.(13) HIV prevalence in individuals aged 15–19 years was 3.7% and 4.6% for boys and girls respectively. Among those 20-24 years the HIV prevalence was 8% and 10.8% for boys and girls respectively.(13,14) The age-disparity in HIV prevalence among young people, high rate of early sexual debut and low condom use indicates gaps in HIV prevention among adolescents. Nevertheless, since 2009, Zimbabwe has implemented several programmes to limit HIV infection among young people with the two core strategies of Voluntary Medical Male Circumcision (VMMC) and ASRH services.

The ASRH programme implemented in 2010, involves the provision of CSE, life skills training, diagnosis and treatment of Sexually Transmitted Infections (STIs) including HIV, family planning counselling, positive masculinity education, vocational training, library services, recreational games and empowerment on rights and responsibility.(15) The ASRH services are delivered at youth friendly clinics or youth centres. There is anecdotal evidence that the majority of young people do not access ASRH services. Whereas, the VMMC programme, implemented as part of combination HIV prevention strategy as per World Health Organisation (WHO) and the United Nations Joint Programme on HIV/AIDS (UNAIDS) recommendation has a high utilization rate.(16) By 2017, about 80% young boys were covered under VMMC and have had unprecedented contact with the health system.

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3 130 However, the potential of VMMC services as a gateway to additional relevant ASRH services
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6 131 for young people has not been maximized.
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8 132 The ASRH and VMMC programs have been implemented as two different vertical
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10 133 national health programs, not complementing each other in improving the service
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13 134 utilization. In 2016, the WHO supported the Ministry of Health and Child Care to pilot
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15 135 Smart-LyncAges project to identify approaches to sustain VMMC and improve the
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17 136 complementarity of both services. Through the project, cross-referral mechanisms were
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19 137 established wherein adolescent boys from VMMC are linked to ASRH programmes and vice
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21 138 versa. Though the Smart-LyncAges project has been piloted as a participatory learning
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23 139 approach since 2016, there was limited quantitative information on the extent of successful
24
25 140 linkage of clients between VMMC clinics and ASRH services. This information on extent of
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27 141 successful referral and associated factors was necessary to address any deficiencies in the
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29 142 referral system prior to scale up of the project countrywide. In this regard, the study aimed
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31 143 to assess the proportion of young people (10-24 years) referred from VMMC clinics
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33 144 successfully linked for ASRH services and factors associated with 'not getting registered' in
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35 145 the Smart-LyncAges pilot project sites in Zimbabwe.
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METHODOLOGY

Study Design:

This was a cohort study using routinely collected secondary data by the VMMC and ASRH programmes.

Study Setting:

General Setting:

Zimbabwe is a land locked country in Sub Saharan Africa. The country is divided into 10 administrative provinces and has a total of 62 districts. According to the Zimbabwe National Statistics Agency, the country had a projected population of 16,4 million in 2018 and 26% of the total population is adolescents and young adults.(17)

Specific Setting:

The study was conducted in the Bulawayo metropolitan province and Mt Darwin district of Mashonaland Central province, where the VMMC-ASRH linkages project was piloted. Bulawayo is Zimbabwe’s second largest city and has a population of approximately 653,000.(17) Mt Darwin is one of seven districts in the Mashonaland Central province with the population of about 213,000. In the district, majority of the population reside in the rural areas.

VMMC services and referral to ASRH

The VMMC programme functions under the National AIDS and TB unit with funding support from external sources mainly The U.S. Presidents Emergency Plan for AIDS Relief (PEPFAR) and Bill and Melinda Gates Foundation (BMGF). The VMMC sites were supported by various non-governmental organizations (NGOs) as implementing partners facilitating

1
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3 171 service delivery and community mobilization. The Bulawayo Metropolitan province has two
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5 172 VMMC clinics and the Mount Darwin district has one clinic. The circumcision services were
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8 173 provided at static VMMC clinics and also through outreach clinics in the public health
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10 174 facilities.

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13 175 Demand generation for VMMC services was created through print and mass media
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15 176 advertisements, school health programmes, road shows and music galas. At community
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17 177 level, the adolescents and young adults were counselled and referred to VMMC clinics by
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19 178 incentivized community mobilizers, peer educators or health workers. The adolescents and
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21 179 young adults registered for ASRH services at youth centres were also referred for VMMC.
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23 180 The adolescents were referred to either static VMMC clinics or outreach clinics based on
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25 181 their convenience.

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28 182 Upon presentation at a VMMC clinic, the clients were registered with unique VMMC
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30 183 ID number. The clerk documented details of clients in the 'client intake form'. During
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32 184 registration, the clerk issued the referral slip to all the clients who were not already
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34 185 registered for ASRH services. The clients were advised to register themselves for ASRH
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36 186 services in their preferred youth centre. The referral slip was created in triplicate; one slip
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38 187 given to the adolescent, one maintained in the referral file at the VMMC clinic and the other
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40 188 slip sent to peer-educator of the service area from where the adolescent has come.

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43 189 The adolescents registered in the VMMC were offered group education and
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45 190 individual counselling by nurse counsellor. During counselling, importance of registering for
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47 191 ASRH services was emphasized. The nurse counsellors provided HIV testing and pre-
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49 192 operation examination to assess the eligibility for circumcision surgery. Those adolescents
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51 193 with diabetes, keloids and haemophilia were considered as not eligible for surgery. Among
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53 194 those eligible for surgery, either dorsal slit or forceps guided procedure was performed by
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195 either a trained and qualified nurse circumciser or doctor surgeon. Adolescents were
196 advised to make follow-up visits on day-2 and day-7 after the procedure. The adolescents
197 were also advised to visit the clinic in case of any complications. All the details on surgery,
198 follow-up and adverse events were recorded in the ‘client intake form’.

199 *ASRH services and registration*

200 The ASRH services were provided at the youth centres. The Bulawayo metropolitan
201 province has seventeen youth centres and the Mount Darwin district has two youth centres.
202 Each youth centre was supposed to be staffed with a youth health advisor (a registered
203 general nurse), youth facilitator/recreational officer (a social worker) and five peer
204 educators.

205 Upon arrival at the youth centres, adolescents referred from VMMC submit their
206 VMMC-ASRH referral slips. The youth facilitator/recreational officer registers the
207 adolescents for ASRH services and documents the VMMC ID number in VMMC-ASRH
208 linkages register. The services received by the adolescent during their initial visit were also
209 documented in the VMMC-ASRH linkage register. The referral slip received from the
210 adolescent are stored in the referral box maintained at the youth centre.

211
212 **Study Population:**

213 All adolescents and young adults (10-24 years) registered in VMMC clinics of Mt
214 Darwin district and Bulawayo city during October and November, 2018 were included in the
215 study. Those who were already registered for ASRH services prior to accessing VMMC
216 services were excluded.

Data Variables, sources of data and data collection:

We extracted details including VMMC identification number, age, education status, mode of referral to VMMC clinic, type of VMMC clinic, HIV status, date of referral to ASRH services, date of registration at VMMC, reason for circumcision, eligibility for circumcision, circumcision status, method of circumcision, status of day-2 post op visit, status of day-7 post op visit and adverse events following circumcision within 42 day from the VMMC 'client intake form' maintained at VMMC clinic. The details on registration and date of registration for ASRH services were extracted from VMMC-ARSH linkage register maintained at youth centres. The information on registration for ASRH services extracted from VMMC-ARSH register was validated using the referral slips maintained in the referral box of youth centres. Those individuals registered for ASRH services within three months of receiving referral slip were considered as 'successfully linked' to ASRH services.

The data was extracted in March, 2019 using two separate structured data extraction proformas designed to extract data from VMMC 'client intake form' and VMMC-ARSH linkage register. Data extraction proformas were field tested by the principal investigator and modified before data extraction.

Data entry and analysis:

Data was double entered and validated using EpiData entry software (EpiData Association, Odense, Denmark). Two separate data entry structures were used to enter data from two proformas. The two data structures were then merged using unique 'VMMC ID number'. The final merged data file was used for analysis.

Data was analyzed using Stata version 12.0 (STATA Corp., College, TX, USA). Socio-demographic, HIV status and clinical characteristics was summarized using percentages.

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243 The proportion of participants ‘successfully linked’ to ASRH was summarized as percentages
244 with 95% confidence interval.

245 The association between socio-demographic and baseline clinical characteristics with
246 ‘not linked for ASRH service’ was assessed using bivariate log binomial regression. To assess
247 the independent association, a generalized linear model (Poisson regression) with variables
248 having p value <0.25 in the bivariate log binomial regression was developed. Adjusted
249 relative risks with 95% CI were calculated as measure of association.

250
251 **Ethics Approval:**

252 The ethics approval was obtained from the Medical Research Council of Zimbabwe
253 (MRCZ/E229) and Ethics Advisory Group of the International Union Against Tuberculosis and
254 Lung Disease, Paris, France (58/18). Permission was sought from the Ministry of Health and
255 Child Care program officials for extracting the routine data collected at VMMC and ASRH
256 centres.

257
258 **A data sharing statement:**

259 Technical appendix, statistical code, and dataset available from the
260 <https://www.dropbox.com/sh/cm03olkw3qj8j4x/AAArNAzjweJ1iw0UHq86JIFwa?dl=0>

261
262 **Patient and Public Involvement:**

263 Principal Investigator and the data collectors did not interact directly with the young
264 people availing services from VMMC clinics during this retrospective record review. The PI
265 worked with the healthcare staff and peer educators of both the VMMC and ASRH clinics
266 included in the study. Findings from this study will help the Smart-LyncAges project to

267 assess the performance in linkages and also gives insight on deficiencies to be fixed prior to
268 country wide scale-up.

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RESULTS

In total 1773 young people (10-24 years) were registered for VMMC services during the study reference period. Of the total, 1478 (83%) had not been previously registered in ASRH clinic and were included in the study. The mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were out of school. Of the 1478 study participants, 1032 (69.8%) were referred for VMMC by community mobilizer and 1230 (83.2%) reported HIV prevention as the reason for seeking circumcision service. Of the total, 6 (0.3%) had HIV infection. The characteristics of study participants are depicted in **Table-1**.

Of the 1478 study participants, 1461 (99%) were eligible for circumcision surgery and among of those eligible, 1443 (99%) underwent circumcision (**Figure-1**). Of those who underwent circumcision, 477 (33.1%) had the surgery performed at an outreach site. Of the 1443 participants, 1379 (95.6%) and 1025 (71%) attended day 2 and day 7 review visits respectively. In total, 20 (1.4%) developed mild adverse event following circumcision and 3 (0.2%) each developed moderate and severe adverse events (**Table-2**).

Of the 1478 study participants referred for ASRH services, 463 (31.3%, 95% CI-30.0%-33.8%) successfully linked for ASRH services at ‘youth centre’ within 3 months of referral (**Figure-1**). Among those who were successfully linked, the median (IQR) duration from referral to getting registered at ‘youth centre’ was 6 (0-56) days. Referral from Bulawayo circumcision clinic (RR-1.4 (95% CI-1.2-1.7)) and undergoing circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently associated with not linked for ASRH services after referral from circumcision clinic. The association between participant’s characteristics and failure of referral is shown in **Table-3**.

DISCUSSION

This is the first study assessing the extent of successful referral among adolescents and young men between VMMC clinics and ASRH services under Smart-LyncAges project implemented in Zimbabwe. About 31% of young males (10-24 years) referred from VMMC clinics successfully linked to ASRH services at youth centres within three months of referral. Young people referred from the outreach sites and Bulawayo male circumcision clinic had significantly higher rates of not being registered for ASRH services.

Globally, there were limited studies assessing the linkages between various HIV preventive strategies like VMMC services and ASRH services. A study from Zambia reported that, with enhanced counselling and referral from community, uptake of ASRH services like HIV testing and counselling, family planning counselling and VMMC services was less than 20% within six months.⁽¹⁸⁾ Also, previous reviews have reported that demand generation activities in the community, improving accessibility and quality of ASRH services improve ASRH related knowledge but may not increase the utilization of specific ASRH services.^(19–21) The potential reason for underutilization of ASRH services may be that, a preventive strategy may not be considered as an immediate need by young people.^(21–23) Considering this, the successful linkage (uptake) of about one in three of the VMMC clients to ASRH services through Smart-LyncAges project is promising. It would be important to better understand the real and perceived ASRH needs and the relevance of referrals.

The clients referred from Bulawayo MC clinic had slightly higher risk of not being linked to ASRH services. A potential reason for this finding is that, the MC clinic is situated in the eastern suburbs of the city where people of high socio-economic status reside. All the fifteen youth centres are however were located in western suburbs which are predominantly of low socio economic status. It is possible that, the recreational activities

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3 317 available under ASRH services do not appeal to the technologically savvy urban youths from
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6 318 the elite suburbs. Furthermore, distance to youth centres might have limited the clients
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8 319 from the eastern suburbs to register for ASRH services. Similarly, clients accessing VMMC
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10 320 services at outreach clinics were not being linked to ASRH services. The focus of outreach
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12 321 clinics is to conduct surgery in hard to reach areas. Though the referral slips were issued,
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15 322 there would not be space and time to counsel on ASRH services comprehensively. Also, the
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17 323 youth centres in Mt Darwin were mainly located in district centres and might not be
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19 324 accessible to clients of outreach clinics. Although the actual numbers were small, a high
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21 325 proportion of clients ineligible for circumcision or experiencing an adverse event were
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23 326 referred and successfully linked suggesting they have additional service needs.

27 327 The study had several strengths. First, the study was conducted within the routine
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29 328 programmatic setting, reflecting the field realities and using routine data. Second, all the
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31 329 young males attending the VMMC clinics during the study reference period were included
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33 330 and thus, there was no sampling bias. Third, the study had large sample size and thus, the
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35 331 estimate of ‘successfully linked’ was precise. Fourth, the continuous supportive supervision
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37 332 was rendered during the study period to ensure completeness in recording under project
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39 333 setting and thus, the ‘missing data’ was limited. Fifth, the registration for ASRH services was
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41 334 validated by cross-checking the stored referral slips along with information extracted from
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43 335 VMMC-ASRH linkage register and thus, it enhanced the validity of the outcome
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45 336 ascertainment. Sixth, the STrengthening the Reporting of OBservational Studies in
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47 337 Epidemiology (STROBE) guidelines was used to report the study findings.(24)

54 338 The study had a few limitations. First, the registration for ASRH services was
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56 339 ascertained based on the VMMC-ASRH linkage register. Only, those who produced VMMC
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58 340 referral slips during registration were listed in VMMC-ASRH register. Thus, those

participants who might have missed their referral slips before registration for ASRH services could have been misclassified as 'not linked'. This could have led to underestimation of percentage of 'successfully' linked. Second, the study was conducted only during two months of the year and thus failed to account for seasonal variations in seeking services. During the festive month of December, the youth centres were closed due to holidays. Also, during December, the youth centres in the Mt Darwin region were closed for two weeks due to cholera outbreak in the region. There might have been an underestimation of 'successfully' linked due to non-functioning of youth centres during study follow-up period. Third, the pathways for seeking ASRH services and contribution of peer-educators in reaching the ASRH services were not assessed. Thus, the study failed to document the pathways with highest successful linkage rate, which could have helped in replicating the model elsewhere. Fourth, the potential confounders like distance from youth centres, socio-economic status, parents' willingness and adolescents' willingness were not captured and included in the adjusted analysis. Inclusion of these variables could have improved the validity of the model. Fifth, because the study represents select group of young people who came for VMMC clinics in the project pilot districts, thus the generalizability of the study results is limited. Lastly, study did not explore the reasons for not registering for ASRH services among those referred.

The study has a few programmatic implications and recommendations. First, the percentage of 'successfully linked' between VMMC clinics and ASRH services was promising. The Smart-LyncAges project can be scaled up to improve the utilization of ASRH services. However, there is need for qualitative research to explore the reasons for not accessing the ASRH services among those who did not register. This information can help to improve

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3 364 linkages and effectiveness by understanding relevance of linkages to young people`s health
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6 365 needs.

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8 366 Second, with the existing records maintained under the project, cohort monitoring
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10 367 of the performance of referral system was feasible. The ‘proportion of those referred from
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13 368 the facility successfully registered for ASRH services’ can be introduced as an indicator in the
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15 369 monthly report of each VMMC clinic. This would enable the programme managers to
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17 370 monitor the performance of referral system better than the absolute number of referred
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20 371 which is being reported now.

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23 372 Third, the young adolescents seeking VMMC services from outreach clinics at
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25 373 peripheral public health facilities were not registering for ASRH services, implying the
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27 374 distance to youth centres was a potential barrier. Solutions should be person centred, such
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30 375 as co-location of ASRH and VMMC services, improved accessibility with services
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32 376 decentralized to peripheral public health facilities and enhanced training of existing general
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35 377 health staff to deliver youth friendly services.

