BRIGHAM AND WOMEN'S HOSPITAL

Cases in Global Health delivery: Voluntary Medical Male Circumcision in Nyanza Province, Kenya

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From 2008 to 2012, Dr. Nicholas Muraguri, head of Kenya's National AIDS and Sexually Transmitted Infections Control Programme, had been working hard to promote male circumcision in Kenya. As part of the national HIV/AIDS strategic plan, Kenya's goal had been to circumcise 80% of consenting uncircumcised men aged 15–49 by July 2013. Officials believed performing these 860 000 circumcisions could avert an estimated 900 000 infections over 20 years.[1] Nyanza province, which had the highest HIV prevalence and lowest male circumcision prevalence in the country, was one of four targeted provinces and was expected to perform 426 500 circumcisions.

Over 395 500 men and boys, most of whom were from Nyanza, had been circumcised by mid-2012. Campaign implementers in Nyanza offered ongoing circumcision services in various delivery settings as well as an annual intensive 30-day Rapid Results Initiative (RRI), each of which resulted in over 30 000 circumcisions. Nyanza had increased the total percent of men circumcised by 18%. As national scale-up progressed, the country looked at Nyanza. One implementing director in Nairobi commented, "We borrowed lessons learned in Nyanza...however, we also recognize that each place is unique and requires different approaches to service delivery."[3]

***Exhibit 1:* Map of Kenya**
Source: University of Texas Libraries.

Overview of the Republic of Kenya

The Republic of Kenya is composed of eight provinces, and is located in Eastern Africa (see Exhibit 1 for map).[4] In 2012, 76% of Kenyans lived in rural areas,[5] and approximately 43·4% of all Kenyans lived below the national poverty line (see Exhibit 2 showing basic socioeconomic and demographic indicators).[6] Of over 70 ethnic groups in Kenya, the Kikuyu (22%), the Luhya (14%), and the Luo (13%) were the largest.[4,7] The majority of Kenyans were Christian.[4]

In December 2007, Mwai Kibaki was elected President for a second term after defeating Raila Odinga in a highly controversial election. Amid allegations of corruption, riots across the country led to deaths and over 600 000 internally displaced persons.[8] In 2008 the United Nations Secretary Kofi Annan mediated a power-sharing agreement. Kibaki served as president and Odinga as prime minister—a newly created position.[9]

Health in Kenya and Nyanza Province

In 2006, HIV/AIDS was the third leading cause of death in Kenya (see Exhibit 3 for table of key indicators).[10] Among health facilities, 41% were public, 43% were private for-profit, and 14% were nonprofit (see Exhibit 4 for number of facilities).[11,12] Acute and chronic disease management was free,[13] though the government recognized that the public health infrastructure often fell short of its mandate without external assistance.[1]

In Nyanza, the majority of public hospitals were understaffed and underequipped given the province's more than 5 million people, including 1·2 million males aged 15–49.[14,15] As in the rest of the country, most people, including the poor, accessed the private sector. Many traveled an average of five kilometers for health care, primarily by foot. The majority of Nyanza's population identified as Luo and lived in 16 of Nyanza's 34 diverse districts.[16]

Male Circumcision in Kenya

The majority of adult males in Kenya were circumcised in 2012, with a national prevalence of 91·2% (see Exhibit 5 for circumcision prevalence by province).[15] Long before medical benefits were known, most ethnic groups in Kenya practiced male circumcision as a rite of passage.[17] Traditional, non-professionally trained circumcision providers performed 10% of all circumcisions in 2008[18] and had a higher rate of adverse events[17,18] than those performed by the health system. Many Kenyans, including those from non-circumcising groups, sought male circumcision from the health system.[18] Prior to 2008, the cost of medical circumcision—USD 6–12—was prohibitive for many.

