

An estimation of operative time requirements for the scaling up of male circumcision in Malawi

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Abstract

Background: Three randomized controlled trials have demonstrated the efficacy of male circumcision (MC) in the prevention of HIV transmission in predominantly heterosexual communities in Africa. In order to inform program planning and implementation for this intervention there is need to estimate the human resource requirements expected in a possible roll-out of circumcision.

Patients and methods: We asked surgeons from across the world the usual operative time it takes in their setting to circumcise one non-infant and one infant male. We also obtained estimates of the 2006 Malawi national population from an official government statistical source to estimate the potential demand for male

circumcision. Using the duration of time a surgeon would take to circumcise a male non-infant or an infant, we estimated how many clinicians would be required to circumcise 10% to 100% of the infant or non-infant male population in Malawi. Clinician operative time was estimated in full-time equivalents (FTEs).

Results: There were 610 clinicians (clinical officers and physicians) eligible to provide MC in Malawi. The surgical procedure took between 0.33 to 0.50 clinician-hours for non-infants and 0.17 to 0.33 clinician-hours for infants. Providing MC to between 10% and 100% of all infants in the country would require between 0.4% and 6.2% of FTEs of all registered clinicians in the country. However to provide MC to between 10%

and 100% of 15 to 24 years old males in the country would require between 2.9% and 43.6% of FTEs for all the available clinicians. If 10% to 100% of 10 to 14 years old males were the targets, this would require 8.1% to 54.2% of the clinicians' FTEs. At 50% of the population target to be circumcised, this would require 14.8% to 21.8% for infants, 2.1% - 3.15 for 10 to 14 year olds, and 14.8% to 21.8% for 15-24 year olds.

Conclusion: We have estimated the operative time, expressed as FTEs of the available clinician pool, to provide male circumcision to specified proportions of potential target population age-groups. This information may be useful in estimating the human resource needed to scale-up male circumcision in Malawi.

Key words: male circumcision, HIV prevention, Malawi

Introduction

The efficacy of male circumcision (MC) in preventing heterosexual transmission of HIV infection among males has been described as "proven beyond reasonable doubt" ^[1]. Bailey and Westercamp in a review paper have also reported that Proportion of the total number of clinicians (physicians and clinical officers) available for practice. ^[2].

In Malawi, Ngalande et al ^[3] reported that in the most populous central and southern regions of the country, and where HIV infection prevalence estimates are higher than in the north, acceptability of MC would be high if circumcision services were safe, affordable, and confidential.

hypothetical acceptability of MC among non-circumcising populations in most parts of southern Africa, which is the epicenter of the HIV pandemic, is high. In Swaziland, the demand for MC rose because of reports that the procedure reduces HIV infection^[4]. Following the first randomized controlled trial (RCT) in South Africa and the subsequent trials in Kenya and Uganda demonstrating the efficacy of MC in preventing male sexual acquisition of HIV ^[5,7], many southern African countries are considering making MC a policy-based intervention for the prevention of HIV transmission. Among the challenges that health systems like in Malawi face, is the limited and stretched human resource even without the addition of MC as an intervention for HIV prevention ^[8]. However, we are unaware of any previous reports that have quantitatively assessed how much human resource may be needed to operate on both infant and non-infant males in the country. We carried out this study to estimate the number of clinicians needed for the proposed scale-up of MC in Malawi based on national population estimates for males. We also estimated the

Patients and method

Surgical practitioners in Malawi

Malawi established its only medical school in 1991. An average of 17 students graduated each year for the first several years of the medical school. From the inception to 2006, 254 graduates were produced ^[9]. Although most of the medical school's graduates are within the country, and the country also, hosts physicians trained abroad (including non-Malawian nationals), the available number of physicians is still grossly inadequate ^[10]. Like many other

countries in sub-Saharan Africa, Malawi relies heavily on clinical officers (paramedics with three years of training) for the provision of clinical services including surgical procedures^[11-12].

Clinical officers are also the backbone in the scaling-up of antiretroviral treatment in Malawi^[13] where an estimated 95,000 patients were estimated to be on treatment by March 2007. If there would be MC scale-up, it is likely that both clinical officers and physicians would be the practitioner that would be mobilized to do the surgical operations.

Population estimates and number of clinicians

The estimated mid-year population of under-1 year olds in Malawi in 2006 was 587, 233 of whom 296, 537 were males. Males older than one year numbered 5,985,019, those of age 10 to 14 years were 1,903,278, and those 15 to 24 years old were 1,244, 086^[14]. According to the Malawi Demographic and Health Survey 2004, 18% of Malawian men 15 to 24 years were circumcised^[15], i.e. a total 223,935. A total of 1,020,151 would potentially be eligible for circumcision. There were 610 clinicians (physicians and clinical officers) registered with the Malawi Medical Council in Malawi^[16].