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37 378 Fourth, about 70% of clients came back to avail follow-up services on day-7 post
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39 379 circumcision. This opportunity can be used to further educate and to reinforce to young
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42 380 people on services available to them as they will be more able to absorb information since
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45 381 the MC procedure has been completed.

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49 383 **CONCLUSION**

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52 384 The rate of young males referred from VMMC clinics and successfully linked for
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54 385 ASRH services was promising. However, there is need to explore the reasons for clients not
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57 386 accessing the ASRH services, the type of services sought and take corrective actions to
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59 387 improve the same.
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AUTHOR CONTRIBUTION

TM was the principal investigator; PT and KT were the SORT IT course mentors; OM, WA, JS, SX and GN were the senior authors. TM, NZ, AM, SM, TT, and RM were involved in data collection; TM, PT and KT analyzed the data and prepared the first draft of the paper. All authors were involved in conception, design, inference of results, providing critical review and approval of the final manuscript.

DISCLOSURE STATEMENT

None of the authors have any competing interests.

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Table 1: The demographic characteristics, reason for circumcision and HIV status of adolescents and young adults registered for VMMC services during October and November, 2018 in selected health facilities of Zimbabwe, N=1478

Characteristics	Categories	Frequency	(%)
Total		1478	(100)
Age (in years)	10-14	980	(66.3)
	15-19	314	(21.2)
	20-24	184	(12.3)
Education status	Out of school	427	(28.9)
	Primary education	899	(60.8)
	Secondary education	152	(10.3)
Health facility	Mt Darwin	542	(36.7)
	Lobengula MC clinic	587	(39.7)
	Bulawayo MC clinic	349	(23.6)
Referred by	Friend or partner	37	(2.5)
	Health worker	216	(14.6)
	Community mobilizer	1032	(69.8)
	Others	139	(9.4)
	Missing	54	(3.7)
Reasons for circumcision*	HIV prevention	1230	(83.2)
	Sexual pleasure	248	(16.8)
	STI Prevention	736	(49.8)
	Hygiene	1196	(80.9)
	Socio-cultural reasons	51	(3.5)
HIV status	Positive	6	(0.3)
	Negative	1472	(99.7)

Abbreviation: HIV- Human Immunodeficiency virus; VMMC- Voluntary Medical Male Circumcision; MC- Male Circumcision; STI- Sexually Transmitted Infection

* Multiple responses are possible

Table 2: The surgical and follow-up details of adolescents and young adults who underwent circumcision during October and November, 2018 in selected male circumcision clinics of Zimbabwe, N=1443

Characteristics	Categories	Frequency	(%)
Total		1443	(100.0)
Method of circumcision	Dorsal slit	1439	(99.7)
	Forceps Guided	4	(0.3)
Service delivery point	Static site	966	(66.9)
	Outreach site	477	(33.1)
Circumciser	Nurse practitioner	1418	(98.3)
	Doctor	25	(1.7)
Attended post-op day-2	Yes	1379	(95.6)
	No	64	(4.4)
Attended post-op day-7	Yes	1025	(71.0)
	No	418	(29.0)
Adverse event	None	1417	(98.2)
	Mild	20	(1.4)
	Moderate	3	(0.2)
	Severe	3	(0.2)

Table 3: Demographic, HIV status and surgical characteristics associated with not getting registered for ASRH services within 3 months of referral from the selected VMMC health facilities in Zimbabwe, October and November 2018.

Characteristic	Category	Total	Not linked to ASRH, n (%) [*]	Unadjusted RR (95% CI)	Adjusted RR (95 % CI) [#]	p value
Total		1478	1015 (68.7)			
Age (in years)	10 - 14	980	671 (68.5)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.887
	15 - 19	314	200 (63.7)	1	1	
	20 - 24	184	144 (78.3)	1.2 (1.1-1.4)	1.1 (1.0-1.3)	0.149
Education	Out of school	427	297 (69.6)	1.1 (1.0-1.3)	1.0 (0.9-1.2)	0.710
	Primary	899	622 (69.2)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.713
	Secondary	152	96 (63.2)	1	1	
Referred By	Friend/Partner	37	22 (59.5)	1	1	
	Health Worker	216	164 (75.9)	1.3 (1.0-1.7)	1.2 (0.9-1.5)	0.281
	Community mobiliser	1032	694 (67.3)	1.1 (0.9-1.5)	1.1 (0.8-1.4)	0.569
Health Facility	Others	139	106 (76.3)	1.3 (1.0-1.7)	1.0 (0.8-1.3)	0.973
	Missing	54	29 (53.7)	0.9 (0.6-1.3)	1.1 (0.8-1.6)	0.446
	Mt Darwin	542	330 (60.9)	1	1	
HIV Status	Lobengula MC	587	386 (65.8)	1.1 (1.0-1.2)	1.1 (1.0-1.3)	0.118
	Bulawayo MC	349	299 (85.7)	1.4 (1.3-1.5)	1.4 (1.2-1.7)	<0.001
	Positive	6	5 (83.3)	1.2 (0.8-1.7)	1.3 (0.9-1.9)	0.118
	Negative	1472	1010 (68.6)	1	1	
Reasons for MC						
<i>HIV Prevention</i>	Yes	1230	865 (85.2)	1.2 (1.0-1.3)	1.0 (0.9-1.1)	0.815
	No	248	150 (60.5)	1	1	
<i>Sexual Pleasure</i>	Yes	248	158 (63.7)	0.9 (0.8-1.0)	0.9 (0.8-1.1)	0.550
	No	1230	857 (69.7)	1	1	
<i>STI Prevention</i>	Yes	736	523 (71.1)	1.1 (1.0-1.1)	1.0 (0.9-1.1)	0.990
	No	742	492 (66.3)	1	1	
<i>Hygiene</i>	Yes	1196	847 (70.8)	1.2 (1.1-1.3)	1.1 (1.0-1.2)	0.192
	No	282	168 (59.6)	1	1	
<i>Socio-cultural</i>	Yes	51	32 (62.8)	0.1 (0.7-1.1)	0.9 (0.7-1.1)	0.432
	No	1427	983 (68.9)	1	1	
Circumcision[¥]	Not Eligible	17	3 (17.7)	1	1	
	Circumcised	1443	1003 (69.5)	3.9 (1.4-11)	1.9 (0.6-6.3)	0.313
	Not circumcised	18	9 (50.0)	2.8 (0.9-8.7)	2.3 (0.8-7.2)	0.139
Circumciser[¥]	Nurse	1418	989 (69.8)	1.2 (0.9-1.8)	1.2 (0.8-1.7)	0.312
	Doctors	25	14 (56.0)	1	1	
Service delivery point[¥]	Static	966	66 (65.8)	1	1	
	Outreach	477	367 (76.9)	1.2 (1.1-1.2)	1.2 (1.1-1.3)	<0.001
Day-2 follow-up[¥]	Yes	1379	965 (70.0)	1.2 (1.0-1.4)	1.1 (0.9-1.4)	0.376
	No	64	38 (59.4)	1	1	
Day-7 follow-up[¥]	Yes	1025	732 (71.4)	1.1 (1.0-1.2)	0.9 (0.7-1.0)	0.042
	No	418	271 (64.8)	1	1	
Adverse event^{§¥}	Yes	26	11 (42.3)	1	1	
	No	1417	992 (70.0)	1.7 (1.1-2.6)	1.5 (0.9-2.3)	0.101

Abbreviations: ASRH-Adolescent Sexual Reproductive Health; STI-Sexually Transmitted Infection; HIV-Human Immunodeficiency Virus; RR-Relative Risk, CI-Confidence Interval
* Row percentage; # Using generalized linear model (Poisson regression); \$ Mild, Moderate and Severe were clubbed as 'Yes'; *Applicable only for those who underwent circumcision

Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

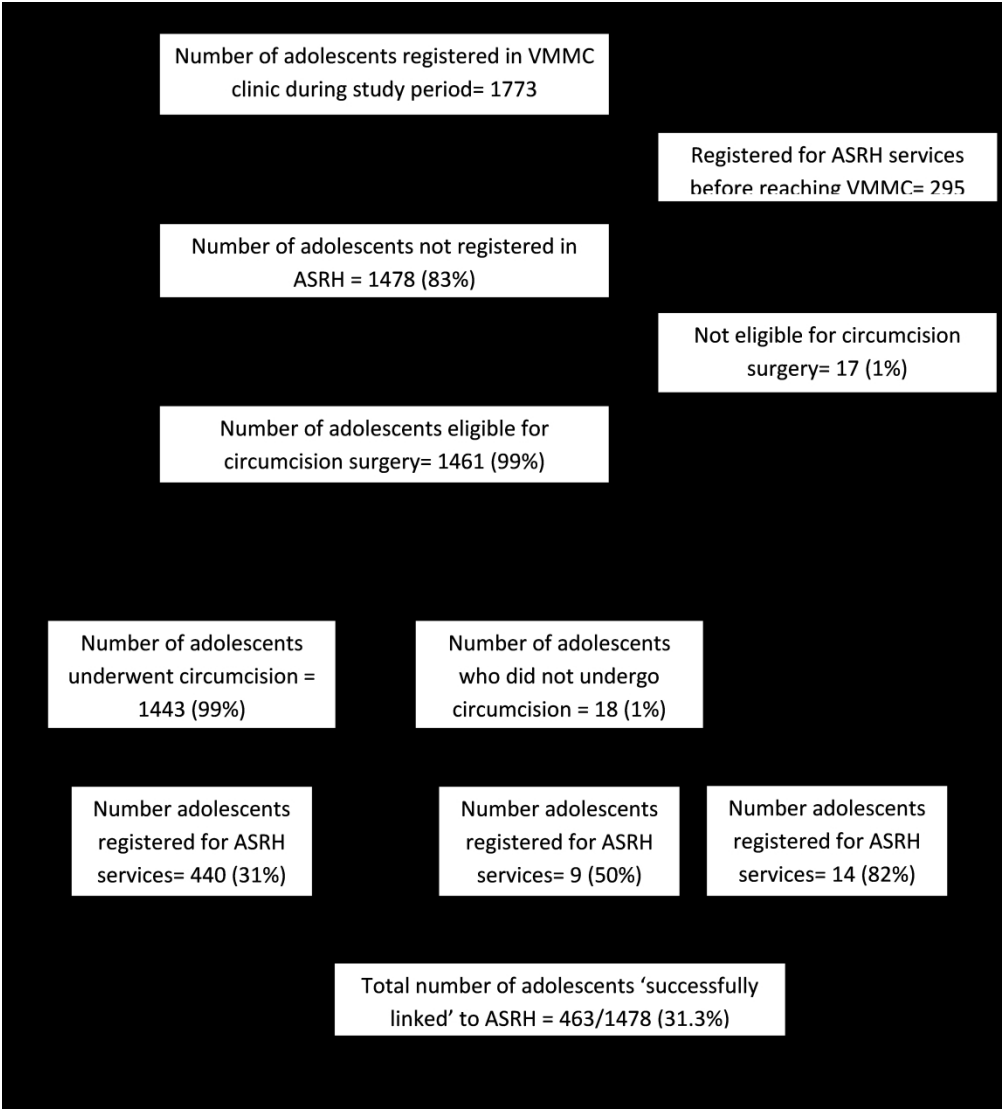


Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

359x398mm (300 x 300 DPI)

STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No (Line No)
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1(2-3)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3(38-67)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-7(85-145)
Objectives	3	State specific objectives, including any prespecified hypotheses	7(142-145)
Methods			
Study design	4	Present key elements of study design early in the paper	8(149-150)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	8-10(153-210)
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	10(213-216)
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Case-control study—For matched studies, give matching criteria and the number of controls per case	11(220-230)
		Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	11(231-234)
Bias	9	Describe any efforts to address potential sources of bias	11(237-240, 245-249)
Study size	10	Explain how the study size was arrived at	10(213-216)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11,12(241-244)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	11,12(241-249)
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	11(229-230)

		(d) Cohort study—If applicable, explain how loss to follow-up was addressed	
		Case-control study—If applicable, explain how matching of cases and controls was addressed	NA
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	

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1	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the	19 (407-
2			present article is based	411)
3	<i>*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.</i>			
4	Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is			
5	best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/ , Annals of Internal Medicine at http://www.annals.org/ , and			
6	Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org .			
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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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Secondary Subject Heading:	Global health, HIV/AIDS, Sexual health, Reproductive medicine, Epidemiology
Keywords:	HIV & AIDS < INFECTIOUS DISEASES, Adolescent Health, SORT IT, Operational Research, Sexual and Reproductive Health, Youth centres

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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

Manuscript Type: Research Article

Short Running Title: Linkage of VMMC clients to ASRH services in Zimbabwe

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47 ABSTRACT

48 **Objectives:** World Health Organization recommended strengthening the linkages between
49 various HIV prevention programmes and Adolescent Sexual Reproductive Health (ASRH)
50 services. The Smart-LyncAges project piloted in Bulawayo city and Mt Darwin district of
51 Zimbabwe, established referral system to link the Voluntary Medical Male Circumcision
52 (VMMC) clients to ASRH services provided at youth centres. Since its inception in 2016,
53 there has been no assessment of the performance of referral system. Thus, we aimed to
54 assess the proportion of young (10-24 years) VMMC clients getting 'successfully linked' to
55 ASRH services and factors associated with not being linked.

56 **Design:** This was a cohort study using routinely collected secondary data.

57 **Setting:** All three VMMC clinics of Mt Darwin district and Bulawayo metropolitan city.

58 **Primary outcome measures:** The proportion of 'successfully linked' was summarized as
59 percentage with 95% confidence interval (CI). Adjusted relative risks (aRR) using generalized
60 linear model was calculated as a measure of association between client characteristics and
61 not being linked.

62 **Results:** Of 1773 young people registered for VMMC services during the study reference
63 period, 1478 (83%) who had not previously registered for ASRH services included in the
64 study. The mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were
65 out of school. Of the 1478 VMMC clients referred, 463 (31.3%, 95% CI- 30.0-33.8) were
66 'successfully linked' to ASRH services and the median (IQR) duration for linkage was 6 (0-56)
67 days. Receiving referral from Bulawayo circumcision clinic (RR-1.5 (95% CI-1.3-1.7)) and
68 undergoing circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently
69 associated with not being linked for ASRH services.

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Conclusion: Linkage to ASRH services from VMMC is feasible as one-third referred of VMMC clients were successfully linked. However, there is need to explore reasons for not accessing ASRH services and take corrective actions to improve the linkages.

Keywords: HIV prevention; Adolescent Health; Sexual and Reproductive Health; Youth centres; SORT IT; Operational Research

Article Summary:

Strengths and Limitations:

- First study to have assessed the extent of linkages with Smart-LyncAges project
- No selection bias as we included all the young people (10-24 years) who registered for circumcision services in the VMMC clinics of two project districts
- Routine programmatic data of large cohort was used and thus reflected the field realities in project implementation
- There might have been an underestimation in proportion of young people ‘successfully linked’ to ASRH services as only those who produced referral slip from VMMC clinic were considered as ‘successfully linked’
- Study was conducted only during two months of the year and thus might have failed to account for seasonal variations in seeking ASRH services

89 INTRODUCTION

90 Young people (aged 10-24 years) are disproportionately affected by Human
91 Immunodeficiency Virus (HIV) infection with an estimated 3.9 million living with HIV
92 worldwide in 2017.[1,2] Globally, approximately 1600 youths acquire HIV every day and a
93 youth dies every 10 minutes because of AIDS related illness.[1] In contrast to decline in HIV
94 related death rates over years in other age groups, there has been a rise among young
95 people and HIV stands second leading cause of death globally.[3,4] About 84% of young
96 people living with HIV are in Sub-Saharan Africa and it is estimated that an additional 7.4
97 million young people might become infected with HIV in Sub-Saharan Africa region alone by
98 2030.[5]

99 Unprotected sex is the most common route of HIV infection among young people
100 and is largely due to low knowledge on HIV, early sexual debut, multiple sexual partners,
101 and low condom use.[6] This highlights the need for comprehensive sexuality education
102 (CSE) for adolescents before they become sexually active. Realizing this, the United Nations
103 General Assembly Special Session (UNGASS) on HIV in 2001 recommended access to
104 information, youth-specific HIV education and life skills development to at least 95% of
105 young people.[7] Following this, most Sub-Saharan African countries implemented
106 Adolescent Sexual and Reproductive Health (ASRH) services. However, recent studies from
107 this region have reported poor utilization of ASRH services with only about 21%-51% of
108 adolescents accessing it.[8,9] Acknowledging the importance and poor utilisation of ASRH
109 services, the World Health Organization (WHO) recommended to strengthen the linkages
110 between various HIV prevention and ASRH programmes delivered through general health
111 services.[10]

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Zimbabwe, a landlocked Sub-Saharan country has a high burden of HIV with an estimated prevalence of 14% among people aged 15 to 49 years.[11] The country has ASRH indicators showing risky behaviours with about 40% girls and 30% boys having sex before age eighteen and 62% of males aged 15-24 not using a condom in their last sexual encounter.[12] HIV prevalence in individuals aged 15–19 years was 3.7% and 4.6% for boys and girls respectively. Among those 20-24 years the HIV prevalence was 8% and 10.8% for boys and girls respectively.[12,13] Thus, since 2009, Zimbabwe has implemented Voluntary Medical Male Circumcision (VMMC) and ASRH services as core strategies to limit HIV burden in young people.