Non-circumcising groups faced stigma and included the Turkana, the Luo, and the Teso. Most of Kenya's powerful political leaders came from circumcising ethnic groups, and circumcision status was often made public during elections.[1] Nyanza Province had the country's lowest circumcision prevalence, at 46·7% overall in 2007, with some primarily Luo districts at 17%.[19,18]

HIV/AIDS in Kenya

The first official case of HIV/AIDS was reported in Kenya in 1984. By 2008, almost 7% of Kenyans aged 15–64 (1·4 million Kenyans) were HIV positive. Kenyan women were more likely to be infected with HIV (8·4%) than men (5·4%)[20] (see Exhibit 6 for HIV prevalence by age). Transmission occurred most frequently through vaginal intercourse between casual heterosexual partners (accounting for 41% of cases; see Exhibit 7 for incident HIV infections by mode of transmission) in 2009. At that time, about 45% of married, HIV-positive individuals had a partner who was not infected.[21] Prevalence ranged regionally from less than 1% in Northeastern province to almost 15% in Nyanza. There, 2003 reports showed HIV prevalence at about 25% in Luo women and 18% in Luo men.[22]

The Kenyan government's initial response to HIV/AIDS, starting in 1986, aimed to prevent HIV through educational campaigns.[23] In 2004 Kenya received USD 92·5 million from the US President's Emergency Plan for AIDS Relief (PEPFAR) for service delivery and technical support.[24] The following year, with a budget of USD 2·39 billion, the government declared a "total war on AIDS." A new plan prioritized targeted interventions for vulnerable populations and called for greater grassroots-level involvement.[25] By 2007, there was new but limited funding from PEPFAR[26] to support male circumcision.[27]

	Indicator	Year
UN Human Development Index ranking	147 (out of 187)	2012
Population (millions)	43·2	2012
Urban population (%)	24	2012
Drinking water coverage (%)	60·9	2011
Poverty rate (% living under USD 1·25 per day)	43·4	2011
Gini index	42·5	2008
GDP per capita in PPP (constant 2005 international dollars)	2151	2012
GDP per capita (constant 2005 USD)	595	2012
Literacy (adult/youth; %)	(72/82)	2012

Source: Case writers compiled tables using data from the following sources: United Nations (UN), UNICEF, World Bank, and the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

***Exhibit 2*: Basic Socioeconomic and Demographic Indicators**

	Indicator	Year
Average life expectancy at birth (total/female/male [years])	61·1/63/59	2012
Maternal mortality ratio (per 100 000 live births)	360	2012
Under-five mortality rate (per 1000 live births)	73	2012
Infant mortality rate (per 1000 live births)	49	2012
Vaccination rates (% of DTP3 coverage)	88	2011
Undernourished (%)	26	2012
Adult (15–49 years) HIV prevalence (%)	6·1	2012
HIV antiretroviral therapy coverage (%)	73	2012
Tuberculosis prevalence (per 100 000)	272	2012
DOTS coverage (%)	100	2012
Malaria cases (per 1000)	82	2012
Expenditure on health as a % GDP expenditure	4·5	2012
Government expenditure on health as a % of total government expenditure	5·9	2012
Annual government expenditure on health per capita (international dollar/USD)	39/17	2012
Total annual health expenditure per capita (international dollar/USD)	84/45	2012
Physician density (per 10 000)	1·8	2011
Nursing and midwifery density (per 10 000)	8	2011
Number of hospital beds (per 10 000)	14	2010

Source: Case writers compiled tables using data from the following sources: United Nations (UN), UNICEF, World Bank, and the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

***Exhibit 3*: Health System and Epidemiologic Indicators**

Voluntary Medical Male Circumcision for HIV Prevention

The first suggestion that male circumcision had a protective effect against HIV was in 1986. In 2000, a cohort study in Rakai, Uganda, confirmed this for men.[28] In 2006, data from a randomized control trial involving 18–24 year old males in Orange Farm, South Africa showed a statistically significant 60% reduction in risk of female-to-male transmission among those circumcised.[29,30] Interim data from two other trials also showed over 50% protective effect that year.[29]

In February 2007 the final results of the trials were published in *The Lancet*, and within a month the World Health Organization (WHO) and the Joint United Nations

	National	Nyanza
Dispensaries/health centres	5744	630
District general hospitals	432	84
Provincial hospitals	10	2
National referral hospitals	4	0

Source: Republic of Kenya, Division of Health Management Information Systems. Annual Health Sector Statistics Report; 2008.

Exhibit 4: **Health Facilities, National and Nyanza Province**

	HIV (2007)	Circumcision
Nyanza (Luo in Nyanza)	15·3% (22%)	48·2% (12%)
Nairobi	9·0%	83·2%
Western	5·1%	87·8%
Rift Valley	7·0%	88·7%
Central	3·8%	95·5%
North Eastern	1·0%	97·3%
Eastern	4·7%	96·3%
Coast	7·9%	97·0%

Source: Government of Kenya. *Kenya AIDS Indicator Survey Data Sheet*: Population Reference Bureau; 2007.

