

Differences in Adverse Events Related to Voluntary Male Medical Circumcision Between Civilian and Military Health Facilities in Uganda

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Keywords: Voluntary Male Circumcision, Military camps, Civilian, Adverse events

Posted Date: May 25th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-536381/v1>

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Title page

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24 **Abstract**

25 **Background:** Voluntary medical male circumcision (VMMC) significantly reduces the risk of
26 acquiring HIV in men. Despite the percentage of circumcised men (15-49 years) in Uganda
27 increasing over time, some populations are not taking up the surgical procedure. The
28 government of Uganda and implementing partners have responded to this lack of VMMC
29 coverage among key populations by intensifying introducing innovative strategies that increase
30 demand particularly among military personnel using the WHO's MOVE strategy. As a surgical
31 intervention, it is critical that VMMC services are safe for clients and that adverse events or
32 complications are minimized. This paper describes the prevalence and trends of adverse events
33 reported among military mobile camps in comparison to civilian sites in Uganda.

34 **Methods:** A prospective study conducted in eighteen (18) public health facilities between
35 March and August 2019. Of these nine (9) were providing care to civilian populations while
36 nine (9) served the military population and catchment areas. Descriptive statistics, Chi-square
37 test and trends analysis were carried out to describe profile of advance events among civilian
38 and military facilities over the study period.

39 **Results:** The highest proportions of VMMC were done among persons aged 15 to 19 years
40 whereas among military camps the highest proportions of circumcision among males aged 20
41 to 24 years. Regarding site of circumcision, the highest proportions of VMMC were done at
42 outreaches, with higher levels in military camps compared to civilian camps. For the
43 proportions of adverse events reported, higher proportions were reported in civilian camps
44 compared to military camps (Total – 1.3% vs 0.2%; p- value<0.05). For trends analysis, results
45 indicate that there was no statistically significant trend for both civilian and military number
46 of adverse events reported for the four quarters in 2020 (P-value =0.315 for civilian and
47 P=0.094 for the military).

48 **Conclusions:** The MOVE model is great for scaling up VMMC in specialized populations such
49 as military. Can also be adapted in other populations if contextual bottlenecks are identified
50 and collectively addressed by key stakeholders – leadership, community engagement and using
51 a largely horizontal approach offer promising possibilities and outcomes.

52 **Key words:** Voluntary Male Circumcision, Military camps, Civilian, Adverse events

53

54 **Background**

55 Voluntary medical male circumcision (VMMC) significantly reduces the risk of acquiring HIV
56 in men (1-9) and for every circumcision there is a reduction of male to female sexual
57 transmission of HIV by approximately 60% (10, 11). VMMC is associated with several health
58 benefits such as reducing the risk of contracting genital ulcers, syphilis, penile cancer, human
59 papillomavirus (HPV), herpes simplex virus (HSV) and cancrion (12, 13).

60 Given that the Southern and Eastern African countries have been severely affected by the HIV
61 epidemic, prevention and treatment services remain significant public health priorities [19].

62 Uganda is a priority country for VMMC scale-up, with HIV prevalence among adults at 6.2%,
63 7.6% among women and 4.7% among men in 2016; corresponding to approximately 1.2
64 million adults living with HIV (14). Despite, the percentage of circumcised men (15-49 years)
65 in Uganda increasing from 24% in 2006 to 27% in 2011 and 46% in 2016 (15, 16); of these,
66 18% are circumcised by traditional practitioners or family friends and 22% by a health
67 professional (15, 16) so there is still need to scale up VMMC (12) to reduce new infections.

68 The Government of Uganda and implementing partners have responded to this lack of VMMC
69 coverage by intensifying introducing innovative strategies that increase demand especially for
70 previously unreach populations or hard-to-reach people (6). The Ministry of Health (MOH)
71 formally endorsed VMMC as an effective HIV prevention strategy in 2010 and set a goal of
72 circumcising 4.2 million Ugandans by 2015.