Estimated number of circumcision per clinician

We asked 9 authors of papers that have reported on MC for infants and/or non-infants in Kenya, United States, Uganda, Iraq, Malawi, Nigeria and Turkey, about the usual surgical time (from the initial incision to the last suture or bandaging) it took to complete an uncomplicated circumcision for non-infant and/or infant males. It usually took 20 to 30 minutes to circumcise non-infant males. About

10 to 15 minutes was the usual time it took to complete circumcision for pediatric males. We then estimated the potential number of MC provided per one clinician working full-time in an 8 hour workday. This was considered as one day full-time equivalent (FTE) *i.e.* if one clinician was doing only circumcisions during their working day. We also estimated the number of clinicians and clinicians' full-time equivalents (FTEs) to provide MC to various proportions of the infants and non-infants in the 10 to 14 years, and 15 to 24 years age groups.

Results

One circumcision took 0.33 to 0.50 clinician-hours for non-infant and 0.17 to 0.33 clinician-hours for infant males. We estimated that in an 8-hours working day *i.e.* 8 clinician-hours, between 16 to 24 MCs for non-infant and 32 to 48 MCs for infant males could be carried out by one clinician. In numbers of patients, one clinician could potentially circumcise between 3840 and 5760 non-infants, and 7680 to 11,520 infants in a year *i.e.* one year full-time equivalent. The number of clinicians required circumcising various percentages of infants or non-infants in age groups 10 to 14 years, and 15 to 24 years are shown in Tables 1 to 3. As shown in these tables, circumcising 50% of infants would require 2.1% to 3.1% of the clinician workforce; 27.1% to 40.6% would be required for 50% of the 10 to 14 years old males. Between 14.8% and 21.8% would be needed to circumcise half of the 15 to 24 years old males. The clinical work force required for the other proportions of the population are shown in the tables.

Table 1: Estimated number and proportion of clinicians required to provide circumcision to male infants in Malawi

At 32 circumcisions per one FTE per day	% infants to be circumcised	Number of infants circumcised	Number of clinicians required*	% of clinicians as proportion of total registered
	10	29051	4	0.6
	20	58102	8	1.2
	50	145,257	19	3.1
	75	217,885	29	4.7
	100	290,514	38	6.2
At 48 circumcisions per one FTE per day				
	10	29051	3	0.4
	20	58102	5	0.8
	50	145,257	13	2.1
	75	217,885	19	3.1
	100	290,514	26	4.1

** all figures rounded up*

Table 2: Estimated number and proportion of FTEs for clinicians required to provide circumcision to 15-24 years old males in Malawi

At 24 circumcisions per day per one FTE	% non-infants to be circumcised	Number of non-infants to be circumcised in a year	Number of Clinicians required*	% of clinicians as proportion of total registered
	10	102,015	18	2.9
	20	204,030	36	5.8
	50	510,075	89	14.8
	75	765,113	133	21.8
	100	1,020,151	178	29.0

At 16 circumcisions per day per one FTE	% non-infants	Number of non-infants to be circumcised in a year	Number of clinicians required	% of clinicians as proportion of total registered
	10	102,015	27	4.4
	20	204,030	54	8.7
	50	510,075	133	21.8
	75	765,113	200	32.7
	100	1,020,151	266	43.6

* all figures rounded up

Table 3: Estimated number and proportion of FTEs for clinicians required to provide circumcision to 10-14 years old males in Malawi

At 16 circumcisions per day per one FTE	% non-infants to be circumcised	Number of non-infants to be circumcised in a year	Number of clinicians required*	% of clinicians as proportion of total registered
	10	190,328	50	8.1
	20	380,656	100	16.3
	50	951,639	248	40.6
	75	1,427,459	372	60.9
	100	1,903,280	496	81.3

At 24 circumcisions per day per one FTE	% non-infants	Number of non-infants to be circumcised in a year	Number of clinicians required	% of clinicians as proportion of total registered
	10	190,328	33	5.4
	20	380,656	67	10.8
	50	951,639	166	27.1
	75	1,427,459	247	40.6
	100	1,903,280	331	54.2

* all figures rounded up

Discussion

Our study has demonstrated that to circumcise all infants in Malawi within a year will require 26 to 38 clinicians' FTEs. The number of clinicians thus required translates to 0.4 % to 6.2% of the total clinical officers and physicians registered in the country in 2006. Circumcising 10% of the males of age 10 to 14 years within a year would require an estimated 5.4% to 8.1% of the FTEs of all registered clinical officers and physicians, while attempting to circumcise 20% will need 10.8% to 16.3% of all the clinical officers and physicians in the country. At 50% of the population target to be circumcised, this would require 14.8% to 21.8% of the FTEs of all registered clinical officers and physicians for infants, 2.1% - 3.15% for 10 to 14 years old males, and 14.8% to 21.8% for 15-24 years old males. Although in many cases male circumcision is a one-off procedure and is permanent, providing safe circumcision by trained health professionals in Malawi would require a significant proportion of its health human resource.