Exhibit 5: **HIV and Male Circumcision Prevalence by Province**

	Women		Men		Total	
	HIV-infected (%)	Total number tested	HIV-infected (%)	Total number tested	HIV-infected (%)	Total number tested
Age group (years)						
15–19	3·5	1328	1·0	1175	2·3	2503
20–24	7·4	1598	1·9	1034	5·2	2632
25–29	10·2	1345	7·3	874	9·1	2219
30–34	13·3	1154	8·9	772	11·6	1926
35–39	11·2	950	9·3	678	10·5	1628
40–44	9·4	742	10·2	576	9·7	1318
45–49	8·8	732	5·6	549	7·5	1281
50–54	7·5	519	8·3	425	7·8	944
55–59	4·7	425	2·3	380	3·6	805
60–64	1·7	256	3·4	341	2·7	597
Totals						
15–24	5·6	2926	1·4	2209	3·8	5135
15–49	8·8	7849	5·5	5658	7·4	13 507
50–64	5·2	1200	4·7	1146	5·0	2346
Total (15–64)	8·4	9049	5·4	6804	7·1	15 853

Source: Government of Kenya. *Kenya AIDS Indicator Survey Data Sheet*: Population Reference Bureau; 2007.

Exhibit 6: **HIV Prevalence by Age Group, 2007**

Programme on AIDS (UNAIDS) issued guidance endorsing male circumcision accompanied by HIV counseling and testing, sexually transmitted disease treatment, safe sex promotion, and condom provision for HIV prevention. They advised countries with hetero-sexually driven, generalized HIV epidemics and low male circumcision rates to "scale up with urgency."[31] While UNAIDS recommended targeting men aged 12–30, another study found targeting men older than 30 might initially be the most cost-effective.[32]

The Kenyan government convened the first official male circumcision stakeholder meeting in September 2006, aiming to rapidly scale up existing male circumcision services.[B,1,29] In October 2009, the government formally released the *Kenya National Strategy for Voluntary Medical Male Circumcision*. The aim was to increase the proportion of men ages 15–49 years who were circumcised in Kenya from 84% to 94% by 2013.[15] The campaign prioritized provinces where circumcision rates were low and HIV rates were high, including Nyanza, Western, Rift Valley, and Nairobi.[15]

The following month, the third Kenyan National AIDS Strategic Plan 2009–2013 was released. It aimed to reduce the incidence of HIV infection by 50% and AIDS-related deaths by 25%. Of the USD 3·56 billion budgeted for the plan, about 19·5% was allocated to prevention.[33] A large proportion (60·7%) of total government health spending was going to HIV/AIDS-related costs,[34] so the plan aimed to ensure investments paid off. The plan stated, "The most cost-effective intervention, at about USD 225 per case averted, is that of VMMC for men in rural Nyanza aged 25 to 49 years."[35, 15] All interventions were expected to cost less than USD 4000 per infection averted.[33] The VMMC program comprised 1·6% of total AIDS funding in the 2009–2013 strategic plan.[33] Kenya would be the first country in sub-Saharan Africa to roll out a national male circumcision program for HIV prevention.

Voluntary Medical Male Circumcision in Kenya

Ministry of Health (MOH leadership reached out to Luo community leaders to discuss the plan, and community engagement began in April 2007.[1] Dr. Nicholas Muraguri, director of health promotion at the time, explained, "We took a very aggressive publicity approach. We wanted the message to be clear...that [male circumcision] was a medical intervention, not a cultural expectation."

In the fall of 2007, the MOH named the National AIDS Control Council responsible for the national circumcision agenda and created the National Male Circumcision Task Force to ensure that male circumcision efforts aligned with national health system strengthening goals; that messaging regarding the 60% protective effect of VMMC was consistent; and to oversee training, monitoring and evaluation, development of program tools, and quality control.[36]

Muraguri became head of Kenya's National AIDS and Sexually Transmitted Infections Control Programme in July 2008 and prioritized the VMMC campaign. "It was the first thing we had that was going to be cost-effective [and] give us returns in a short time," he said. Prime Minister Raila Odinga, a Luo and Nyanza native, promoted male circumcision as well.