73 Health systems in developing countries, Uganda inclusive, are fragile and faced with multiple
74 bottlenecks which constrain their ability to provide optimum quality VMMC services or their
75 scale up. To cover the unmet need and cognizant of LMIC health system challenges the WHO,
76 in 2010, recommended the model of optimizing volume and efficiency (MOVE) of male
77 circumcision services (17). The MOVE model advocates for a task-shifting and task-sharing
78 approach; whereby task-shifting refers to the use of non-physician providers to complete all

79 steps of male circumcision surgery. This allows the operator (or surgeon) to focus on the most
80 technically complex components of the surgery. In task-shifting and task-sharing models,
81 surgical activities are reassigned, where appropriate, from those providers qualified for such
82 interventions, e.g. physicians, to other appropriately trained and competent healthcare
83 providers, e.g. clinical officers and nurses (17).

84 The Uganda military was targeted for VMMC scale-up utilizing the MOVE model because
85 they are characterized as a key population due to the mobile nature of their work. Although the
86 exact HIV prevalence rate for the military is unknown, it is estimated that key populations have
87 a high prevalence between 15% - 37%, much higher than that of the general population at 6.2%
88 (18). World Health Organization (WHO) and Joint United Nations Programme on HIV/AIDS
89 (UNAIDS) recommend that regions with high prevalence rates must implement voluntary
90 medical male circumcision (VMMC) to scale down the transmission of HIV (10, 13). This
91 clearly indicated the military as a key population to target for VMMC programs.

92 As a surgical intervention, it is critical that VMMC services are safe for clients and that adverse
93 events or complications are minimized. There is limited information on adverse events
94 following VMMC for Uganda; however, various studies have shown the rate of adverse events
95 to be in the range of 2.1% (19) to 3.6% (20). Adverse events rates as high as 7.5% have been
96 reported among clients actively followed up after circumcision in Kenya (21). Even with a
97 skilled surgical team, adverse events occur and when they do, it is essential that they are quickly
98 identified and properly managed (22). The Ministry of Health (MOH) in Uganda has developed
99 a scale to guide male circumcision surgical teams in grading the severity of various types of
100 adverse events (23) in addition to data capture tools in which to record adverse events.
101 Management of voluntary medical male circumcision by surgery or device adverse events
102 requires knowledge of classification and adverse events may be classified according to type,
103 timing of their occurrence since male circumcision surgery and severity (22). The adverse

104 events may be managed locally on site of the VMMC service delivery or referred to a higher-
105 level health facility or to a specialist for further management for adverse events related to
106 partial or complete amputation of the glans or shaft; resulting in permanent disability; and
107 resulting in permanent anatomic deformity.

108 Timely and proper management of VMMC adverse events is very crucial for the attainment of
109 the set goals of VMMC to prevent HIV and STI. There is little known about adverse rates
110 reported among the various projects implementing VMMC programs in different populations
111 and contexts. This paper describes the prevalence and trends of adverse events reported among
112 military mobile camps in comparison to civilian sites in Uganda.

113 **Methods**

114 **Study aim:**

115 To describes the prevalence and trends of adverse events reported among military mobile
116 camps in comparison to civilian sites in Uganda.

117 **Study Sites**

118 The study took place in eighteen (18) public health facilities. Of these nine (9) were providing
119 care to civilian populations while nine (9) served the military population and catchment areas.
120 The health facilities are located in all regions of Uganda. These sites were selected for the
121 scale-up because they met the minimum standards for providing safe VMMC including that
122 appropriate VMMC outreach/mobile sites must: be co-located or close to a health facility; have
123 sufficient space for comprehensive VMMC services; have water, electricity, and sewerage
124 systems; have an unmet need for HIV prevention and population interest in VMMC; be
125 geographically distributed and accessible; have normal transit patterns; located on a public
126 transportation route, within 45 minutes of healthcare team accommodations and have
127 reasonable security (17, 24).

128

129 Civilian health facilities:. Just like the military facilities, nine facilities were picked from the
130 civilian facilities - three (3) from each of the regions and at the same level as the military
131 facilities. Data was picked from three regions of the country - Central, Northern and Western
132 regions. In each region three facilities were picked based on Uganda's hierarchical health
133 system arrangement. They consisted of one Health Centre III, one Health Centre IV and one
134 hospital.