The ASRH programme implemented in 2010, involves the provision of CSE, life skills training, diagnosis and treatment of sexually transmitted infections (STIs) including HIV, family planning counselling, positive masculinity education, vocational training, library services, recreational games and empowerment on rights and responsibility.[14] The ASRH services are delivered at youth friendly clinics or youth centres. There is anecdotal evidence that the majority of young people do not access ASRH services. Whereas, the VMMC programme, implemented as part of combination HIV prevention strategy has a high utilization rate.[15] By 2017, about 80% young boys were covered under VMMC and have had unprecedented contact with the health system. However, the potential of VMMC services as a gateway to additional relevant ASRH services for young people has not been maximized.

The ASRH and VMMC programs have been implemented as two different vertical national health programs, not complementing each other in improving the service utilization. In 2016, the WHO supported the Ministry of Health and Child Care to pilot Smart-LyncAges project to identify approaches to sustain VMMC and improve the

136 complementarity of both services. Through the project, cross-referral mechanisms were
137 established wherein adolescent boys from VMMC are linked to ASRH programmes and vice
138 versa. Though the Smart-LyncAges project has been piloted as a participatory learning
139 approach since 2016, there was limited quantitative information on the extent of successful
140 linkage of clients between VMMC clinics and ASRH services. This information on extent of
141 successful referral and associated factors was necessary to address any deficiencies in the
142 referral system prior to scale up of the project countrywide. In this regard, the study aimed
143 to assess the proportion of young people referred from VMMC clinics successfully linked for
144 ASRH services and factors associated with 'not linked' in the Smart-LyncAges pilot project
145 sites in Zimbabwe.

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147 **METHODOLOGY**

148 **Study Design:**

149 This was a cohort study using routinely collected secondary data by the VMMC and
150 ASRH programmes.

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152 **Study Setting:**

153 **General Setting:**

154 Zimbabwe is a land locked country in Sub Saharan Africa. The country is divided into
155 10 administrative provinces and has a total of 62 districts. According to the Zimbabwe
156 National Statistics Agency, the country had a projected population of 16,4 million in 2018
157 and 26% of the total population is adolescents and young adults.[16]

158

159 **Specific Setting:**

160 The study was conducted in the Bulawayo metropolitan province and Mt Darwin
161 district of Mashonaland Central province, where the VMMC-ASRH linkages project was
162 piloted. Bulawayo is Zimbabwe’s second largest city and has a population of approximately
163 653,000.[16] Mt Darwin is one of seven districts in the Mashonaland Central province with
164 the population of about 213,000. In the district, majority of the population reside in the
165 rural areas.

166 *VMMC services and referral to ASRH*

167 The VMMC programme functions under the National AIDS and TB unit with funding
168 support from external sources mainly The U.S. Presidents Emergency Plan for AIDS Relief
169 (PEPFAR) and Bill and Melinda Gates Foundation (BMGF). The VMMC sites were supported
170 by various non-governmental organizations (NGOs) as implementing partners facilitating

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3 171 service delivery and community mobilization. The Bulawayo Metropolitan province has two
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5 172 VMMC clinics and the Mount Darwin district has one clinic. The circumcision services were
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8 173 provided at static VMMC clinics and also through outreach clinics in the public health
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10 174 facilities.

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13 175 Demand generation for VMMC services was created through print and mass media
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15 176 advertisements, school health programmes, road shows and music galas. At community
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17 177 level, the adolescents and young adults were counselled and referred to VMMC clinics by
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19 178 incentivized community mobilizers, peer educators or health workers. The adolescents and
20
21 179 young adults registered for ASRH services at youth centres were also referred for VMMC.
22
23 180 The adolescents were referred to either static VMMC clinics or outreach clinics based on
24
25 181 their convenience.

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28 182 Upon presentation at a VMMC clinic, the clients were registered with unique VMMC
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30 183 ID number. The clerk documented details of clients in the 'client intake form'. During
31
32 184 registration, the clerk issued the referral slip to all the clients who were not already
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34 185 registered for ASRH services. The clients were advised to register themselves for ASRH
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36 186 services in their preferred youth centre and referral slip was provided. The referral slip was
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38 187 created in triplicate; one slip given to the adolescent, one maintained in the referral file at
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40 188 the VMMC clinic and the other slip sent to peer-educator of the service area from where the
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42 189 adolescent has come.

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45 190 The adolescents registered in the VMMC were offered group education and
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47 191 individual counselling by nurse counsellor. During counselling, importance of registering for
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49 192 ASRH services was emphasized. The nurse counsellors provided HIV testing and pre-
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51 193 operation examination to assess the eligibility for circumcision surgery. Those adolescents
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53 194 with diabetes, keloids and haemophilia were considered as not eligible for surgery. Among
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those eligible for surgery, either dorsal slit or forceps guided procedure was performed by either a trained and qualified nurse circumciser or doctor surgeon. Adolescents were advised to make follow-up visits on day-2 and day-7 after the procedure. The adolescents were also advised to visit the clinic in case of any complications. All the details on surgery, follow-up and adverse events were recorded in the ‘client intake form’.

ASRH services and registration

The ASRH services were provided at the youth centres. The Bulawayo metropolitan province has seventeen youth centres and the Mount Darwin district has two youth centres. Each youth centre was staffed with a youth health advisor (a registered general nurse), youth facilitator/recreational officer (a social worker) and five peer educators.

Upon arrival at the youth centres, adolescents referred from VMMC submit their VMMC-ASRH referral slips. The youth facilitator/recreational officer registers the adolescents for ASRH services and documents the VMMC ID number in VMMC-ASRH linkages register. The services received by the adolescent during their initial visit were also documented in the VMMC-ASRH linkage register. The referral slip received from the adolescent are stored in the referral box maintained at the youth centre.

Study Population:

All adolescents and young adults (10-24 years) registered in VMMC clinics of Mt Darwin district and Bulawayo city during October and November, 2018 were included in the study. Those who were already registered for ASRH services prior to accessing VMMC services were excluded. Sample size was not calculated and there was no sampling as all the adolescents and young adults in both the pilot districts of Smart-LyncAges project during study reference period were included.

Data Variables, sources of data and data collection:

We extracted details including VMMC identification number, age, education status, mode of referral to VMMC clinic, type of VMMC clinic, HIV status, date of referral to ASRH services, date of registration at VMMC, reason for circumcision, eligibility for circumcision, circumcision status, method of circumcision, status of day-2 post-op visit, status of day-7 post-op visit and adverse events following circumcision within 42 day from the VMMC 'client intake form' maintained at VMMC clinic. The details on registration and date of registration for ASRH services were extracted from VMMC-ARSH linkage register maintained at youth centres. The information on registration for ASRH services extracted from VMMC-ARSH register was validated using the referral slips maintained in the referral box of youth centres. Those individuals linked for ASRH services within three months of receiving referral slip were considered as 'successfully linked' to ASRH services.

The data was extracted in March, 2019 using two separate structured data extraction proformas designed to extract data from VMMC 'client intake form' and VMMC-ARSH linkage register. Thus, for each of the study participant registered during October and November, 2018 the linkage status was ascertained only after minimum of 90 days of follow-up. Data extraction proformas were field tested by the principal investigator and modified before data extraction.

Data entry and analysis:

Data was double entered and validated using EpiData entry software (EpiData Association, Odense, Denmark). Two separate data entry structures were used to enter data from two proformas. The two data structures were then merged using unique 'VMMC ID number'. The final merged data file was used for analysis.

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243 Data was analyzed using Stata version 12.0 (STATA Corp., College, TX, USA). Socio-
244 demographic, HIV status and clinical characteristics was summarized using percentages.
245 The age of the participants was summarized with mean and standard deviation (SD). The
246 proportion of participants ‘successfully linked’ to ASRH was summarized as percentages
247 with 95% confidence interval. The duration between referral to ‘successfully linked’ to ASRH
248 was summarized with median and inter-quartile range (IQR).

249 The association between socio-demographic and baseline clinical characteristics with
250 ‘not linked for ASRH service’ was assessed using bivariate log binomial regression. To assess
251 the independent association, a generalized linear model (Poisson regression) with robust
252 variance estimates was used as log binomial model did not converge.[17,18] Initially, all the
253 variables with p value<0.25 in the bivariate model was included in the multivariate model.
254 Later, the variables with variance inflation factor of more than 10 were removed from the
255 final model and adjusted relative risks (RR) with 95% CI were expressed as measure of
256 association.

257
258 **Ethics Approval:**

259 The ethics approval was obtained from the Medical Research Council of Zimbabwe
260 (MRCZ/E229) and Ethics Advisory Group of the International Union Against Tuberculosis and
261 Lung Disease, Paris, France (58/18). Permission was sought from the Ministry of Health and
262 Child Care program officials for extracting the routine data collected at VMMC and ASRH
263 centres.

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265 **A data sharing statement:**

Technical appendix, statistical code, and dataset available from the

<https://www.dropbox.com/sh/cm03olkw3qj8j4x/AAArNAzjweJ1iw0UHq86JIFwa?dl=0>

Patient and Public Involvement:

Principal Investigator and the data collectors did not interact directly with the young people availing services from VMMC clinics during this retrospective record review. The PI worked with the healthcare staff and peer educators of both the VMMC and ASRH clinics included in the study. Findings from this study will help the Smart-LyncAges project to assess the performance in linkages and also gives insight on deficiencies to be fixed prior to country wide scale-up.

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RESULTS

In total 1773 young people (10-24 years) were registered for VMMC services during the study reference period. Of the total, 1478 (83%) had not been previously registered in ASRH clinic and were included in the study. The mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were out of school. Of the 1478 study participants, 1032 (69.8%) were referred for VMMC by community mobilizer and 1230 (83.2%) reported HIV prevention as the reason for seeking circumcision service. Of the total, 6 (0.3%) had HIV infection. The characteristics of study participants are depicted in **Table-1**.

Of the 1478 study participants, 1461 (99%) were eligible for circumcision surgery and among of those eligible, 1443 (99%) underwent circumcision (**Figure-1**). Of those who underwent circumcision, 477 (33.1%) had the surgery performed at an outreach site. Of the 1443 participants, 1379 (95.6%) and 1025 (71%) attended day 2 and day 7 review visits respectively. In total, 20 (1.4%) developed mild adverse event following circumcision and 3 (0.2%) each developed moderate and severe adverse events (**Table-2**).

Of the 1478 study participants referred for ASRH services, 463 (31.3%, 95% CI-29.0%-33.8%) successfully linked for ASRH services at ‘youth centre’ within 3 months of referral (**Figure-1**). Among those who were successfully linked, the median (IQR) duration from referral to getting linked at ‘youth centre’ was 6 (0-56) days. Referral from Bulawayo circumcision clinic (RR-1.5 (95% CI-1.3-1.7)) and undergoing circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently associated with not linked for ASRH services after referral from circumcision clinic. The association between participant’s characteristics and failure of referral is shown in **Table-3**.

DISCUSSION

This is the first study assessing the extent of successful referral among adolescents and young men between VMMC clinics and ASRH services under Smart-LyncAges project implemented in Zimbabwe. About 31% of young males (10-24 years) referred from VMMC clinics successfully linked to ASRH services at youth centres within three months of referral. Young people referred from the outreach sites and Bulawayo male circumcision clinic had significantly higher rates of not being linked for ASRH services.

Globally, there were limited studies assessing the linkages between various HIV preventive strategies like VMMC services and ASRH services. A study from Zambia reported that, with enhanced counselling and referral from community, uptake of ASRH services like HIV testing and counselling, family planning counselling and VMMC services was less than 20% within six months.[19] Also, previous reviews have reported that demand generation activities in the community, improving accessibility and quality of ASRH services improve ASRH related knowledge but may not increase the utilization of specific ASRH services.[20–22] The potential reason for underutilization of ASRH services may be that, a preventive strategy may not be considered as an immediate need by young people.[22–24] Considering this, the successful linkage (uptake) of about one in three of the VMMC clients to ASRH services through Smart-LyncAges project (as they produced referral slips) is promising. It would be important to better understand the real and perceived ASRH needs and the relevance of referrals.

The clients referred from Bulawayo MC clinic had slightly higher risk of not being linked to ASRH services. A potential reason for this finding is that, the MC clinic is situated in the eastern suburbs of the city where people of high socio-economic status reside. All the fifteen youth centres were located in western suburbs which are largely populated with

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3 324 people from low socio economic status. It is possible that, the recreational activities
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6 325 available under ASRH services do not appeal to the technologically savvy urban youths from
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8 326 the elite suburbs. Furthermore, distance to youth centres might have limited the clients
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10 327 from the eastern suburbs to go and register for ASRH services. Similarly, clients accessing
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12 328 VMMC services at outreach clinics were not being linked to ASRH services. The focus of
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14 329 outreach clinics is to conduct surgery in hard to reach areas. Though the referral slips were
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16 330 issued, there would not be space and time to counsel on ASRH services comprehensively.
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18 331 Also, the youth centres in Mt Darwin were mainly located in district centres and might not
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20 332 be accessible to clients of outreach clinics conducted in hard to reach areas. Thus, though
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22 333 not assessed objectively, there might be rural-urban divide in linkages. Although the actual
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24 334 numbers were small, a high proportion of clients ineligible for circumcision or experiencing
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26 335 an adverse event were referred and successfully linked suggesting they have additional
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28 336 service needs.
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35 337 The study had several strengths. First, the study was conducted within the routine
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37 338 programmatic setting, reflecting the field realities and using routine data. Second, all the
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39 339 young males attending the VMMC clinics during the study reference period were included
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41 340 and thus, there was no sampling bias. Third, the study had large sample size and thus, the
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43 341 estimate of ‘successfully linked’ was precise. Fourth, the continuous supportive supervision
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45 342 was rendered during the study period to ensure completeness in recording under project
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47 343 setting and thus, the ‘missing data’ was limited. Fifth, the registration for ASRH services was
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49 344 validated by cross-checking the stored referral slips along with information extracted from
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51 345 VMMC-ASRH linkage register and thus, it enhanced the validity of the outcome
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53 346 ascertainment. Sixth, the STrengthening the Reporting of OBservational Studies in
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55 347 Epidemiology (STROBE) guidelines was used to report the study findings.[25]
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3 348 The study had a few limitations. First, the registration for ASRH services was
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6 349 ascertained based on the VMMC-ASRH linkage register. Only, those who produced VMMC
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8 350 referral slips during registration were listed in VMMC-ASRH register. Thus, those
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10 351 participants who might have missed their referral slips before registration for ASRH services
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12 352 could have been misclassified as 'not linked'. This could have led to underestimation of
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14 353 percentage of 'successfully' linked. Second, the study was conducted only during two
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16 354 months of the year and thus failed to account for seasonal variations in seeking services.
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18 355 During the festive month of December, the youth centres were closed due to holidays. Also,
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20 356 during December, the youth centres in the Mt Darwin region were closed for two weeks due
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22 357 to cholera outbreak in the region. There might have been an underestimation of
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24 358 'successfully' linked due to non-functioning of youth centres during study follow-up period.
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26 359 However, as there are no estimates of the extent of underestimation, we failed to account it
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28 360 in estimating the percentage of successfully linked. Third, the pathways for seeking ASRH
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30 361 services and contribution of peer-educators in reaching the ASRH services were not
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32 362 assessed. Thus, the study failed to document the pathways with highest successful linkage
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34 363 rate, which could have helped in replicating the model elsewhere. Fourth, the potential
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36 364 confounders like distance from youth centres, socio-economic status, parents' willingness
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38 365 and adolescents' willingness were not captured and included in the adjusted analysis.
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40 366 Inclusion of these variables could have improved the validity of the model. Fifth, the study
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42 367 represents select group of young people who came for VMMC clinics in the project pilot
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44 368 districts, thus the generalizability of the study results is limited. Lastly, study did not explore
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46 369 the reasons for not being linked for ASRH services among those referred.
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57 370 The study has a few programmatic implications and recommendations. First, the
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59 371 percentage of 'successfully linked' between VMMC clinics and ASRH services was promising.
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372 The Smart-LyncAges project can be scaled up to improve the utilization of ASRH services.
373 However, there is need for qualitative research to explore the facilitators and barriers for
374 getting linked to ASRH services. This information can help to improve linkages and
375 effectiveness by understanding relevance of linkages to young people`s health needs.