Many saw an opportunity to increase service utilization. Muraguri explained: "We know women...have a lot of

contact with the health system. But for men, the opportunities are rare. We see [VMMC] as an opportunity to address that gap."[37] The national program launched officially in November 2008.[1] "Speed matters," Muraguri said, "It was an emergency...and the 'building blocks'... had been assembled."

External Support for Male Circumcision

The total cost for the VMMC campaign over five years was estimated at USD 76·5 million (see Exhibit 8 for estimated program costs); around USD 7·3 million would go toward infrastructure, primarily in public facilities. The setup costs for each delivery site were estimated to be USD 12 000. Assuming no more than a 5% adverse event rate, USD 33·2 million was budgeted for complications. Cost per client was expected to decline over time, from USD 143 to USD 65; consumables were USD 15 per procedure in private sites and USD 22·50 in government facilities.

PEPFAR, the male circumcision implementation funder, channeled money to 11 sub-grantees and US agencies in Kenya through USAID and the CDC. In line with its mission to support long-term and equitable growth, including strengthening the health system, USAID incorporated VMMC into its large umbrella program called AIDS, Population, and Health Integrated Assistance (APHIA) II in Nyanza. Four public sector organizations trained providers and paid for locum services. By contrast, the CDC funded four direct grantees to conduct circumcisions, promoting rapid scale-up and innovation to achieve targets. CDC implementers hired dedicated staff and paid government staff as consultants to perform circumcisions.[38]

Beyond direct implementation support, the Bill & Melinda Gates Foundation funded a five-year USD 18·5 million grant to launch a Male Circumcision Consortium in Kenya in 2008 composed of private, research, and academic institutions to support the government in developing a national strategy; expand research, training, health facility capacity, and monitoring; address misunderstandings about male circumcision; conduct its own research, and bring partners together to mobilize resources and work in sync with the MOH. "It's like the Male Circumcision Consortium is the champion the catalyst," one stakeholder explained.[39]

Male Circumcision in Nyanza Province

A provincial body—the Provincial Male Circumcision Task Force for Nyanza—coordinated delivery efforts in Nyanza. The Provincial Task Force posted implementers' data at each meeting and encouraged sharing of resources. Some implementers felt they had an unfair disadvantage, depending on how many eligible men were in their assigned district. "It was the fight for the foreskin, to get as many...as possible," one campaign leader said.

Though Task Force meetings could be tense due to competition among implementers, implementers ultimately represented their work as a joint effort. As one communications officer shared, "We don't attribute leadership to any specific partner, but to the government."[1]

	Uganda (2008)	Kenya (2006)	Zambia (2008)	Swaziland (2008)	Lesotho (2008)
Injecting drug users (IDUs)	0·28	4·84	0	1·1	0
Partners of IDUs	0·01	0·2	0	0·1	0
Sex workers (SW)	0·91	1·25	0·75	3	0·47
SW clients	7·83	10·48	4·04	4·7	0·59
Partners of SW clients	1·81	1·1	1·81	2·6	1·68
Men who have sex with men (MSM)	0·61	4·49	0·99	3·6	2·89
Female partners of MSM	0·1	0·64	0·05	0·5	0·5
Multiple partnerships (MP)	23·73	18·31	33·96	13·4	31·04
Partners' MP (PMP)	21·76	27·74	37·03	20·8	27·45
Mutually monogamous heterosexual sex	42·89	30·14	21·19	49·8	35·15
Medical injections	0·06	0·55	0·17	0·01	0·04
Blood transfusions	0	0·24	0·02	0·02	0

Bold text indicated sexual transmission (61, 78–81).

Exhibit 7: **Incident HIV Infections by Mode of Transmission in Five sub-Saharan Africa Countries**

Implementation Efforts

Training

Teams consisting of a surgeon, a surgical assistant, an infection control officer, and a counselor received training in implementing an adapted version of the WHO/Jhpeigo training curriculum in collaboration with the university that had spearheaded the Kenyan clinical trial (see Footnote B for full training guide).[B] The training involved two to three days of classroom instruction followed by six to eight days of practicum in which each trainee observed two circumcisions, assisted with one, performed one with the trainer, and then performed 20 under supervision.[1,40, 38] The total cost for training was about USD 6500 per team.[15] Many sites deployed a "train-the-trainers" model, and a refresher training was offered as needed.