135 **Study Population**

136 Participants included in this study were males aged 10 years and above. All persons included
137 in the VMMC program provided consent prior to being circumcised. Parental assent was
138 provided for all children aged less than 18 years.

139 **Definitions**

140 **Adverse event:** Any injury, harm, or undesired outcome that occurred during or following a
141 clinical procedure, such as the male circumcision procedure, that would not have occurred if
142 the client had not undergone the procedure at that time.

143 **Voluntary Medical Male Circumcision:** Surgical removal of the foreskin of the penis.

144 **The Intervention**

145 This paper is based on the University Research Council - Department of Defence HIV/AIDS
146 Prevention Program (URC-DHAPP) implemented in military populations between March and
147 June 2019. URC-DHAPP is providing technical assistance and direct support to the Uganda
148 People's Defence Forces (UPDF) to scale-up the military ART program and achieve the
149 UNAIDS 90-90-90 goals (90% of people with HIV diagnosed, 90% of those diagnosed on
150 antiretroviral treatment (ART), and 90% of those on ART virally suppressed by 2020). The
151 program involves HIV testing, treatment and care services to reduce the HIV burden and ensure

152 a healthy Ugandan military. The program adapted the MOVE model in its implementation of
153 interventions to scale up VMMC services among soldiers, their families and neighbouring
154 communities (17). The target was to reach 20,200 males within the catchment populations. The
155 Uganda Peoples Defence Forces (UPDF) were selected because they are mobile populations
156 with higher HIV prevalence; also with less likelihood to be linked and adhere to antiretroviral
157 therapy (ART) (17, 25).

158 The leaders and VMMC teams systematically targeted areas previously without VMMC
159 services, including locations of recently recruited personnel. The military men were identified
160 systematically through assistance from military commanders who mobilized their teams.
161 Military men or clients eligible for VMMC were then mobilized by commanders and
162 voluntarily participated in the circumcision exercises.

163 We implemented a military-centered, persistently high-frequency community mobile VMMC
164 service which catered for soldiers, their families and surrounding communities. We adopted
165 the WHO models for optimizing the volume and efficiency (MOVE) for male circumcision
166 services (13) which outlines considerations for improving efficiency while ensuring safety
167 taking into account the Uganda VMMC local national policy. Interventions were designed to
168 last two weeks at a time per month with a break to permit change/rotation and debrief of fresh
169 teams. Every team served a maximum period of two weeks at a time in a location.

170 **The Mobile VMMC Logistic Package**

171 The mobile VMMC logistic package – exclusive of consumables included in 3 16-seater vans,
172 3 lorry tracks. Each equipped with a tent, generator and conditioner units constituting 3 mobile
173 VMMC teams that delivered mobile VMMC services at 3 different selected outreach posts at
174 a time. Initiatives to scale up services were later adopted where innovatively; static health
175 facility sites were occasionally transformed into semi-mobile outreach sites to expand on the
176 volume of VMMC conducted. After three static health facilities with a functional theatre were

177 identified, a mobile VMMC team would be dispatched with all the required supplies to provide
178 services based on the MOVE model. Mobilisation efforts around the community served by the
179 clinic were increased to ensure clients sought services during that period. After the camps,
180 these facilities were expected to continue offering post-operation services to clients such as
181 follow up and managing of adverse events while they continued to offer routine static VMMC
182 services.

183 UPDF commanders requested for the services through their medical leadership which in turn
184 also requested VMMC programs from URC. In the end, several soldiers accessed preventive
185 services without needing them to move from their operation sites except during recovery
186 periods. The mobile nature of the VMMC program also increases coverage in line with
187 universal health coverage goals that cater for equity through the availability of service to those
188 who are in need irrespective of the population or geographical location (24).

189 Composition and roles of team members

190 We adopted the Aravind eye clinic (26) method to gain efficiency in the delivery of VMMC
191 surgical intervention for national public health impact on a large scale. The VMMC surgical
192 teams typically comprised of 12 military medical personnel. In locations where, mobile camps
193 were set up, the resident troop commanders in various parts of the country constituted the
194 surgical teams as jurisdiction leads for their territories. They were encouraged to mobilise their
195 troops, families and surrounding civilian community for the two-week long military led
196 VMMC surgical camps within their command areas.