376 Second, with the existing records maintained under the project, cohort monitoring
377 of the performance of referral system was feasible. The ‘proportion of those referred from
378 the facility successfully linked for ASRH services’ can be introduced as an indicator in the
379 monthly report of each VMMC clinic. This would enable the programme managers to
380 monitor the performance of referral system better than the absolute number of referred
381 which is being reported now.

382 Third, the young adolescents seeking VMMC services from outreach clinics at
383 peripheral public health facilities were not getting linked for ASRH services, implying the
384 distance to youth centres was a potential barrier. Solutions should be person centred, such
385 as co-location of ASRH and VMMC services, improved accessibility with services
386 decentralized to peripheral public health facilities and enhanced training of existing general
387 health staff to deliver youth friendly services.

388 Fourth, about 70% of clients came back to avail follow-up services on day-7 post
389 circumcision. This opportunity can be used to further educate and to reinforce to young
390 people on services available to them as they will be more able to absorb information since
391 the MC procedure has been completed.

392
393 **CONCLUSION**

394 The rate of young males referred from VMMC clinics and successfully linked for
395 ASRH services was promising. However, there is need to explore the reasons for clients not

396 accessing the ASRH services, the type of services sought and take corrective actions to
397 improve the same.

398

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study design, data collection and analysis, decision to publish, or preparation of the manuscript.

AUTHOR CONTRIBUTION

TM was the principal investigator; PT and KT were the SORT IT course mentors; OM, WA, JS, SX and GN were the senior authors. TM, NZ, AM, SM, TT, and RM were involved in data collection; TM, PT and KT analyzed the data and prepared the first draft of the paper. All authors were involved in conception, design, inference of results, providing critical review and approval of the final manuscript.

DISCLOSURE STATEMENT

None of the authors have any competing interests.

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Table 1: The demographic characteristics, reason for circumcision and HIV status of adolescents and young adults registered for VMMC services during October and November, 2018 in selected health facilities of Zimbabwe, N=1478

Characteristics	Categories	Frequency	(%)
Total		1478	(100)
Age (in years)	10-14	980	(66.3)
	15-19	314	(21.2)
	20-24	184	(12.3)
Education status	Out of school	427	(28.9)
	Primary education	899	(60.8)
	Secondary education	152	(10.3)
Health facility	Mt Darwin	542	(36.7)
	Lobengula MC clinic	587	(39.7)
	Bulawayo MC clinic	349	(23.6)
Referred by*	Friend or partner	37	(2.5)
	Health worker	216	(14.6)
	Community mobilizer	1032	(69.8)
	Others	139	(9.4)
	Missing	54	(3.7)
Reasons for circumcision[#]	HIV prevention	1230	(83.2)
	Sexual pleasure	248	(16.8)
	STI Prevention	736	(49.8)
	Hygiene	1196	(80.9)
	Socio-cultural reasons	51	(3.5)
HIV status	Positive	6	(0.3)
	Negative	1472	(99.7)

Abbreviation: HIV- Human Immunodeficiency virus; VMMC- Voluntary Medical Male Circumcision; MC- Male Circumcision; STI- Sexually Transmitted Infection

* The person who referred the client to VMMC clinic

[#] Multiple responses are possible

Table 2: The surgical and follow-up details of adolescents and young adults who underwent circumcision during October and November, 2018 in selected male circumcision clinics of Zimbabwe, N=1443

Characteristics	Categories	Frequency	(%)
Total		1443	(100.0)
Method of circumcision	Dorsal slit	1439	(99.7)
	Forceps Guided	4	(0.3)
Service delivery point*	Static site	966	(66.9)
	Outreach site	477	(33.1)
Circumciser#	Nurse practitioner	1418	(98.3)
	Doctor	25	(1.7)
Attended post-op day-2	Yes	1379	(95.6)
	No	64	(4.4)
Attended post-op day-7	Yes	1025	(71.0)
	No	418	(29.0)
Adverse event	None	1417	(98.2)
	Mild	20	(1.4)
	Moderate	3	(0.2)
	Severe	3	(0.2)

* The circumcision in VMMC clinics are considered as static sites. The circumcision done at other public health facilities in a camp mode by staff of VMMC clinics are considered as outreach sites

Circumciser is the one who conducted the circumcision

Table 3: Demographic, HIV status and surgical characteristics associated with not getting linked for ASRH services within 3 months of referral from the selected VMMC health facilities in Zimbabwe, October and November 2018.

Characteristic	Category	Total	Not linked to ASRH, n (%) [*]	Unadjusted RR (95% CI)	Adjusted RR (95 % CI) [#]	p value
Total		1478	1015 (68.7)			
Age (in years)	10 - 14	980	671 (68.5)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.828
	15 - 19	314	200 (63.7)	1	1	
	20 - 24	184	144 (78.3)	1.2 (1.1-1.4)	1.1 (1.0-1.3)	0.168
Education	Out of school	427	297 (69.6)	1.1 (1.0-1.3)	1.0 (0.9-1.2)	0.560
	Primary	899	622 (69.2)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.632
	Secondary	152	96 (63.2)	1	1	
Referred By	Friend/Partner	37	22 (59.5)	1	1	
	Health Worker	216	164 (75.9)	1.3 (1.0-1.7)	1.2 (0.9-1.6)	0.207
	Community mobiliser	1032	694 (67.3)	1.1 (0.9-1.5)	1.1 (0.8-1.5)	0.453
	Others	139	106 (76.3)	1.3 (1.0-1.7)	1.0 (0.8-1.4)	0.849
	Missing	54	29 (53.7)	0.9 (0.6-1.3)	1.2 (0.8-1.6)	0.345
Health Facility	Mt Darwin	542	330 (60.9)	1	1	
	Lobengula MC	587	386 (65.8)	1.1 (1.0-1.2)	1.1 (1.0-1.3)	0.087
	Bulawayo MC	349	299 (85.7)	1.4 (1.3-1.5)	1.5 (1.3-1.7)	<0.001
HIV Status	Positive	6	5 (83.3)	1.2 (0.8-1.7)	1.3 (0.9-1.9)	0.117
	Negative	1472	1010 (68.6)	1	1	
Reasons for MC						
<i>HIV Prevention</i>	Yes	1230	865 (85.2)	1.2 (1.0-1.3)	1.0 (0.9-1.1)	0.800
	No	248	150 (60.5)	1	1	
<i>Sexual Pleasure</i>	Yes	248	158 (63.7)	0.9 (0.8-1.0)	0.9 (0.8-1.1)	0.593
	No	1230	857 (69.7)	1	1	
<i>STI Prevention</i>	Yes	736	523 (71.1)	1.1 (1.0-1.1)	1.0 (0.9-1.1)	0.980
	No	742	492 (66.3)	1	1	
<i>Hygiene</i>	Yes	1196	847 (70.8)	1.2 (1.1-1.3)	1.1 (1.0-1.2)	0.183
	No	282	168 (59.6)	1	1	
<i>Socio-cultural</i>	Yes	51	32 (62.8)	0.9 (0.7-1.1)	0.9 (0.7-1.1)	0.407
	No	1427	983 (68.9)	1	1	
Circumcision[‡]	Not Eligible	17	3 (17.7)	1	1	
	Circumcised	1443	1003 (69.5)	3.9 (1.4-11)	2.9 (0.6-8.8)	0.062
	Not circumcised	18	9 (50.0)	2.8 (0.9-8.7)	2.3 (0.8-7.1)	0.142
Circumciser[‡]	Nurse	1418	989 (69.8)	1.2 (0.9-1.8)	1.2 (0.8-1.8)	0.283
	Doctors	25	14 (56.0)	1	1	
Service delivery point[‡]	Static	966	66 (65.8)	1	1	
	Outreach	477	367 (76.9)	1.2 (1.1-1.2)	1.2 (1.1-1.3)	<0.001
Day-2 follow-up^{‡£}	Yes	1379	965 (70.0)	1.2 (1.0-1.4)		
	No	64	38 (59.4)	1		
Day-7 follow-up[‡]	Yes	1025	732 (71.4)	1.1 (1.0-1.2)	0.9 (0.8-1.0)	0.070
	No	418	271 (64.8)	1	1	
Adverse event^{‡£}	Yes	26	11 (42.3)	1		
	No	1417	992 (70.0)	1.7 (1.1-2.6)		

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Abbreviations: ASRH-Adolescent Sexual Reproductive Health; STI-Sexually Transmitted Infection; HIV-Human Immunodeficiency Virus; RR-Relative Risk, CI-Confidence Interval
* Row percentage; # Using generalized linear model (Poisson regression); § Mild, Moderate and Severe were clubbed as ‘Yes’; ¥ Applicable only for those who underwent circumcision; £ These factors were removed from the final model as they had variance inflation factor of more than 10

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Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

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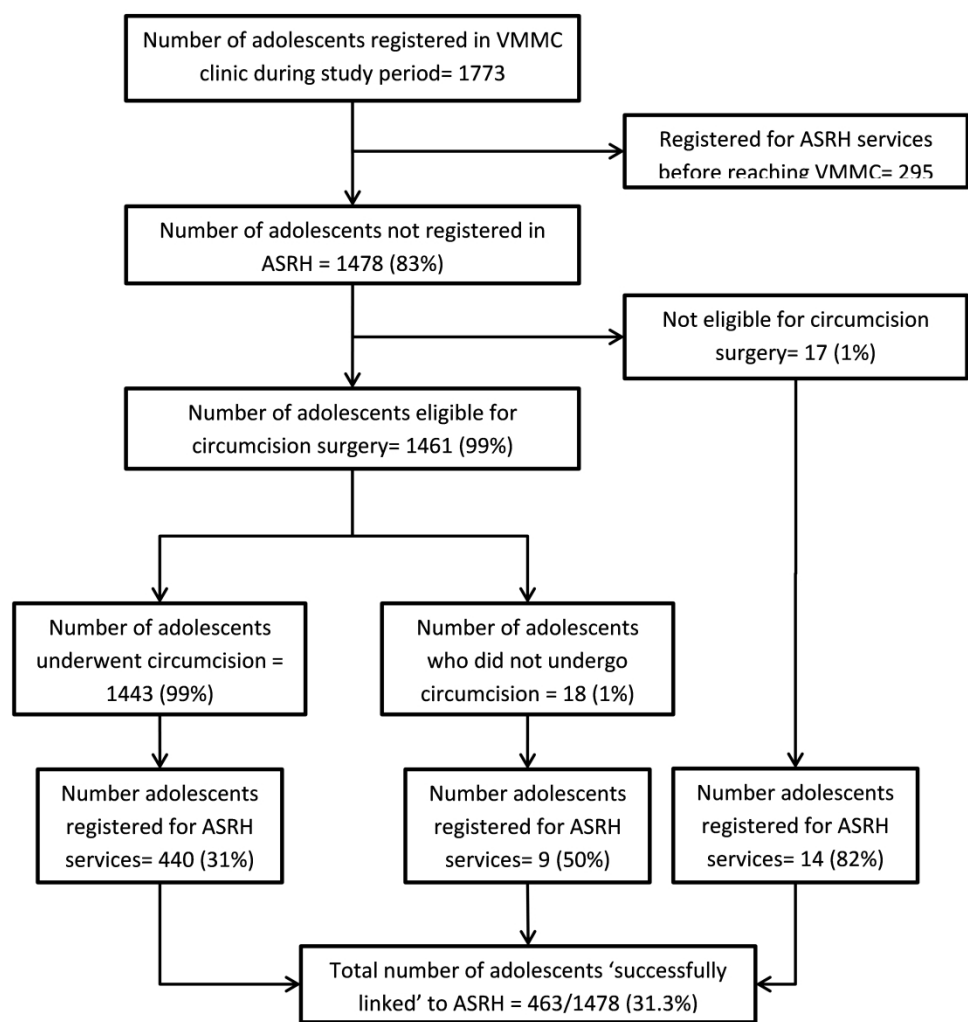


Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

1123x1193mm (96 x 96 DPI)

STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No (Line No)
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1(2-3)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3(38-67)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-7(85-145)
Objectives	3	State specific objectives, including any prespecified hypotheses	7(142-145)
Methods			
Study design	4	Present key elements of study design early in the paper	8(149-150)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	8-10(153-210)
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	10(213-216)
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Case-control study—For matched studies, give matching criteria and the number of controls per case	11(220-230)
		Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	11(231-234)
Bias	9	Describe any efforts to address potential sources of bias	11(237-240, 245-249)
Study size	10	Explain how the study size was arrived at	10(213-216)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11,12(241-244)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	11,12(241-249)
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	11(229-230)

		(d) Cohort study—If applicable, explain how loss to follow-up was addressed	
		Case-control study—If applicable, explain how matching of cases and controls was addressed	NA
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	

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1	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the	19 (407-
2			present article is based	411)
3	<i>*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.</i>			
4	Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is			
5	best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/ , Annals of Internal Medicine at http://www.annals.org/ , and			
6	Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org .			
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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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Primary Subject Heading:	Sexual health
Secondary Subject Heading:	Global health, HIV/AIDS, Sexual health, Reproductive medicine, Epidemiology
Keywords:	HIV & AIDS < INFECTIOUS DISEASES, Adolescent Health, SORT IT, Operational Research, Sexual and Reproductive Health, Youth centres

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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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Short Running Title: Linkage of VMMC clients to ASRH services in Zimbabwe

Investigators and affiliations

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47 ABSTRACT

48 **Objectives:** World Health Organization recommended strengthening the linkages between
49 various HIV prevention programmes and Adolescent Sexual Reproductive Health (ASRH)
50 services. The Smart-LyncAges project piloted in Bulawayo city and Mt Darwin district of
51 Zimbabwe established a referral system to link the Voluntary Medical Male Circumcision
52 (VMMC) clients to ASRH services provided at youth centres. Since its inception in 2016,
53 there has been no assessment of the performance of the referral system. Thus, we aimed to
54 assess the proportion of young (10-24 years) VMMC clients getting 'successfully linked' to
55 ASRH services and factors associated with 'not being linked'.

56 **Design:** This was a cohort study using routinely collected secondary data.

57 **Setting:** All three VMMC clinics of Mt Darwin district and Bulawayo province.

58 **Primary outcome measures:** The proportion of 'successfully linked' was summarized as the
59 percentage with a 95% confidence interval (CI). Adjusted relative risks (aRR) using a
60 generalized linear model was calculated as a measure of association between client
61 characteristics and 'not being linked'.

62 **Results:** Of 1773 young people registered for VMMC services, 1478 (83%) were referred for
63 ASRH services as they had not registered for ASRH previously. Of those referred for ASRH
64 services, the mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were
65 out of school. Of the referred, 463 (31.3%, 95% CI- 30.0-33.8) were 'successfully linked' to
66 ASRH services and the median (IQR) duration for linkage was 6 (0-56) days. Receiving a
67 referral from Bulawayo circumcision clinic (RR-1.5 (95% CI-1.3-1.7)) and undergoing
68 circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently associated with
69 'not being linked' to ASRH services.

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Conclusion: Linkage to ASRH services from VMMC is feasible as one-third VMMC clients referred were successfully linked. However, there is need to explore reasons for not accessing ASRH services and take corrective actions to improve the linkages.