The limited number of clinicians available to provide patient care in Malawi has resulted from multiple factors such as low number of trainees, migration, and deaths ^[17]. Malawi, like many other countries with limited numbers of physicians, has heavily relied on clinical officers in the provision of clinical services including surgical care ^[18]. There is increased global interest in the utilization of para-medical health practitioners in health services. Legler et al ^[19] have reported

that the United Kingdom, Scotland, Canada, the Netherlands, Taiwan, South Africa, and Ghana are exploring how they could utilize physician assistants to provide clinical services. Malawi's only medical school's enrollment has over the past several years improved remarkably to over 50 new students each year ^[9]. The country's health system will increasingly experience large numbers of physicians graduating in the not so distant future. Ensuring that the physicians continue to remain in the country is an ongoing challenge for many countries in Africa. In some countries where circumcision is common, non-physicians significantly contribute in the provision of circumcision. In Israel for example, a ritual circumciser (the Mohel) provides much of the services ^[20]. In other countries midwives are trained to provide the services. As the WHO explores possibilities of scaling-up of MC for the prevention of HIV, it is important that lessons be learnt from the much experienced nations. A WHO team has already visited Israel in order to learn lessons on how circumcision could be provided at a wider scale ^[21].

Limitations of the study Our study had a number of limitations. Firstly we obtained data on the clinician-hours required to perform one MC from just 8 physicians. However, the fact that there was agreement among these physicians independently reporting duration of surgical time suggests that our estimate of duration of the procedure is robust. Also in a study in Kenya where Krieger et al ^[22] provided MC to community, the procedure took a median duration of 30 minutes, just as was reported by the physicians we contacted.

In our estimation we assumed that a clinician would perform MCs full time. This is likely to be unrealistic but enabled us to estimate how many FTEs would be needed to provide the service. An alternative approach would have been to estimate the required clinician-hours per certain number of patients or clients circumcised. Such estimation, although mathematically reasonable is likely to be difficult to interpret. We also used a mid-year national population estimate for males as the expected population of males in Malawi. The National Statistical Office (NSO) based that estimate on 1.9% population growth. During the current inter-census period, it is not really known whether the assumptions on which the national population estimate was based have remained valid.

It is also important to recognize that we have estimated the number of clinicians required by assuming that the populations of both the country and the registered clinicians are fixed. In reality the populations are likely to be increasing.

The amount of FTEs that we have estimated only refers to the time from first incision to bandaging the penis. We have not included any time requirements for pre-op and post-op care, support staff that may be needed and time requirements for training and supervision of surgeons. We suggest collection and use of this data in future studies. We did not address complications rates or the time that might be required to manage complications of the procedure. Furthermore, some families may procure circumcision from traditional circumcisers. This prospect may reduce time requirements from clinic- or hospital-based surgeons

Conclusion

We have estimated the operative time requirements from the first incision to bandaging in any possible scale-up of male circumcision in Malawi. Scaling-up the availability and provision of MC in Malawi will require significant investment in human resources for health as the available pool is not adequate to ensure wide accessibility. The Ministry of Health will also have to consider investing in surgical instruments and consumables such as anesthesia, analgesics, and antibiotics. However as male circumcision is for most clients a one-off event and is permanent, any sustained public health circumcision effort will cumulatively result in more people having been circumcised. Also with proper training and supervision, it is possible as has been reported in other settings ^[21-23] to recruit nurses to perform the surgeon's roles that have traditionally been reserved for physicians and clinical officers.

Competing interests The authors declare that they have no competing interests.

Authors' contributions ASM: conceived the study concept, participated in data collection and drafting of manuscript. TS: contributed to the data and interpretation of the findings. ER: contributed to the design and interpretation of the findings. SS: contributed to the interpretation of findings and drafting of manuscript. JII: contributed to data collection, interpretation and drafting of manuscript. KC: contributed to the interpretation of findings and drafting of manuscript. RHM: contributed to interpretation and drafting of manuscript. All authors read the final draft of manuscript.

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