197 **Circumcision Process**

198 The operational mobile tent surgical theatre move model was adopted: each theatre tent had a
199 minimum of three/four surgical beds for the two surgeons in each team, two surgical assistants
200 per surgical bed with a total of 10 lower cadres per team. The program adopted the forceps-

201 guided dorsal slit surgical method (ref) with each surgeon assisted by two assistants. After the
202 main operation, the surgeon inserted three sutures at 12, 3, 6 and 9 o'clock position, achieved
203 haemostasis and moved on to the next vacant surgical table. The surgical assistants completed
204 the incision sutures while monitoring clients for achievement of immediate post-surgical
205 haemostasis and moved on to the next surgeon while the patient was assisted to the immediate
206 post-operation observation area outside the surgical tent. Each surgical camp was linked to the
207 nearest MOH health facility for data reporting and referral of participants of any medium to
208 long term post-operative complications. Participants were given mobile phone numbers of
209 participating surgeons to report any immediate side effects while the team was in session and
210 referred to linked MOH health facility for medium- and long-term post-operation side effects.
211 All post-operative follow-up was patient initiated.

212 Sampled three sites for both civilian and military sites within the three regions of the country.
213 Each region consisted of three sites which are H/C III, H/C IV and a general or referral hospital.
214 Each for both civilian and military

215 **Extraction of Data**

216 Between March and August 2019, various records capturing the execution of mobile VMMC
217 in military settings were collected and stored at supporting health facilities with tertiary
218 aggregates stored at URC DHAPP program offices. Primary patient level data were collected
219 using Ministry of Health (MOH) data collection forms, aggregated and submitted to the linked
220 MOH health facility. Daily staff performance data in terms of number of males mobilised and
221 circumcised was collected, aggregated by the surgical team leads and delivered to the URC-
222 DHAPP program officer. The utility of micro-level program data in informing program
223 interventions in the current program was adopted from PEPFER 3.0 strategy (27) referred to
224 as “granular programming” within URC-DHAPP Uganda. The current paper uses data from

225 these multiple sources to describe the VMMC methods adopted at military health facilities and
226 served surrounding communities to assess the effectiveness of a military health service driven
227 mobile VMMC program in accelerating VMMC coverage.

228 Using the military and local government reporting systems, adverse events were identified, and
229 locally managed at military health facilities even after the circumcision camps close was
230 collected. The military leadership applies robust follow up mechanism at all administrative
231 levels. National VMMC data was extracted from (dhis2) for 14 military health facilities and
232 was compared with similar data from civilian health facilities over the period of October 2018
233 to September 2019.

234 **Statistical Analysis**

235 Descriptive statistics including frequencies and percentages, medians and interquartile ranges
236 (IQRs) for categorical and continuous variables respectively. Chi-square test or Fishers' exact
237 tests were used to test for associations between categorical variables, while Student's T-test
238 was used for assessing differences between normally distributed continuous variables. Chi
239 square tests for trend were used to test for trends. Statistical significance will set at the $P < .05$
240 level and all analyses were performed using Stata version 14 (StataCorp, College Station, TX,
241 USA).

242 **Results**

243 Results from Table 1 indicate that there were differences in age by region between civilian and
244 military camps in proportions of men circumcised. Overall and by region, in civilian camps,
245 the highest proportions of VMMC were done among persons aged 15 to 19 years whereas
246 among military camps the highest proportions of circumcision are among males aged 20 to 24
247 years, with significant camp differences noted by age (p - value <0.05).