Keywords: HIV prevention; Adolescent Health; Sexual and Reproductive Health; Youth centres; SORT IT; Operational Research

Article Summary:

Strengths and Limitations:

- First study to have assessed the extent of linkages with Smart-LyncAges project
- No selection bias as we included all the young people (10-24 years) who registered for circumcision services in the VMMC clinics of two project districts
- Routine programmatic data of large cohort was used and thus reflected the field realities in project implementation
- There might have been an underestimation in the proportion of young people ‘successfully linked’ to ASRH services as only those who produced referral slip from VMMC clinic were considered as ‘successfully linked’
- Study was conducted only during two months of the year and thus might have failed to account for seasonal variations in seeking ASRH services

90 INTRODUCTION

91 Young people (aged 10-24 years) are disproportionately affected by the Human
92 Immunodeficiency Virus (HIV) infection, with an estimated 3.9 million living with HIV
93 worldwide in 2017.[1,2] Globally, approximately 1600 youths acquire HIV every day and a
94 youth dies every 10 minutes because of AIDS-related illness.[1] In contrast to the decline in
95 HIV related death rates over the years in other age groups, there has been a rise among
96 young people.[3,4] About 84% of young people living with HIV are in Sub-Saharan Africa and
97 it is estimated that an additional 7.4 million young people might become infected with HIV
98 in Sub-Saharan Africa region alone by 2030.[5]

99 Unprotected sex is the most common route of HIV infection among young people
100 and is largely due to low knowledge of HIV, early sexual debut, multiple sexual partners, and
101 low condom use.[6] This highlights the need for comprehensive sexuality education (CSE) for
102 adolescents before they become sexually active. Realizing this, the United Nations General
103 Assembly Special Session (UNGASS) on HIV in 2001 recommended access to information,
104 youth-specific HIV education and life skills development to at least 95% of young people.[7]
105 Following this, most Sub-Saharan African countries implemented Adolescent Sexual and
106 Reproductive Health (ASRH) services. However, recent studies from this region have
107 reported poor utilization of ASRH services, with only about 21%-51% of adolescents
108 accessing it.[8,9] Acknowledging the importance and poor utilisation of ASRH services, the
109 World Health Organization (WHO) recommended strengthening the linkages between
110 various HIV prevention and ASRH programmes delivered through general health
111 services.[10]

112 Zimbabwe, a landlocked Sub-Saharan country, has a high burden of HIV, with an
113 estimated prevalence of 14% among people aged 15 to 49 years.[11] The country has ASRH

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114 indicators showing risky behaviours with about 40% girls and 30% of boys having sex before
115 age eighteen and 62% of males aged 15-24 not using a condom in their last sexual
116 encounter.[12] HIV prevalence in individuals aged 15–19 years was 3.7% and 4.6% for boys
117 and girls, respectively. Among those 20-24 years, the HIV prevalence was 8% and 10.8% for
118 boys and girls, respectively.[12,13] Thus, since 2009, Zimbabwe has implemented Voluntary
119 Medical Male Circumcision (VMMC) and ASRH services as core strategies to limit the HIV
120 burden in young people.

121 The ASRH programme implemented in 2010, involves the provision of CSE, life skills
122 training, diagnosis and treatment of sexually transmitted infections (STIs) including HIV,
123 family planning counselling, positive masculinity education, vocational training, library
124 services, recreational games and empowerment on rights and responsibility.[14] The ASRH
125 services are delivered at youth-friendly clinics or youth centres. There is anecdotal evidence
126 that the majority of young people do not access ASRH services. Whereas, the VMMC
127 programme implemented as part of an HIV prevention strategy has a high utilization
128 rate.[15] By 2017, about 80% of young boys were covered under VMMC and have had
129 unprecedented contact with the health system. However, the potential of VMMC services as
130 a gateway to additional relevant ASRH services for young people has not been maximized.

131 The ASRH and VMMC programs have been implemented as two different vertical
132 national health programs, not complementing each other in improving service utilization. In
133 2016, the WHO supported the Ministry of Health and Child Care to pilot the Smart-LyncAges
134 project to identify approaches to sustain VMMC and improve the complementarity of both
135 services. Through the project, cross-referral mechanisms were established wherein
136 adolescent boys from VMMC are linked to ASRH programmes and vice versa. Though the
137 Smart-LyncAges project has been piloted as a participatory learning approach since 2016,

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3 138 there is no quantitative information on the extent of successful linkage of clients between
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6 139 VMMC clinics and ASRH services. The information on the extent of successful linkage and
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8 140 factors associated with failure to linkage is necessary to address any deficiencies in the existing
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11 141 referral system prior to scale-up of the project countrywide. In this regard, the study aimed
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13 142 to assess the proportion of young people referred from VMMC clinics successfully linked for
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15 143 ASRH services and factors associated with 'not being linked' in the Smart-LyncAges pilot
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18 144 project sites in Zimbabwe.
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METHODOLOGY

Study Design:

This was a cohort study using routinely collected secondary data by the VMMC and ASRH programmes.

Study Setting:

General Setting:

Zimbabwe is a landlocked country in Sub Saharan Africa. The country is divided into ten administrative provinces and has a total of 62 districts. According to the Zimbabwe National Statistics Agency, the country had a projected population of 16,4 million in 2018 and 26% of the total population is adolescents and young adults.[16]

Specific Setting:

The study was conducted in the Bulawayo metropolitan province and Mt Darwin district of Mashonaland Central province, where the VMMC-ASRH linkages project was piloted. Bulawayo is Zimbabwe’s second-largest city and has a population of approximately 653,000.[16] Mt Darwin is one of seven districts in the Mashonaland Central province, with a population of about 213,000. In the district, the majority of the population resides in rural areas.

VMMC services and referral to ASRH

The VMMC programme functions under the National AIDS and TB unit with funding support from external sources, mainly The U.S. Presidents Emergency Plan for AIDS Relief (PEPFAR) and Bill and Melinda Gates Foundation (BMGF). The VMMC sites are supported by various non-governmental organizations (NGOs), which act as implementing partners

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3 170 facilitating service delivery and community mobilization. The Bulawayo Metropolitan
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6 171 province has two VMMC clinics and the Mount Darwin district has one clinic. The
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8 172 circumcision services are provided at static VMMC clinics and also through outreach clinics
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11 173 in the public health facilities.

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13 174 Demand generation for VMMC services is done through print and mass media
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15 175 advertisements, school health programmes, roadshows and music galas. At the community
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18 176 level, the community mobilizers, peer educators or health workers counsel and refer
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20 177 adolescents and young adults for VMMC clinics. The adolescents and young adults
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23 178 registered for ASRH services are also referred for VMMC. The referral is made to either
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25 179 static VMMC clinics or outreach clinics based on their convenience.

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28 180 Upon presentation at a VMMC clinic, the clients are registered with a unique VMMC
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30 181 ID number. The clerk documents the details in the 'client intake form'. During registration,
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33 182 the clerk issues the referral slip to all the clients who are not previously registered for ASRH
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35 183 services. The clients are advised to register themselves for ASRH services in their preferred
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37 184 youth centre and referral slip is provided. The referral slip is created in triplicate, one slip
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40 185 given to the adolescent, one maintained in the referral file at the VMMC clinic and the other
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42 186 slip sent to the peer-educator of the service area from where the adolescent has come.

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45 187 A nurse counsellor offers group education and individual counselling to clients
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47 188 registered for VMMC. During counselling, the importance of registering for ASRH services is
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49 189 emphasized. The nurse counsellors provide HIV testing and a pre-operation examination to
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52 190 assess the eligibility for circumcision surgery. Those adolescents with diabetes, keloids and
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54 191 haemophilia are considered not eligible for surgery. Among those eligible for surgery, either
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57 192 dorsal slit or forceps guided procedure is performed by either a trained and qualified nurse
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59 193 circumciser or doctor surgeon. Clients are advised to make follow-up visits on day-2 and
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194 day-7 after the procedure. All the details on surgery, follow-up and adverse events are
195 recorded in the ‘client intake form’.

196 *ASRH services and registration*

197 The ASRH services are provided at the youth centres. The Bulawayo metropolitan
198 province has seventeen youth centres and the Mount Darwin district has two youth centres.
199 Each youth centre is staffed with a youth health advisor (a registered general nurse), a
200 youth facilitator/recreational officer (a social worker) and five peer educators.

201 Upon arrival at the youth centres, the VMMC clients submit their VMMC-ASRH
202 referral slips. The youth facilitator/recreational officer registers the adolescents for ASRH
203 services and documents the VMMC ID number in the VMMC-ASRH linkages register. The
204 services received by the adolescent during their initial visit are documented in the VMMC-
205 ASRH linkage register. The referral slip received from the adolescent is stored in the referral
206 box maintained at the youth centre.

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208 **Study Population:**

209 All adolescents and young adults (10-24 years) registered in VMMC clinics of Mt
210 Darwin district and Bulawayo city during October and November 2018 were included in the
211 study. Those who were previously registered for ASRH services prior to accessing VMMC
212 services were excluded. The sample size was not calculated and there was no sampling as all
213 the adolescents and young adults in both the pilot districts of the Smart-LyncAges project
214 during study reference period were included.

215 **Data Variables, sources of data and data collection:**

216 We extracted details including VMMC identification number, age, education status,
217 mode of referral to VMMC clinic, type of VMMC clinic, HIV status, date of referral to ASRH

services, date of registration at VMMC, reason for circumcision, eligibility for circumcision, circumcision status, method of circumcision, status of day-2 post-op visit, status of day-7 post-op visit and adverse events following circumcision within 42 day from the VMMC 'client intake form' maintained at VMMC clinic. The details on registration and date of registration for ASRH services were extracted from the VMMC-ARSH linkage register maintained at youth centres. The information on registration for ASRH services extracted from the VMMC-ARSH register was validated using the referral slips maintained in the referral box of youth centres. Those individuals linked for ASRH services within three months of receiving referral slip were considered as 'successfully linked' to ASRH services.

The data was extracted in March 2019 using two separate structured data extraction proformas designed to extract data from VMMC 'client intake form' and VMMC-ARSH linkage register. Thus, for each of the study participants registered during October and November 2018, the linkage status was ascertained only after a minimum of 90 days of follow-up. The principal investigator field-tested data extraction proformas and modified them before data extraction.

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234 **Data entry and analysis:**

Data were double entered and validated using EpiData Entry software (EpiData Association, Odense, Denmark). Two separate data entry structures were used to enter data from two proformas. The two data structures were then merged using the unique 'VMMC ID number'. The final merged data file was used for analysis.

Data were analyzed using Stata version 12.0 (STATA Corp., College, TX, USA). Socio-demographic, HIV status and clinical characteristics were summarized using percentages. The age of the participants was summarized with mean and standard deviation (SD). The

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proportion of participant ‘successfully linked’ to ASRH was summarized as percentages with 95% confidence interval. The duration between referral to ‘successfully linked’ to ASRH was summarized with median and inter-quartile range (IQR).

The association between socio-demographic and baseline clinical characteristics with ‘not being linked’ for ASRH service was assessed using bivariate log-binomial regression. A generalized linear model (Poisson regression) with robust variance estimates was used for multivariate regression as the log-binomial model did not converge.[17,18] Initially, all the variables with p value<0.25 in the bivariate model was included in the multivariate model. Later, the variables with a variance inflation factor of more than ten were removed from the final model and adjusted relative risks (aRR) with 95% CI were expressed as measure of association.

Ethics Approval:

The ethics approval was obtained from the Medical Research Council of Zimbabwe (MRCZ/E229) and Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France (58/18). Permission was sought from the Ministry of Health and Child Care program officials for extracting the routine data collected at VMMC and ASRH centres.

A data sharing statement:

Technical appendix, statistical code, and dataset available from the <https://www.dropbox.com/sh/cm03olkw3qj8j4x/AAArNAzjweJ1iw0UHq86JIFwa?dl=0>

Patient and Public Involvement:

Principal Investigator and the data collectors did not interact directly with the young people availing services from VMMC clinics during this retrospective record review. The PI worked with the healthcare staff and peer educators of both the VMMC and ASRH clinics included in the study. Findings from this study will help the Smart-LyncAges project to assess the performance in linkages and also gives insight on deficiencies to be fixed prior to country wide scale-up.

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RESULTS

In total, 1773 young people (10-24 years) were registered for VMMC services during the study reference period. Of the total, 1478 (83%) had not been previously registered in the ASRH clinic and were included in the study. The mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were out of school. Of the 1478 study participants, 1032 (69.8%) were referred for VMMC by community mobilizer and 1230 (83.2%) reported HIV prevention as the reason for seeking circumcision service. Of the total, 6 (0.3%) had HIV infection. The characteristics of study participants are depicted in **Table-1**.

Of the 1478 study participants, 1461 (99%) were eligible for circumcision surgery, of which, 1443 (99%) underwent circumcision (**Figure-1**). Of those who underwent circumcision, 477 (33.1%) had the surgery performed at an outreach site. Of the 1443 participants, 1379 (95.6%) and 1025 (71%) attended day-2 and day-7 review visits, respectively. In total, 20 (1.4%) developed mild adverse events following circumcision and 3 (0.2%) each developed moderate and severe adverse events (**Table-2**).

Of the 1478 study participants referred for ASRH services, 463 (31.3%, 95% CI-29.0%-33.8%) successfully linked for ASRH services at 'youth centre' within three months of referral (**Figure-1**). Among those who were successfully linked, the median (IQR) duration from referral to getting linked at 'youth centre' was 6 (0-56) days. Referral from Bulawayo circumcision clinic (RR-1.5 (95% CI-1.3-1.7)) and undergoing circumcision at outreach sites (RR-1.2 (95% CI-1.1-1.3)) were independently associated with not being linked for ASRH services after referral from circumcision clinic. The AIC and BIC of the model were 2799.2 and 2926.3, respectively. The LR test was significant compared to constant model (p value=0.014). The association between participant's characteristics and not being linked is shown in **Table-3**.

DISCUSSION

This is the first study assessing the extent of successful referral among adolescents and young men between VMMC clinics and ASRH services under the Smart-LyncAges project implemented in Zimbabwe. About 31% of young males (10-24 years) referred from VMMC clinics successfully linked to ASRH services at youth centres within three months of referral. Young people referred from the outreach sites and Bulawayo male circumcision clinic had significantly higher rates of not being linked for ASRH services.

Globally, there is limited literature on linkages between various HIV preventive strategies like VMMC services and ASRH services. A study from Zambia reported that, with enhanced counselling and referral from the community, uptake of ASRH services like HIV testing and counselling, family planning counselling and VMMC services was less than 20% within six months.[19] Also, previous reviews have reported that demand generation activities in the community, improving accessibility and quality of ASRH services, improve ASRH related knowledge but may not increase the utilization of specific ASRH services.[20–22] The potential reason for underutilization is that the preventive strategy like ASRH may not be considered as an immediate need by young people.[22–24] Considering this, the successful linkage (uptake) of about one in three of the VMMC clients to ASRH services through the Smart-LyncAges project (as they produced referral slips) is promising.

The clients referred from the Bulawayo MC clinic had a slightly higher risk of not being linked to ASRH services. A potential reason for this finding is that the MC clinic is situated in the eastern suburbs of the city where people of high socio-economic status reside. All the fifteen youth centres were located in western suburbs, which are largely populated with people from low socio-economic status. It is possible that the recreational activities available under ASRH services do not appeal to the technologically savvy urban

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3 320 youths from the elite suburbs. Furthermore, distance to youth centres might have limited
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6 321 the clients from the eastern suburbs to go and register for ASRH services. Similarly, clients
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8 322 accessing VMMC services at outreach clinics were not being linked to ASRH services. The
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10 323 focus of outreach clinics is to conduct surgery in hard to reach areas. Though the referral
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13 324 slips were issued, there would not be space and time to counsel on ASRH services
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15 325 comprehensively. Also, the youth centres in Mt Darwin were mainly located in district
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17 326 centres and might not be accessible to clients of outreach clinics conducted in hard to reach
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20 327 areas. Thus, though not assessed objectively, there might be a rural-urban divide in linkages.
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23 328 Although the actual numbers were small, a high proportion of clients ineligible for
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25 329 circumcision or experiencing an adverse event were referred and successfully linked,
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28 330 suggesting they have additional service needs.

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30 331 The study had several strengths. First, the study was conducted within the routine
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32 332 programmatic setting, reflecting the field realities and using routine data. Second, all the
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34 333 young males attending the VMMC clinics during the study reference period were included
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37 334 and thus, there was no sampling bias. Third, the study had a large sample size and thus, the
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40 335 estimate of ‘successfully linked’ was precise. Fourth, the continuous supportive supervision
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42 336 was rendered during the study period to ensure completeness in recording under the
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44 337 project setting and thus, the ‘missing data’ was limited. Fifth, the registration for ASRH
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47 338 services was validated by cross-checking the stored referral slips along with information
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50 339 extracted from the VMMC-ASRH linkage register and thus, it enhanced the validity of the
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52 340 outcome ascertainment. Sixth, the STrengthening the Reporting of OBservational Studies in
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54 341 Epidemiology (STROBE) guidelines was used to report the study findings.[25]

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57 342 The study had a few limitations. First, the registration for ASRH services was
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59 343 ascertained based on the VMMC-ASRH linkage register. Only those who produced VMMC

referral slips during registration were listed in the VMMC-ASRH register. Thus, those participants who might have missed their referral slips before registration for ASRH services could have been misclassified as 'not linked'. This could have led to the underestimation of the percentage of 'successfully' linked. Second, the study was conducted only during two months of the year and thus failed to account for seasonal variations in seeking services. During the festive month of December, the youth centres were closed due to holidays. Also, during December, the youth centres in the Mt Darwin region were closed for two weeks due to the cholera outbreak in the region. There might have been an underestimation of 'successfully' linked due to the non-functioning of youth centres during the study follow-up period. However, as there are no estimates of the extent of underestimation, we failed to account for it in estimating the percentage of successfully linked. Third, the pathways for seeking ASRH services and the contribution of peer-educators in reaching the ASRH services were not assessed. Thus, the study failed to document the pathways with the highest successful linkage rate, which could have helped in replicating the model elsewhere. Fourth, the potential confounders like distance from youth centres, socio-economic status, parents' willingness and adolescents' willingness were not captured and included in the adjusted analysis. The inclusion of these variables could have improved the validity of the model. Fifth, the study represents select group of young people who came for VMMC clinics in the project pilot districts. Thus, the generalizability of the study results is limited. Lastly, the study did not explore the reasons for not being linked to ASRH services among those referred.