248

249 **Table 1: Comparison of characteristics between participated in VMMC at Civilian and Military facilities by region**

	CENTRAL			WESTERN			NORTHERN			TOTAL		
	Civilian (N = 9266)	Military (N = 5158)	P value	Civilian (N = 2283)	Military (N = 3202)	P- value	Civilian (N = 2978)	Military (N = 2946)	P- value	Civilian (N = 14527)	Military (N = 11306)	P-value
AGE												
15-19Yrs	4406(47.6)	1573(30.5)	0.000	1091(47.8)	471(14.7)	0.000	1938(65.1)	506(17.2)	0.000	7435(51.2)	2550(22.6)	0.000
20-24Yrs	2018(21.8)	1380(26.8)		645(23.3)	1011(31.6)		477(16.0)	1168(39.6)		3140(21.6)	3559(31.5)	
25-29Yrs	1330(14.4)	1098(21.3)		346(15.2)	1051(32.8)		297(10.0)	850(28.9)		1973(13.6)	2999(26.5)	
30-34Yrs	750(8.1)	610(11.8)		96(4.2)	417(13.0)		126(4.2)	300(10.2)		972(6.7)	1327(11.7)	
35-39Yrs	396(4.3)	314(6.1)		63(2.8)	147(4.6)		62(2.1)	73(2.5)		521(3.6)	534(4.7)	
40-44Yrs	220(2.4)	131(2.5)		28(1.2)	63(2.0)		43(1.4)	28(1.0)		291(2.0)	222(2.0)	
45-49Yrs	102(1.1)	41(0.8)		12(0.5)	34(1.1)		23(0.8)	15(0.5)		137(0.9)	90(0.8)	
50+Yrs	44(0.5)	11(0.2)		2(0.1)	8(0.2)		12(0.4)	6(0.2)		58(0.4)	25(0.2)	
Adverse events												
Yes	120(1.3)	4(0.1)	0.000	14(0.5)	15(0.5)	0.728	84(2.1)	2(0.1)	0.000	218(1.3)	21(0.2)	0.000
No	9506(98.7)	5652(99.9)		2679(99.5)	3267(99.5)		3845(97.9)	2988(99.9)		16030(98.7)	11907(99.8)	
Site												
Facility	2408(26.0)	973(18.9)	0.000	743(32.5)	325(10.1)	0.000	144(5.5)	75(4.9)	0.000	3295(22.7)	1373(12.1)	0.000
Outreach	6858(74.0)	4185(81.1)		1540(67.5)	2877(89.9)		2834(94.5)	2871(95.1)		11232(77.3)	9933(87.9)	

251 Regarding site of circumcision, overall and by region, the highest proportions of VMMC were
252 done at outreaches, with higher levels in military camps compared to civilian camps (Total –
253 87.9% vs 77.3%; Central- 81.1% vs 74.0%; West – 89.9% vs 67.5%; and North – 95.1% vs
254 94.5%) with significant camp differences noted by site (p- value<0.05) (Table 1).

255 For the proportions of adverse events reported, overall and by region, higher proportions were
256 reported in civilian camps compared to military camps (Total – 1.3% vs 0.2%; Central- 1.3%
257 vs 0.1%; and North – 2.1% vs 0.1%) with significant camp differences noted (p- value<0.05)
258 in all regions apart from western region where no difference in the proportions of adverse
259 events reported was noted (West – 0.5% vs 0.5%; p-value>0.05) (Table 1).

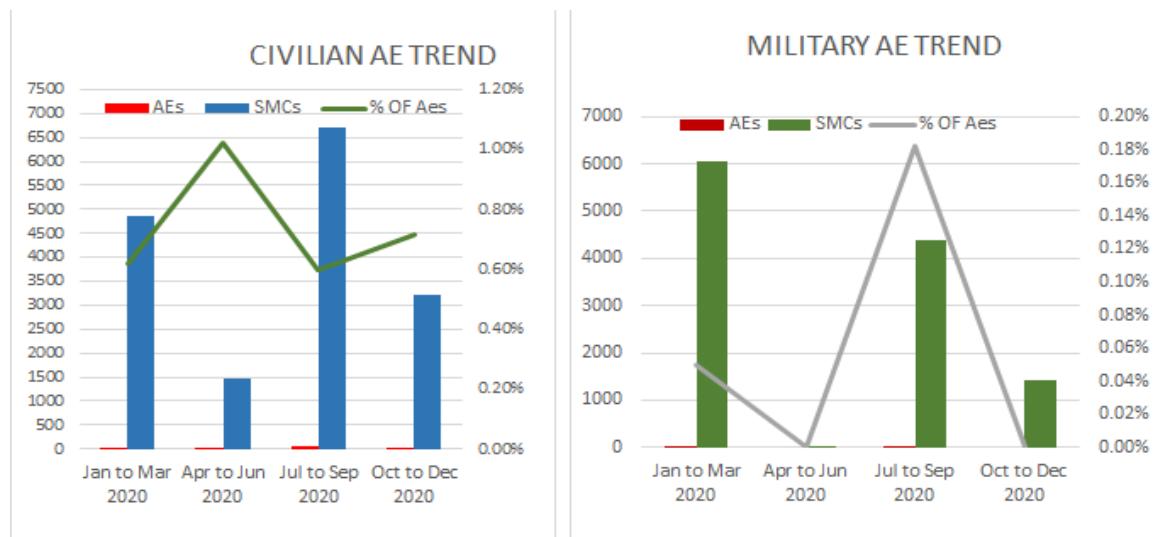
260 **Table 2: Comparison of characteristics between participated in VMMC at Civilian and**
261 **Military facilities**

	Facility			Outreach		
	Civilian (N = 3295)	Military (N = 1373)	p-value	Civilian (N = 11232)	Military (N = 9933)	P-value
AGE						
15-19Yrs	1085(32.9)	264(19.2)	0.000	6350(56.5)	2286(23.0)	0.000
20-24Yrs	864(26.2)	465(33.9)		2276(20.3)	3094(31.1)	
25-29Yrs	656(19.9)	325(23.7)		1317(11.7)	2674(26.9)	
30-34Yrs	292(8.9)	184(13.4)		680(6.1)	1143(11.5)	
35-39Yrs	212(6.4)	94(6.8)		309(2.8)	440(4.4)	
40-44Yrs	106(3.2)	32(2.3)		185(1.6)	190(1.9)	
45-49Yrs	56(1.7)	4(0.3)		81(0.7)	86(0.9)	
50+Yrs	24(0.7)	5(0.4)		34(0.3)	20(0.2)	
Region						
Central	2408(73.1)	973(70.9)	0.161	6858(61.1)	4185(42.1)	0.000
West	743(22.5)	325(23.4)		1540(13.7)	2877(29.0)	
North	144(4.4)	75(5.7)		2834(25.2)	2871(28.9)	
Adverse events						
Yes	141(4.1)	8(0.5)	0.000	70(0.6)	11(0.1)	0.000
No	3311(95.9)	1519(99.5)		12726(99.4)	10390(99.9)	

262 Aggregating the data by site of circumcision, the results show that there was significant
263 difference by age of number of males circumcised between civilian and military camps for both

264 outreach and facility-based circumcisions ($p\text{-value}=0.000$). On the other hand, for region, the
265 differences between males circumcised was noted for only outreach sites ($p=0.000$) with no
266 significant difference noted between civilian and military camps among facility-based
267 circumcisions ($p\text{-value}=0.655$). The results show that there was significant difference between
268 civilian and military camps for both outreach and facility-based circumcisions ($p\text{-value}=0.000$)
269 regarding the number of adverse events reported (Table 2).

270 **Figure 1: Proportions of Advance Events reported in civilian and military camps by 2020**
271 **quarter**



272
273 Trends analysis was carried out for the year 2020 quarterly, to assess the if there were any
274 significant trends in the number of AEs reported, results indicate that there was no statistically
275 significant trend for both civilian and military number of adverse events reported for the four
276 quarters in 2020 (P-value =0.315 for civilian and P=0.094 for the military) Fig 1.