The study has a few programmatic implications and recommendations. First, the percentage of 'successfully linked' between VMMC clinics and ASRH services was promising. The Smart-LyncAges project can be scaled up to improve the utilization of ASRH services.

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368 However, there is a need for qualitative research to explore the facilitators and barriers to
369 getting linked to ASRH services. This information can help to improve the linkages and
370 effectiveness of the programme.

371 Second, with the existing records maintained under the project, cohort monitoring
372 of the performance of the referral system was feasible. The ‘proportion of those referred
373 from the facility successfully linked for ASRH services’ can be introduced as an indicator in
374 the monthly report of each VMMC clinic. This would enable the programme managers to
375 monitor the performance of the referral system better than the absolute number of
376 referred and linked, which is currently being monitored.

377 Third, the young adolescents seeking VMMC services from outreach clinics at
378 peripheral public health facilities were not getting linked for ASRH services, implying the
379 distance to youth centres was a potential barrier. Solutions should be person-centred, such
380 as co-location of ASRH and VMMC services, improved accessibility with services
381 decentralized to peripheral public health facilities and enhanced training of existing general
382 health staff to deliver youth-friendly services.

383 Fourth, about 70% of clients came back to avail follow-up services on day-7 post
384 circumcision. This opportunity can be used to educate further and to reinforce the
385 importance of ASRH services. The clients might be more responsive to the information since
386 the circumcision procedure is already completed.

387
388 **CONCLUSION**

389 The rate of young males referred from VMMC clinics and successfully linked to ASRH
390 services was promising. Those referred from the outreach sites and clinics in Bulawayo had
391 significantly higher rates of ‘not being linked’. However, there is a need to explore the

reasons for clients not accessing the ASRH services and take corrective actions to improve the linkages.

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study design, data collection and analysis, decision to publish, or preparation of the manuscript.

AUTHOR CONTRIBUTION

TM was the principal investigator; PT and KT were the SORT IT course mentors; OM, WA, JS, SX and GN were the senior authors. TM, NZ, AM, SM, TT, and RM were involved in data collection; TM, PT and KT analyzed the data and prepared the first draft of the paper. All authors were involved in conception, design, inference of results, providing critical review and approval of the final manuscript.

DISCLOSURE STATEMENT

None of the authors have any competing interests.

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Table 1: The demographic characteristics, reason for circumcision and HIV status of adolescents and young adults registered for VMMC services during October and November, 2018 in selected health facilities of Zimbabwe, N=1478

Characteristics	Categories	Frequency	(%)
Total		1478	(100)
Age (in years)	10-14	980	(66.3)
	15-19	314	(21.2)
	20-24	184	(12.3)
Education status	Out of school	427	(28.9)
	Primary education	899	(60.8)
	Secondary education	152	(10.3)
Health facility	Mt Darwin	542	(36.7)
	Lobengula MC clinic	587	(39.7)
	Bulawayo MC clinic	349	(23.6)
Referred by*	Friend or partner	37	(2.5)
	Health worker	216	(14.6)
	Community mobilizer	1032	(69.8)
	Others	139	(9.4)
	Missing	54	(3.7)
Reasons for circumcision[#]	HIV prevention	1230	(83.2)
	Sexual pleasure	248	(16.8)
	STI Prevention	736	(49.8)
	Hygiene	1196	(80.9)
	Socio-cultural reasons	51	(3.5)
HIV status	Positive	6	(0.3)
	Negative	1472	(99.7)

Abbreviation: HIV- Human Immunodeficiency virus; VMMC- Voluntary Medical Male Circumcision; MC- Male Circumcision; STI- Sexually Transmitted Infection

* The person who referred the client to VMMC clinic

[#] Multiple responses are possible

Table 2: The surgical and follow-up details of adolescents and young adults who underwent circumcision during October and November, 2018 in selected male circumcision clinics of Zimbabwe, N=1443

Characteristics	Categories	Frequency	(%)
Total		1443	(100.0)
Method of circumcision	Dorsal slit	1439	(99.7)
	Forceps Guided	4	(0.3)
Service delivery point*	Static site	966	(66.9)
	Outreach site	477	(33.1)
Circumciser#	Nurse practitioner	1418	(98.3)
	Doctor	25	(1.7)
Attended post-op day-2	Yes	1379	(95.6)
	No	64	(4.4)
Attended post-op day-7	Yes	1025	(71.0)
	No	418	(29.0)
Adverse event	None	1417	(98.2)
	Mild	20	(1.4)
	Moderate	3	(0.2)
	Severe	3	(0.2)

* The circumcision in VMMC clinics are considered as static sites. The circumcision done at other public health facilities in a camp mode by staff of VMMC clinics are considered as outreach sites

Circumciser is the one who conducted the circumcision

Table 3: Demographic, HIV status and surgical characteristics associated with not getting linked for ASRH services within 3 months of referral from the selected VMMC health facilities in Zimbabwe, October and November 2018.

Characteristic	Category	Total	Not linked to ASRH, n (%) [*]	Linked to ASRH, n (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI) [#]	p value
Total		1478	1015 (68.7)	463 (31.3)			
Age (in years)	10 - 14	980	671 (68.5)	309 (31.5)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.828
	15 - 19	314	200 (63.7)	114 (36.3)	1	1	
	20 - 24	184	144 (78.3)	40 (21.7)	1.2 (1.1-1.4)	1.1 (1.0-1.3)	0.168
Education	Out of school	427	297 (69.6)	130 (30.4)	1.1 (1.0-1.3)	1.0 (0.9-1.2)	0.560
	Primary	899	622 (69.2)	277 (30.8)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.632
	Secondary	152	96 (63.2)	56 (36.8)	1	1	
Referred By	Friend/Partner	37	22 (59.5)	15 (40.5)	1	1	
	Health Worker	216	164 (75.9)	52 (24.1)	1.3 (1.0-1.7)	1.2 (0.9-1.6)	0.207
	Community mobiliser	1032	694 (67.3)	338 (32.7)	1.1 (0.9-1.5)	1.1 (0.8-1.5)	0.453
	Others	139	106 (76.3)	33 (23.7)	1.3 (1.0-1.7)	1.1 (0.8-1.4)	0.849
Health Facility	Missing	54	29 (53.7)	25 (46.3)	0.9 (0.6-1.3)	1.1 (0.8-1.6)	0.345
	Mt Darwin	542	330 (60.9)	212 (39.1)	1	1	
	Lobengula MC	587	386 (65.8)	201 (34.2)	1.1 (1.0-1.2)	1.1 (1.0-1.3)	0.087
	Bulawayo MC	349	299 (85.7)	50 (14.3)	1.4 (1.3-1.5)	1.5 (1.3-1.7)	<0.001
HIV Status	Positive	6	5 (83.3)	1 (16.7)	1.2 (0.8-1.7)	1.1 (0.9-1.9)	0.117
	Negative	1472	1010 (68.6)	462 (31.4)	1	1	
Reasons for MC							
<i>HIV Prevention</i>	Yes	1230	865 (85.2)	365 (14.8)	1.2 (1.0-1.3)	1.1 (0.9-1.1)	0.800
	No	248	150 (60.5)	98 (39.5)	1	1	
<i>Sexual Pleasure</i>	Yes	248	158 (63.7)	90 (36.3)	0.9 (0.8-1.0)	0.9 (0.8-1.1)	0.593
	No	1230	857 (69.7)	373 (30.3)	1	1	
<i>STI Prevention</i>	Yes	736	523 (71.1)	213 (28.9)	1.1 (1.0-1.1)	1.1 (0.9-1.1)	0.980
	No	742	492 (66.3)	250 (33.7)	1	1	
<i>Hygiene</i>	Yes	1196	847 (70.8)	349 (29.2)	1.2 (1.1-1.3)	1.1 (1.0-1.2)	0.183
	No	282	168 (59.6)	114 (40.4)	1	1	

538	<i>Socio-cultural</i>	Yes	51	32 (62.8)	19 (37.2)	0.9 (0.7-1.1)	0.9 (0.7-1.1)	0.407
		No	1427	983 (68.9)	444 (31.1)	1	1	
	Circumcision[‡]	Not Eligible	17	3 (17.7)	14 (82.3)	1	1	
		Circumcised	1443	1003 (69.5)	440 (30.5)	3.9 (1.4-11)	2.9 (0.6-8.8)	0.062
	Circumciser[‡]	Not circumcised	18	9 (50.0)	9 (50.0)	2.8 (0.9-8.7)	2.5 (0.8-7.1)	0.142
		Nurse	1418	989 (69.8)	429 (30.2)	1.2 (0.9-1.8)	1.2 (0.8-1.8)	0.283
	Service delivery point[‡]	Doctors	25	14 (56.0)	11 (44.0)	1	1	
		Static	966	66 (65.8)	900 (34.2)	1	1	
	Day-2 follow-up^{‡£}	Outreach	477	367 (76.9)	110 (23.1)	1.2 (1.1-1.2)	1.2 (1.1-1.3)	<0.001
		Yes	1379	965 (70.0)	414 (30.0)	1.2 (1.0-1.4)		
	Day-7 follow-up[‡]	No	64	38 (59.4)	26 (40.6)	1		
		Yes	1025	732 (71.4)	293 (28.6)	1.1 (1.0-1.2)	0.9 (0.8-1.0)	0.070
539	Adverse event^{‡\$£}	No	418	271 (64.8)	147 (35.2)	1	1	
		Yes	26	11 (42.3)	15 (57.7)	1		
540		No	1417	992 (70.0)	425 (30.0)	1.7 (1.1-2.6)		

Abbreviations: ASRH-Adolescent Sexual Reproductive Health; STI-Sexually Transmitted Infection; HIV-Human Immunodeficiency Virus; RR-Relative Risk, CI-Confidence Interval

* Row percentage; # Using generalized linear model (Poisson regression); \$ Mild, Moderate and Severe were clubbed as 'Yes'; ‡ Applicable only for those who underwent circumcision; £ These factors were removed from the final model as they had variance inflation factor of more than 10

Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

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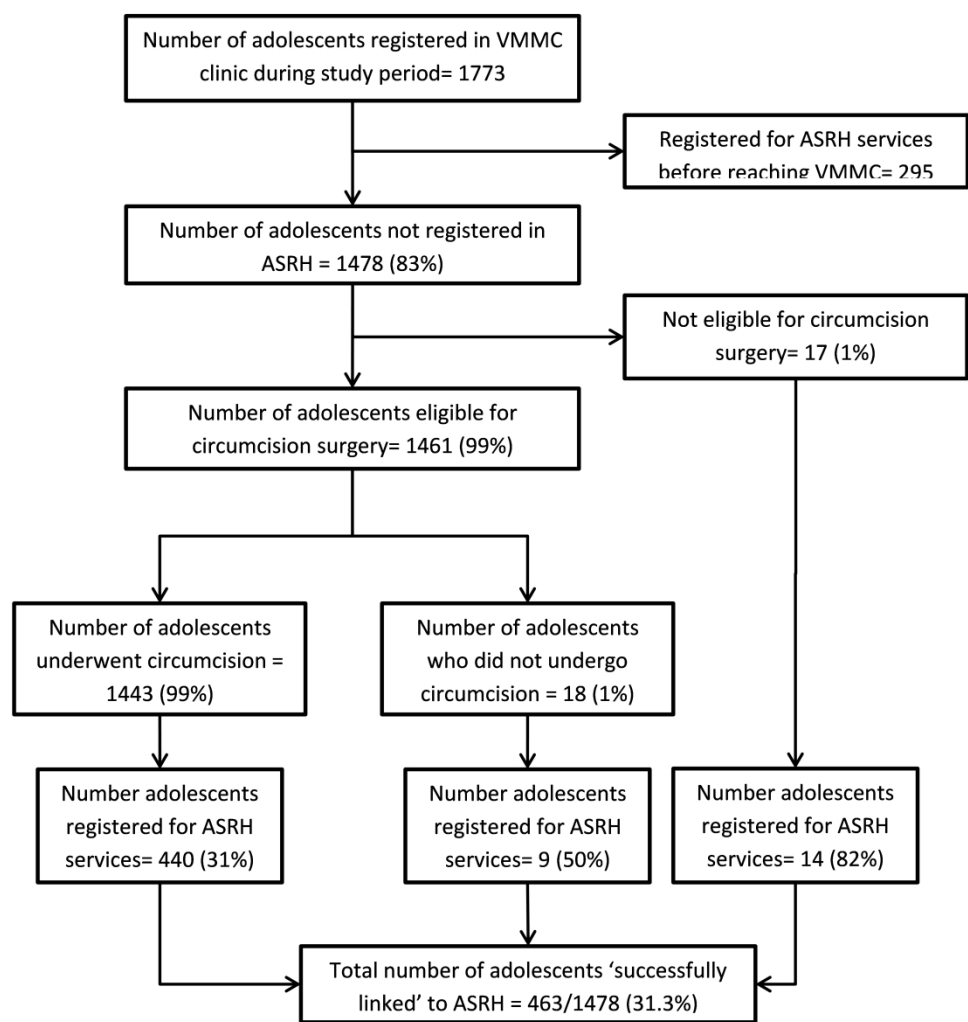


Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

1123x1193mm (96 x 96 DPI)

STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No (Line No)
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1(2-3)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3(38-67)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-7(85-145)
Objectives	3	State specific objectives, including any prespecified hypotheses	7(142-145)
Methods			
Study design	4	Present key elements of study design early in the paper	8(149-150)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	8-10(153-210)
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	10(213-216)
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Case-control study—For matched studies, give matching criteria and the number of controls per case	11(220-230)
		Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	11(231-234)
Bias	9	Describe any efforts to address potential sources of bias	11(237-240, 245-249)
Study size	10	Explain how the study size was arrived at	10(213-216)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11,12(241-244)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	11,12(241-249)
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	11(229-230)

		(d) Cohort study—If applicable, explain how loss to follow-up was addressed	
		Case-control study—If applicable, explain how matching of cases and controls was addressed	NA
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	

1	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the	19 (407-
2			present article is based	411)
3	<i>*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.</i>			
4	Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is			
5	best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/ , Annals of Internal Medicine at http://www.annals.org/ , and			
6	Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org .			
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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

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Secondary Subject Heading:	Global health, HIV/AIDS, Sexual health, Reproductive medicine, Epidemiology
Keywords:	HIV & AIDS < INFECTIOUS DISEASES, Adolescent Health, SORT IT, Operational Research, Sexual and Reproductive Health, Youth centres

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Linkage of Voluntary Medical Male Circumcision Clients to Adolescent Sexual and Reproductive Health (ASRH) services through Smart-LyncAges project in Zimbabwe: A cohort study

Manuscript Type: Research Article

Short Running Title: Linkage of VMMC clients to ASRH services in Zimbabwe

Investigators and affiliations

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ABSTRACT

Objectives: World Health Organization recommended strengthening the linkages between various HIV prevention programmes and Adolescent Sexual Reproductive Health (ASRH) services. The Smart-LyncAges project piloted in Bulawayo city and Mt Darwin district of Zimbabwe established a referral system to link the Voluntary Medical Male Circumcision (VMMC) clients to ASRH services provided at youth centres. Since its inception in 2016, there has been no assessment of the performance of the referral system. Thus, we aimed to assess the proportion of young (10-24 years) VMMC clients getting 'successfully linked' to ASRH services and factors associated with 'not being linked'.

Design: This was a cohort study using routinely collected secondary data.

Setting: All three VMMC clinics of Mt Darwin district and Bulawayo province.

Primary outcome measures: The proportion of 'successfully linked' was summarized as the percentage with a 95% confidence interval (CI). Adjusted relative risks (aRR) using a generalized linear model was calculated as a measure of association between client characteristics and 'not being linked'.

Results: Of 1773 young people registered for VMMC services, 1478 (83%) were referred for ASRH services as they had not registered for ASRH previously. Of those referred for ASRH services, the mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were out of school. Of the referred, 463 (31.3%, 95% CI- 30.0-33.8) were 'successfully linked' to ASRH services and the median (IQR) duration for linkage was 6 (0-56) days. On adjusted analysis, receiving referral from Bulawayo circumcision clinic (aRR-1.5 (95% CI-1.3-1.7)) and undergoing circumcision at outreach sites (aRR-1.2 (95% CI-1.1-1.3)) were associated with 'not being linked' to ASRH services.