277 **Discussion**

278 This study assessed the incidence of adverse events and any differences between the
279 proportions of adverse events reported among civilian and military males circumcised in
280 outreach and facility centres in Uganda. Results from this study indicate that the proportion of
281 adverse events reported in military camps was lower than that reported among the civilian

282 camps (0.2% vs 1.3%). The civilian total prevalence of adverse events of 1.3% is lower when
283 compared to other studies in Uganda, which show prevalence of 2.1- 5.47% in Kampala (19,
284 28) and 0.6% - 1.4% from a study in Rakai (29). Further, our rates are still lower when
285 compared to studies which were published in other African countries that recorded prevalence
286 of adverse events ranging from 0-24% (30) and 0.70 to 37.36% with an overall pooled
287 prevalence of 2.31% (31). In a review of randomised clinical trials (RCTs), which provided
288 safe male circumcision services in a clinical trial setting, adverse event rates of 3.8%, South
289 Africa; 1.5% in Kisumu, Kenya; and 3.6% in Rakai, Uganda (9, 32, 33) were reported.

290 The prevalence of adverse events reported in military centres was 0.2%, a low figure similar to
291 a study carried out in Rwanda regarding follow-up and outcomes after circumcision at the
292 Rwanda Military Hospital, where 28 adverse events among 570 men that received MC were
293 recorded (four cases of diffuse edema, four of bleeding, five of wound infection, three of
294 productive exudate and eleven others) (34).

295 The adverse events reported in facilities were higher compared to outreach (civilian -4.1% vs
296 0.6% and military- 0.5% vs 0.1%). In a facility-based setting, field studies in other sub-Saharan
297 African settings report low AE rates (< 2%) (35-39), and these low rates could be due to the
298 fact that some AEs may not be identified, in part as clients may seek care outside of routine
299 VMMC settings. Also, it is important to note that the men circumcised from outreaches may
300 find it hard to return to their camps of circumcision for follow up thus the low rates of reporting
301 adverse events in outreaches.

302 Although younger boys ages 10–14 represent the majority of program VMMCs, they are not
303 more likely, overall, to have an AE than their older peers (40). However, younger boys are 3
304 times more likely to have infections than older peers, aged 20 and above (40). Younger VMMC
305 patients warrant targeted attention to prevent, promptly identify, and manage AEs. A previous,
306 multicounty study on adolescent wound care knowledge and practices found that adolescent

307 VMMC clients reported multiple obstacles to proper post-operative wound care (41). Providers
308 also noted concerns that younger patients, especially those ages 10–14, may be less able to
309 understand post-VMMC instructions or independently adhere to proper wound care (42),
310 potentially putting them at increased risk of an AE. Alternatively, younger men may not
311 identify AEs early or may not report abnormal healing early enough, possibly increasing the
312 severity of AEs among this youngest age group. Therefore, improved, age-appropriate, post-
313 operative counselling would likely help ensure that younger clients comprehend and recall
314 correct information regarding VMMC procedures and postoperative care.

315 This study's VMMC program employed the WHO's model for optimizing volume and
316 efficiency for male circumcision services (MOVE)(43) to assist facilities and outreach
317 programs to rapidly scale up their ability to perform circumcisions. The model promotes
318 workforce efficiencies, including task shifting, where some medical responsibilities are
319 transferred from doctors and nurses to lower-level military personnel, but fully capable, health
320 workers. Community involvement and participation using VHTs and satisfied clients in
321 planning for outreach and mobilisation of peers was integral to achieving high numbers of men
322 accessing VMMC services. Military and uniformed services were involved in MC service
323 provision so that the population, mostly male, sexually active, 18 years and older are targeted
324 for MC. The military setting is very easy for scheduling provision of MC services, in addition
325 to easy for follow up. Also, a substantial portion of civilians can be reached through military
326 services as they often serve also the surrounding community. One thing to note is that, much
327 as the MOVE principles are great, the preparation of people in advance of surgery is a huge
328 task. With organized outreach campaigns, much of the counselling is moved out of the clinic
329 to the community; and further follow-up and referral mechanisms is very complicated to
330 handle.

331 This study fills gaps in the literature. Although many previous studies report on AEs, these data
332 come from controlled trials and pilot programs with active surveillance, conditions that are
333 largely dissimilar to the routine program implementation setting discussed here. Also, there is
334 scanty data on military populations compared to civilian population in circumcision programs.
335 Therefore, the findings of this study fill a gap in the literature as a starting point regarding
336 reporting of AEs comparing military and civilian populations. Further, in a setting with
337 resource constraints, this study gives information on the advantages of MOVE for male
338 circumcision interventions.