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Conclusion: Linkage to ASRH services from VMMC is feasible as one-third VMMC clients were successfully linked. However, there is need to explore reasons for not accessing ASRH services and take corrective actions to improve the linkages.

Keywords: HIV prevention; Adolescent Health; Sexual and Reproductive Health; Youth centres; SORT IT; Operational Research

Article Summary:

Strengths and Limitations:

- First study to have assessed the extent of linkages with Smart-LyncAges project
- No selection bias as we included all the young people (10-24 years) who registered for circumcision services in the VMMC clinics of two project districts
- Routine programmatic data of large cohort was used and thus reflected the field realities in project implementation
- There might have been an underestimation in the proportion of young people ‘successfully linked’ to ASRH services as only those who produced referral slip from VMMC clinic were considered as ‘successfully linked’
- Study was conducted only during two months of the year and thus might have failed to account for seasonal variations in seeking ASRH services

89 INTRODUCTION

90 Young people (aged 10-24 years) are disproportionately affected by the Human
91 Immunodeficiency Virus (HIV) infection, with an estimated 3.9 million living with HIV
92 worldwide in 2017.[1,2] Globally, approximately 1600 youths acquire HIV every day and a
93 youth dies every 10 minutes because of AIDS-related illness.[1] In contrast to the decline in
94 HIV related death rates over the years in other age groups, there has been a rise among
95 young people.[3,4] About 84% of young people living with HIV are in Sub-Saharan Africa and
96 it is estimated that an additional 7.4 million young people might become infected with HIV
97 in Sub-Saharan Africa region alone by 2030.[5]

98 Unprotected sex is the most common route of HIV infection among young people
99 and is largely due to low knowledge of HIV, early sexual debut, multiple sexual partners, and
100 low condom use.[6] This highlights the need for comprehensive sexuality education (CSE) for
101 adolescents before they become sexually active. Realizing this, the United Nations General
102 Assembly Special Session (UNGASS) on HIV in 2001 recommended access to information,
103 youth-specific HIV education and life skills development to at least 95% of young people.[7]
104 Following this, most Sub-Saharan African countries implemented Adolescent Sexual and
105 Reproductive Health (ASRH) services. However, recent studies from this region have
106 reported poor utilization of ASRH services, with only about 21%-51% of adolescents
107 accessing it.[8,9] Acknowledging the importance and poor utilisation of ASRH services, the
108 World Health Organization (WHO) recommended strengthening the linkages between
109 various HIV prevention and ASRH programmes delivered through general health
110 services.[10]

111 Zimbabwe, a landlocked Sub-Saharan country, has a high burden of HIV, with an
112 estimated prevalence of 14% among people aged 15 to 49 years.[11] The country has ASRH

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indicators showing risky behaviours with about 40% girls and 30% of boys having sex before age eighteen and 62% of males aged 15-24 not using a condom in their last sexual encounter.[12] HIV prevalence in individuals aged 15–19 years was 3.7% and 4.6% for boys and girls, respectively. Among those 20-24 years, the HIV prevalence was 8% and 10.8% for boys and girls, respectively.[12,13] Thus, since 2009, Zimbabwe has implemented Voluntary Medical Male Circumcision (VMMC) and ASRH services as core strategies to limit the HIV burden in young people.

The ASRH programme implemented in 2010, involves the provision of CSE, life skills training, diagnosis and treatment of sexually transmitted infections (STIs) including HIV, family planning counselling, positive masculinity education, vocational training, library services, recreational games and empowerment on rights and responsibility.[14] The ASRH services are delivered at youth-friendly clinics or youth centres. There is anecdotal evidence that the majority of young people do not access ASRH services. Whereas, the VMMC programme implemented as part of an HIV prevention strategy has a high utilization rate.[15] By 2017, about 80% of young boys were covered under VMMC and have had unprecedented contact with the health system. However, the potential of VMMC services as a gateway to additional relevant ASRH services for young people has not been maximized.

The ASRH and VMMC programs have been implemented as two different vertical national health programs, not complementing each other in improving service utilization. In 2016, the WHO supported the Ministry of Health and Child Care to pilot the Smart-LyncAges project to identify approaches to sustain VMMC and improve the complementarity of both services. Through the project, cross-referral mechanisms were established wherein adolescent boys from VMMC are linked to ASRH programmes and vice versa. Though the Smart-LyncAges project has been piloted as a participatory learning approach since 2016,

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3 137 there is no quantitative information on the extent of successful linkage of clients between
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6 138 VMMC clinics and ASRH services. The information on the extent of successful linkage and
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8 139 factors associated with failure to linkage is necessary to address any deficiencies in the existing
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10 140 referral system prior to scale-up of the project countrywide. In this regard, the study aimed
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13 141 to assess the proportion of young people referred from VMMC clinics successfully linked for
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15 142 ASRH services and factors associated with 'not being linked' in the Smart-LyncAges pilot
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18 143 project sites in Zimbabwe.
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METHODOLOGY

Study Design:

This was a cohort study using routinely collected secondary data by the VMMC and ASRH programmes.

Study Setting:

General Setting:

Zimbabwe is a landlocked country in Sub Saharan Africa. The country is divided into ten administrative provinces and has a total of 62 districts. According to the Zimbabwe National Statistics Agency, the country had a projected population of 16,4 million in 2018 and 26% of the total population is adolescents and young adults.[16]

Specific Setting:

The study was conducted in the Bulawayo metropolitan province and Mt Darwin district of Mashonaland Central province, where the VMMC-ASRH linkages project was piloted. Bulawayo is Zimbabwe’s second-largest city and has a population of approximately 653,000.[16] Mt Darwin is one of seven districts in the Mashonaland Central province, with a population of about 213,000. In the district, the majority of the population resides in rural areas.

VMMC services and referral to ASRH

The VMMC programme functions under the National AIDS and TB unit with funding support from external sources, mainly The U.S. Presidents Emergency Plan for AIDS Relief (PEPFAR) and Bill and Melinda Gates Foundation (BMGF). The VMMC sites are supported by various non-governmental organizations (NGOs), which act as implementing partners

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3 169 facilitating service delivery and community mobilization. The Bulawayo Metropolitan
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6 170 province has two VMMC clinics and the Mount Darwin district has one clinic. The
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8 171 circumcision services are provided at static VMMC clinics and also through outreach clinics
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11 172 in the public health facilities.

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13 173 Demand generation for VMMC services is done through print and mass media
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15 174 advertisements, school health programmes, roadshows and music galas. At the community
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18 175 level, the community mobilizers, peer educators or health workers counsel and refer
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20 176 adolescents and young adults for VMMC clinics. The adolescents and young adults
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23 177 registered for ASRH services are also referred for VMMC. The referral is made to either
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25 178 static VMMC clinics or outreach clinics based on their convenience.

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27 179 Upon presentation at a VMMC clinic, the clients are registered with a unique VMMC
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30 180 ID number. The clerk documents the details in the 'client intake form'. During registration,
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33 181 the clerk issues the referral slip to all the clients who are not previously registered for ASRH
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35 182 services. The clients are advised to register themselves for ASRH services in their preferred
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37 183 youth centre and referral slip is provided. The referral slip is created in triplicate, one slip
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40 184 given to the adolescent, one maintained in the referral file at the VMMC clinic and the other
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42 185 slip sent to the peer-educator of the service area from where the adolescent has come.

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44 186 A nurse counsellor offers group education and individual counselling to clients
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47 187 registered for VMMC. During counselling, the importance of registering for ASRH services is
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50 188 emphasized. The nurse counsellors highlight the various ASRH services present in the youth
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52 189 centres and also provide detailing on the benefits of enrolling for ASRH services at youth
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55 190 centres. The nurse counsellors provide HIV testing and a pre-operation examination to
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57 191 assess the eligibility for circumcision surgery. Those adolescents with diabetes, keloids and
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59 192 haemophilia are considered not eligible for surgery. Among those eligible for surgery, either

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dorsal slit or forceps guided procedure is performed by either a trained and qualified nurse circumciser or doctor surgeon. Clients are advised to make follow-up visits on day-2 and day-7 after the procedure. All the details on surgery, follow-up and adverse events are recorded in the ‘client intake form’.

ASRH services and registration

The ASRH services are provided at the youth centres. The Bulawayo metropolitan province has seventeen youth centres and the Mount Darwin district has two youth centres. Each youth centre is staffed with a youth health advisor (a registered general nurse), a youth facilitator/recreational officer (a social worker) and five peer educators.

Upon arrival at the youth centres, the VMMC clients submit their VMMC-ASRH referral slips. The youth facilitator/recreational officer registers the adolescents for ASRH services and documents the VMMC ID number in the VMMC-ASRH linkages register. The services received by the adolescent during their initial visit are documented in the VMMC-ASRH linkage register. The referral slip received from the adolescent is stored in the referral box maintained at the youth centre.

Study Population:

All adolescents and young adults (10-24 years) registered in VMMC clinics of Mt Darwin district and Bulawayo city during October and November 2018 were included in the study. Those who were previously registered for ASRH services prior to accessing VMMC services were excluded. The sample size was not calculated and there was no sampling as all the adolescents and young adults in both the pilot districts of the Smart-LyncAges project during study reference period were included.

Data Variables, sources of data and data collection:

217 We extracted details including VMMC identification number, age, education status,
218 mode of referral to VMMC clinic, type of VMMC clinic, HIV status, date of referral to ASRH
219 services, date of registration at VMMC, reason for circumcision, eligibility for circumcision,
220 circumcision status, method of circumcision, status of day-2 post-op visit, status of day-7
221 post-op visit and adverse events following circumcision within 42 day from the VMMC
222 'client intake form' maintained at VMMC clinic. The details on registration and date of
223 registration for ASRH services were extracted from the VMMC-ARSH linkage register
224 maintained at youth centres. The information on registration for ASRH services extracted
225 from the VMMC-ARSH register was validated using the referral slips maintained in the
226 referral box of youth centres. Those individuals linked for ASRH services within three
227 months of receiving referral slip were considered as 'successfully linked' to ASRH services.

228 The data was extracted in March 2019 using two separate structured data extraction
229 proformas designed to extract data from VMMC 'client intake form' and VMMC-ARSH
230 linkage register. Thus, for each of the study participants registered during October and
231 November 2018, the linkage status was ascertained only after a minimum of 90 days of
232 follow-up. The principal investigator field-tested data extraction proformas and modified
233 them before data extraction.

235 **Data entry and analysis:**

236 Data were double entered and validated using EpiData Entry software (EpiData
237 Association, Odense, Denmark). Two separate data entry structures were used to enter data
238 from two proformas. The two data structures were then merged using the unique 'VMMC ID
239 number'. The final merged data file was used for analysis.

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Data were analyzed using Stata version 12.0 (STATA Corp., College, TX, USA). Socio-demographic, HIV status and clinical characteristics were summarized using percentages. The age of the participants was summarized with mean and standard deviation (SD). The proportion of participant ‘successfully linked’ to ASRH was summarized as percentages with 95% confidence interval. The duration between referral to ‘successfully linked’ to ASRH was summarized with median and inter-quartile range (IQR).

The association between socio-demographic and baseline clinical characteristics with ‘not being linked’ for ASRH service was assessed using bivariate log-binomial regression. A generalized linear model (Poisson regression) with robust variance estimates was used for multivariate regression as the log-binomial model did not converge.[17,18] Initially, all the variables with p value<0.25 in the bivariate model was included in the multivariate model. Later, the variables with a variance inflation factor of more than ten were removed from the final model and adjusted relative risks (aRR) with 95% CI were expressed as measure of association.

Ethics Approval:

The ethics approval was obtained from the Medical Research Council of Zimbabwe (MRCZ/E229) and Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France (58/18). Permission was sought from the Ministry of Health and Child Care program officials for extracting the routine data collected at VMMC and ASRH centres.

A data sharing statement:

Technical appendix, statistical code, and dataset available from the

<https://www.dropbox.com/sh/cm03olkw3qj8j4x/AAArNAzjweJ1iw0UHq86JIFwa?dl=0>

Patient and Public Involvement:

Principal Investigator and the data collectors did not interact directly with the young people availing services from VMMC clinics during this retrospective record review. The PI worked with the healthcare staff and peer educators of both the VMMC and ASRH clinics included in the study. Findings from this study will help the Smart-LyncAges project to assess the performance in linkages and also gives insight on deficiencies to be fixed prior to country wide scale-up.

RESULTS

In total, 1773 young people (10-24 years) were registered for VMMC services during the study reference period. Of the total, 1478 (83%) had not been previously registered in the ASRH clinic and were included in the study. The mean (SD) age of study participants was 13.7 (4.3) years and 427 (28.9%) were out of school. Of the 1478 study participants, 1032 (69.8%) were referred for VMMC by community mobilizer and 1230 (83.2%) reported HIV prevention as the reason for seeking circumcision service. Of the total, 6 (0.3%) had HIV infection. The characteristics of study participants are depicted in **Table-1**.

Of the 1478 study participants, 1461 (99%) were eligible for circumcision surgery, of which, 1443 (99%) underwent circumcision (**Figure-1**). Of those who underwent circumcision, 477 (33.1%) had the surgery performed at an outreach site. Of the 1443 participants, 1379 (95.6%) and 1025 (71%) attended day-2 and day-7 review visits, respectively. In total, 20 (1.4%) developed mild adverse events following circumcision and 3 (0.2%) each developed moderate and severe adverse events (**Table-2**).

Of the 1478 study participants referred for ASRH services, 463 (31.3%, 95% CI-29.0%-33.8%) successfully linked for ASRH services at 'youth centre' within three months of referral (**Figure-1**). Among those who were successfully linked, the median (IQR) duration from referral to getting linked at 'youth centre' was 6 (0-56) days. On adjusted analysis, referral from Bulawayo circumcision clinic (aRR-1.5 (95% CI-1.3-1.7)) and undergoing circumcision at outreach sites (aRR-1.2 (95% CI-1.1-1.3)) were associated with not being linked for ASRH services after referral from circumcision clinic. The AIC and BIC of the model were 2799.2 and 2926.3, respectively. The LR test was significant compared to constant model (p value= 0.014). The association between participant's characteristics and not being linked is shown in **Table-3**.

DISCUSSION

This is the first study assessing the extent of successful referral among adolescents and young men between VMMC clinics and ASRH services under the Smart-LyncAges project implemented in Zimbabwe. About 31% of young males (10-24 years) referred from VMMC clinics successfully linked to ASRH services at youth centres within three months of referral. Young people referred from the outreach sites and Bulawayo male circumcision clinic had significantly higher rates of not being linked for ASRH services.

Globally, there is limited literature on linkages between various HIV preventive strategies like VMMC services and ASRH services. A study from Zambia reported that, with enhanced counselling and referral from the community, uptake of ASRH services like HIV testing and counselling, family planning counselling and VMMC services was less than 20% within six months.[19] Also, previous reviews have reported that demand generation activities in the community, improving accessibility and quality of ASRH services, improve ASRH related knowledge but may not increase the utilization of specific ASRH services.[20–22] The potential reason for under-utilization is that the preventive strategy like ASRH may not be considered as an immediate need by young people.[22–24] Considering this, the successful linkage (uptake) of about one in three of the VMMC clients to ASRH services through the Smart-LyncAges project (as they produced referral slips) is promising.

The clients referred from the Bulawayo MC clinic had a slightly higher risk of not being linked to ASRH services. A potential reason for this finding is that the MC clinic is situated in the eastern suburbs of the city where people of high socio-economic status reside. All the fifteen youth centres were located in western suburbs, which are largely populated with people from low socio-economic status. It is possible that the recreational activities available under ASRH services do not appeal to the technologically savvy urban

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3 321 youths from the elite suburbs. Furthermore, distance to youth centres might have limited
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6 322 the clients from the eastern suburbs to go and register for ASRH services. Similarly, clients
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8 323 accessing VMMC services at outreach clinics were not being linked to ASRH services. The
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10 324 focus of outreach clinics is to conduct surgery in hard to reach areas. Though the referral
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13 325 slips were issued, there would not be space and time to counsel on ASRH services
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15 326 comprehensively. Also, the youth centres in Mt Darwin were mainly located in district
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17 327 centres and might not be accessible to clients of outreach clinics conducted in hard to reach
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20 328 areas. Thus, though not assessed objectively, there might be a rural-urban divide in linkages.
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23 329 Although the actual numbers were small, a high proportion of clients ineligible for
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25 330 circumcision or experiencing an adverse event were referred and successfully linked,
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27 331 suggesting they have additional service needs.

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30 332 The study had several strengths. First, the study was conducted within the routine
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32 333 programmatic setting, reflecting the field realities and using routine data. Second, all the
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34 334 young males attending the VMMC clinics during the study reference period were included
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37 335 and thus, there was no sampling bias. Third, the study had a large sample size and thus, the
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40 336 estimate of 'successfully linked' was precise. Fourth, the continuous supportive supervision
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42 337 was rendered during the study period to ensure completeness in recording under the
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44 338 project setting and thus, the 'missing data' was limited. Fifth, the registration for ASRH
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47 339 services was validated by cross-checking the stored referral slips along with information
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50 340 extracted from the VMMC-ASRH linkage register and thus, it enhanced the validity of the
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52 341 outcome ascertainment. Sixth, the STrengthening the Reporting of OBservational Studies in
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54 342 Epidemiology (STROBE) guidelines was used to report the study findings.[25]

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57 343 The study had a few limitations. First, the registration for ASRH services was
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59 344 ascertained based on the VMMC-ASRH linkage register. Only those who produced VMMC
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3 345 referral slips during registration were listed in the VMMC-ASRH register. Thus, those
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6 346 participants who might have missed their referral slips before registration for ASRH services
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8 347 could have been misclassified as 'not linked'. This could have led to the underestimation of
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10 348 the percentage of 'successfully' linked. Second, the study was conducted only during two
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13 349 months of the year and thus failed to account for seasonal variations in seeking services.
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15 350 During the festive month of December, the youth centres were closed due to holidays. Also,
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17 351 during December, the youth centres in the Mt Darwin region were closed for two weeks due
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20 352 to the cholera outbreak in the region. There might have been an underestimation of
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23 353 'successfully' linked due to the non-functioning of youth centres during the study follow-up
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25 354 period. However, as there are no estimates of the extent of underestimation, we failed to
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28 355 account for it in estimating the percentage of successfully linked. Third, the pathways for
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30 356 seeking ASRH services and the contribution of peer-educators in reaching the ASRH services
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33 357 were not assessed. Thus, the study failed to document the pathways with the highest
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35 358 successful linkage rate, which could have helped in replicating the model elsewhere. Fourth,
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37 359 the potential confounders like distance from youth centres, socio-economic status, parents'
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40 360 willingness and adolescents' willingness were not captured and included in the adjusted
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42 361 analysis. The inclusion of these variables could have improved the validity of the model.
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45 362 Fifth, the study represents select group of young people who came for VMMC clinics in the
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47 363 project pilot districts. Thus, the generalizability of the study results is limited. Lastly, the
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50 364 study did not explore the reasons for not being linked to ASRH services among those
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52 365 referred.

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54 366 The study has a few programmatic implications and recommendations. First, the
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56 367 percentage of 'successfully linked' between VMMC clinics and ASRH services was promising.
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59 368 The Smart-LyncAges project can be scaled up to improve the utilization of ASRH services.
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369 However, there is a need for qualitative research to explore the facilitators and barriers to
370 getting linked to ASRH services. This information can help to improve the linkages and
371 effectiveness of the programme.

372 Second, with the existing records maintained under the project, cohort monitoring
373 of the performance of the referral system was feasible. The ‘proportion of those referred
374 from the facility successfully linked for ASRH services’ can be introduced as an indicator in
375 the monthly report of each VMMC clinic. This would enable the programme managers to
376 monitor the performance of the referral system better than the absolute number of
377 referred and linked, which is currently being monitored.

378 Third, the young adolescents seeking VMMC services from outreach clinics at
379 peripheral public health facilities were not getting linked for ASRH services, implying the
380 distance to youth centres was a potential barrier. Solutions should be person-centred, such
381 as co-location of ASRH and VMMC services, improved accessibility with services
382 decentralized to peripheral public health facilities and enhanced training of existing general
383 health staff to deliver youth-friendly services.

384 Fourth, about 70% of clients came back to avail follow-up services on day-7 post
385 circumcision. This opportunity can be used to educate further and to reinforce the
386 importance of ASRH services. The clients might be more responsive to the information since
387 the circumcision procedure is already completed.

388
389 **CONCLUSION**

390 The rate of young males referred from VMMC clinics and successfully linked to ASRH
391 services was promising. Those referred from the outreach sites and clinics in Bulawayo had
392 significantly higher rates of ‘not being linked’. However, there is a need to explore the

reasons for clients not accessing the ASRH services and take corrective actions to improve the linkages.

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study design, data collection and analysis, decision to publish, or preparation of the manuscript.

AUTHOR CONTRIBUTION

TM was the principal investigator; PT and KT were the SORT IT course mentors; OM, WA, JS, SX and GN were the senior authors. TM, NZ, AM, SM, TT, and RM were involved in data collection; TM, PT and KT analyzed the data and prepared the first draft of the paper. All authors were involved in conception, design, inference of results, providing critical review and approval of the final manuscript.

DISCLOSURE STATEMENT

None of the authors have any competing interests.

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Table 1: The demographic characteristics, reason for circumcision and HIV status of adolescents and young adults registered for VMMC services during October and November, 2018 in selected health facilities of Zimbabwe, N=1478

Characteristics	Categories	Frequency	(%)
Total		1478	(100)
Age (in years)	10-14	980	(66.3)
	15-19	314	(21.2)
	20-24	184	(12.3)
Education status	Out of school	427	(28.9)
	Primary education	899	(60.8)
	Secondary education	152	(10.3)
Health facility	Mt Darwin	542	(36.7)
	Lobengula MC clinic	587	(39.7)
	Bulawayo MC clinic	349	(23.6)
Referred by*	Friend or partner	37	(2.5)
	Health worker	216	(14.6)
	Community mobilizer	1032	(69.8)
	Others	139	(9.4)
	Missing	54	(3.7)
Reasons for circumcision[#]	HIV prevention	1230	(83.2)
	Sexual pleasure	248	(16.8)
	STI Prevention	736	(49.8)
	Hygiene	1196	(80.9)
	Socio-cultural reasons	51	(3.5)
HIV status	Positive	6	(0.3)
	Negative	1472	(99.7)

Abbreviation: HIV- Human Immunodeficiency virus; VMMC- Voluntary Medical Male Circumcision; MC- Male Circumcision; STI- Sexually Transmitted Infection

* The person who referred the client to VMMC clinic

[#] Multiple responses are possible

Table 2: The surgical and follow-up details of adolescents and young adults who underwent circumcision during October and November, 2018 in selected male circumcision clinics of Zimbabwe, N=1443

Characteristics	Categories	Frequency	(%)
Total		1443	(100.0)
Method of circumcision	Dorsal slit	1439	(99.7)
	Forceps Guided	4	(0.3)
Service delivery point*	Static site	966	(66.9)
	Outreach site	477	(33.1)
Circumciser#	Nurse practitioner	1418	(98.3)
	Doctor	25	(1.7)
Attended post-op day-2	Yes	1379	(95.6)
	No	64	(4.4)
Attended post-op day-7	Yes	1025	(71.0)
	No	418	(29.0)
Adverse event	None	1417	(98.2)
	Mild	20	(1.4)
	Moderate	3	(0.2)
	Severe	3	(0.2)

* The circumcision in VMMC clinics are considered as static sites. The circumcision done at other public health facilities in a camp mode by staff of VMMC clinics are considered as outreach sites

Circumciser is the one who conducted the circumcision

Table 3: Demographic, HIV status and surgical characteristics associated with not getting linked for ASRH services within 3 months of referral from the selected VMMC health facilities in Zimbabwe, October and November 2018.

Characteristic	Category	Total	Not linked to ASRH, n (%) [*]	Linked to ASRH, n (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI) [#]	p value
Total		1478	1015 (68.7)	463 (31.3)			
Age (in years)	10 - 14	980	671 (68.5)	309 (31.5)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.828
	15 - 19	314	200 (63.7)	114 (36.3)	1	1	
	20 - 24	184	144 (78.3)	40 (21.7)	1.2 (1.1-1.4)	1.1 (1.0-1.3)	0.168
Education	Out of school	427	297 (69.6)	130 (30.4)	1.1 (1.0-1.3)	1.0 (0.9-1.2)	0.560
	Primary	899	622 (69.2)	277 (30.8)	1.1 (1.0-1.2)	1.0 (0.9-1.2)	0.632
	Secondary	152	96 (63.2)	56 (36.8)	1	1	
Referred By	Friend/Partner	37	22 (59.5)	15 (40.5)	1	1	
	Health Worker	216	164 (75.9)	52 (24.1)	1.3 (1.0-1.7)	1.2 (0.9-1.6)	0.207
	Community mobiliser	1032	694 (67.3)	338 (32.7)	1.1 (0.9-1.5)	1.1 (0.8-1.5)	0.453
	Others	139	106 (76.3)	33 (23.7)	1.3 (1.0-1.7)	1.1 (0.8-1.4)	0.849
Health Facility	Missing	54	29 (53.7)	25 (46.3)	0.9 (0.6-1.3)	1.1 (0.8-1.6)	0.345
	Mt Darwin	542	330 (60.9)	212 (39.1)	1	1	
	Lobengula MC	587	386 (65.8)	201 (34.2)	1.1 (1.0-1.2)	1.1 (1.0-1.3)	0.087
	Bulawayo MC	349	299 (85.7)	50 (14.3)	1.4 (1.3-1.5)	1.5 (1.3-1.7)	<0.001
HIV Status	Positive	6	5 (83.3)	1 (16.7)	1.2 (0.8-1.7)	1.1 (0.9-1.9)	0.117
	Negative	1472	1010 (68.6)	462 (31.4)	1	1	
Reasons for MC							
<i>HIV Prevention</i>	Yes	1230	865 (85.2)	365 (14.8)	1.2 (1.0-1.3)	1.1 (0.9-1.1)	0.800
	No	248	150 (60.5)	98 (39.5)	1	1	
<i>Sexual Pleasure</i>	Yes	248	158 (63.7)	90 (36.3)	0.9 (0.8-1.0)	0.9 (0.8-1.1)	0.593
	No	1230	857 (69.7)	373 (30.3)	1	1	
<i>STI Prevention</i>	Yes	736	523 (71.1)	213 (28.9)	1.1 (1.0-1.1)	1.1 (0.9-1.1)	0.980
	No	742	492 (66.3)	250 (33.7)	1	1	
<i>Hygiene</i>	Yes	1196	847 (70.8)	349 (29.2)	1.2 (1.1-1.3)	1.1 (1.0-1.2)	0.183
	No	282	168 (59.6)	114 (40.4)	1	1	

539	<i>Socio-cultural</i>	Yes	51	32 (62.8)	19 (37.2)	0.9 (0.7-1.1)	0.9 (0.7-1.1)	0.407
		No	1427	983 (68.9)	444 (31.1)	1	1	
	Circumcision[‡]	Not Eligible	17	3 (17.7)	14 (82.3)	1	1	
		Circumcised	1443	1003 (69.5)	440 (30.5)	3.9 (1.4-11)	2.9 (0.6-8.8)	0.062
	Circumciser[‡]	Not circumcised	18	9 (50.0)	9 (50.0)	2.8 (0.9-8.7)	2.5 (0.8-7.1)	0.142
		Nurse	1418	989 (69.8)	429 (30.2)	1.2 (0.9-1.8)	1.2 (0.8-1.8)	0.283
	Service delivery point[‡]	Doctors	25	14 (56.0)	11 (44.0)	1	1	
		Static	966	66 (65.8)	900 (34.2)	1	1	
	Day-2 follow-up^{‡£}	Outreach	477	367 (76.9)	110 (23.1)	1.2 (1.1-1.2)	1.2 (1.1-1.3)	<0.001
		Yes	1379	965 (70.0)	414 (30.0)	1.2 (1.0-1.4)		
	Day-7 follow-up[‡]	No	64	38 (59.4)	26 (40.6)	1		
		Yes	1025	732 (71.4)	293 (28.6)	1.1 (1.0-1.2)	0.9 (0.8-1.0)	0.070
	Adverse event^{‡££}	No	418	271 (64.8)	147 (35.2)	1	1	
		Yes	26	11 (42.3)	15 (57.7)	1		
		No	1417	992 (70.0)	425 (30.0)	1.7 (1.1-2.6)		

Abbreviations: ASRH-Adolescent Sexual Reproductive Health; STI-Sexually Transmitted Infection; HIV-Human Immunodeficiency Virus; RR-Relative Risk, CI-Confidence Interval

* Row percentage; # Using generalized linear model (Poisson regression); \$ Mild, Moderate and Severe were clubbed as 'Yes'; ‡ Applicable only for those who underwent circumcision; £ These factors were removed from the final model as they had variance inflation factor of more than 10

Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

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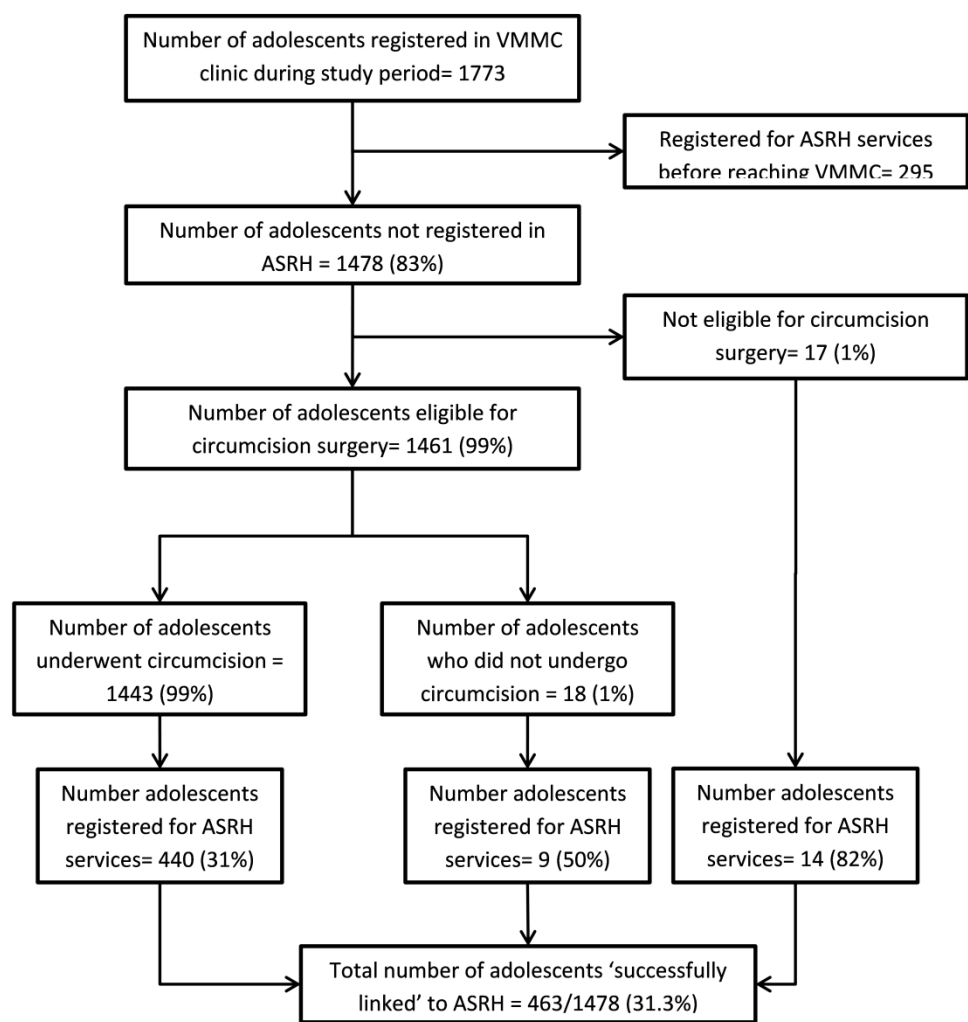


Figure-1: Flow-chart depicting the adolescents eligible for referral to ASRH services, circumcision status and linkage to ASRH services among those registered at selected VMMC clinics of Zimbabwe during October to November 2018

Abbreviation: VMMC- Voluntary Medical Male Circumcision; ASRH- Adolescent Sexual Reproductive Health

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STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No (Line No)
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1(2-3)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3(38-67)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-7(85-145)
Objectives	3	State specific objectives, including any prespecified hypotheses	7(142-145)
Methods			
Study design	4	Present key elements of study design early in the paper	8(149-150)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up and data collection	8-10(153-210)
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	10(213-216)
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Case-control study—For matched studies, give matching criteria and the number of controls per case	11(220-230)
		Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	11(231-234)
Bias	9	Describe any efforts to address potential sources of bias	11(237-240, 245-249)
Study size	10	Explain how the study size was arrived at	10(213-216)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11,12(241-244)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	11,12(241-249)
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	11(229-230)

		(d) Cohort study—If applicable, explain how loss to follow-up was addressed	
		Case-control study—If applicable, explain how matching of cases and controls was addressed	NA
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	

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1	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the	19 (407-
2			present article is based	411)
3	<i>*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.</i>			
4	Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is			
5	best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/ , Annals of Internal Medicine at http://www.annals.org/ , and			
6	Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org .			
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