339 This study has several limitations. First, men who sought follow-up care for AEs outside of the
340 program context in other private or public facilities are not recorded potentially leading to
341 underreporting of AEs. Potential underreporting of AEs noted in the study, however, is not
342 unique to field settings in Uganda, just like other African countries such as other large-scale
343 VMMC program in Zimbabwe (44), and other studies in field settings in Kenya confirm the
344 likelihood of underreporting of AE cases through routine systems (21, 40, 45). Another
345 limitation is the use of aggregate data and failure to model individual level factors associated
346 with AEs. Despite these limitations, we believe the results present informative findings from a
347 large-scale VMMC program for priority populations under routine implementation conditions.

348 **Recommendations**

349 The MOVE model is great for scaling up SMC in specialized populations such as military.
350 It is important to monitor adverse events identified by the provider as well as those perceived
351 by the client, since satisfied clients are the most effective mobilizers for the national VMMC
352 programme. Active surveillance should be integrated into the minimum package program of
353 MOVE to allow active follow-up of circumcised men and avert any negative outcomes
354 associated with non-reported AEs. A VMMC programme that plans to rely solely on passive
355 surveillance for monitoring must promote attendance at follow-up visits. Capacity building for

356 frontline health workers as the local service providers will need to be prioritized to enable them
357 effectively manage AEs. Further study is warranted to determine root causes for AE
358 underreporting, leading to improved AE identification, management and documentation.

359 **Conclusions**

360 The MOVE model is great for scaling up VMMC in specialized populations such as military.
361 Can also be adapted in other populations if contextual bottlenecks are identified and
362 collectively addressed by key stakeholders – leadership, community engagement and using a
363 largely horizontal approach offer promising possibilities and outcomes.

364 **List of abbreviations**

365 AE Advance Events
366 ART Antiretroviral Therapy
367 HPV Human Papillomavirus
368 HSV Herpes Simplex Virus
369 IQRs Interquartile Ranges
370 IRB Institutional Review Board
371 MOH Ministry of Health
372 MOVE Model of Optimizing Volume and Efficiency
373 RCT Randomised Clinical Trials
374 TASO The AIDS Support Organisation
375 URC-DHAPP University Research Council - Department of Defence HIV/AIDS Prevention
376 UPDF Uganda People's Defence Forces
377 UNCST Uganda National Council of Science and Technology
378 VMMC Voluntary Medical Male Circumcision
379 WHO World Health Organization

380 **Declarations**

381 **Ethics approval and consent to participate**

382 The implementation of both program and research activities adhered to required ethical
383 standards. We obtained research approval for the study from The AIDS Support Organisation

384 (TASO) Institutional Review Board (IRB); Uganda National Council of Science and
385 Technology (UNCST), The Ministry of Health and Uganda People's Defense Forces (UPDF).

386 **Consent for publication**

387 Consent was obtained from all males before undergoing VMMC.

388 **Competing interests**

389 The authors declare that they have no competing interests.

390 **Funding**

391 This work was supported, in part, by the Department of Defense Health Agency grant N00244-
392 19-1-0001. The views expressed in this article are those of the authors and do not reflect the
393 official policy or position of the Defense Health Agency, the US Government, or University
394 Research Co., LLC.

395 **Role of the funding source**

396 The funder had no role in design, data collection, analysis, interpretation, or writing of this
397 manuscript. The authors designed and executed the study, had full access to the raw data,
398 performed all analyses, wrote the manuscript, and had final responsibility for the decision to
399 submit for publication.

400 **Availability of data and materials**

401 The dataset collected, used and/or analysed during this study following ethical approval may
402 be made available, from the corresponding author upon request.

403 **Authors' contributions**

404 LOO, GS, EL, AN and SL conceived and designed the study; AK, MSN, GS, TR and DB
405 provided manuscript writing and guidance; MSN and AK analysed the study results. All listed
406 authors contributed to the manuscript.

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525

Figures



Figure 1

Proportions of Advance Events reported in civilian and military camps by 2020 quarter