On average, a newly trained provider could complete one circumcision in 25–45 minutes. With more experience, providers' speed increased and risk of adverse events (most commonly, pain and swelling after the procedure[41]) decreased. After performing 100 or more procedures, some VMMC surgeons completed the procedure in 10–15 minutes.[41]

Newly trained providers were less likely to provide circumcisions in general. "People had too many doubts in their heads," Muraguri explained. "They weren't implementing or motivated." VMMC program leaders observed that coaching and mentorship increased the confidence of those new to the procedure. Training was subsequently done on-site.

Care Package

Implementers began offering services in Nyanza in September 2008, prior to the national launch. When a client presented for circumcision, a counselor ensured

	Annual cost year 2	Total cost years 3–4	4-year cost
I. Through Mobile Teams			
Goal			
Target numbers of AMCs	160 000	408 000	688 000
Human resources			
Number of teams needed	80	102	..
Breakdown	Cost	Cost	Cost
1. Salary & benefits			
Mobile team	3 280 000	8 364 000	14 104 000
2. Surgery			
Equipment & infrastructure	480 000	120 000	1 320 000
Consumables @ $15/MC	2 400 000	6 120 000	10 320 000
3. Training costs			
US $6500 per team	130 000	143 000	520 000
4. Rural outreach			
Vehicle @ US $30 000	600 000	600 000	2 400 000
Petrol & maintenance	800 000	2 040 000	3 440 000
5. Complications			
Adverse events (5% default)	200 000	1 020 000	1 370 000
Total Direct Costs (1–4)	7 890 000	18 467 000	33 474 000
II. Through Support to Public Health Facilities			
Goal			
Target numbers of AMCs	40 000	102 000	172 000
Facilities upgraded			
Hospitals	44	..	..
Health centers	96	..	..
Total Facilities	..	..	..
Human resources			
Two teams per facility for 140 facilities	280	0	560
Breakdown			
1. Incentives			
$10 per circ done	400 000	1 020 000	1 720 000
2. Surgery			
Equipment & Infrastructure	3 360 000	..	6 720 000
Consumables @ $22·5/MC	900 000	2 295 000	4 972 500
3. Training costs			
$6500 per team	1 820 000	..	3 640 000
4. Complications			
Adverse events (5% default)	50 500	127 500	215 000
Total Direct Costs (1–4)	6 530 000	3 442 500	16 165 000
III. Other costs			
Monitoring & evaluation (7·5%)	1 395 484	2 120 274	4 881 484
Warehousing & distribution (7·5%)	1 395 484	2 120 274	4 881 484
Communication campaign (10%)	1 860 645	2 827 032	6 508 645
General administration (15%)	2 790 968	4 240 548	9 762 968
IV. Overall			
Overall goal			
Target numbers of AMC	200 000	510 000	860 000
Human resources			
Overall number of teams	360	662	662
Overall program costs	21 862 581	32 217 629	76 47 581
Overall cost per client (national)	109	65	89

*Overall target numbers for years 3–5 are cumulated of those shown in Section II above. Source: Government of Kenya. *Kenya National AIDS Strategic Plan 2009/10–2012/13*. Nairobi: National AIDS Control Council; 2009.

***Exhibit 8*: VMMC Estimated Program Costs, 2009–2013**

voluntary or parental consent as appropriate and an understanding of risks and benefits. Clients then received HIV voluntary counseling and testing (VCT), and most sites offered free condoms. Rapid HIV testing gave consenting clients immediate results. In addition, counselors screened and prescribed treatment for other sexually transmitted infections, asking those infected to complete a course of treatment and then return for their circumcision. Those with HIV could opt for the procedure as long as CD4 levels were not too low. Counselors explained post-procedure care, emphasized that circumcision was only 60% protective, that clients should continue to use condoms, and advised clients to abstain from sex for six weeks to heal.

After counseling, clients moved to the minor surgery theater. Many fixed sites had formal surgical rooms, while outreach and mobile sites created theaters in available spaces. Clients received an adverse event hotline number to report any problems after the procedure. They were asked to promote VMMC in their communities and to bring their partners for HIV prevention services.[1] Most implementers offered a small monetary reward for new referrals—a small incentive aimed at increasing participants while minimizing coercion.

The majority of implementers advised clients to remove their dressings after three days and to return on the seventh day for a follow-up visit. Follow-up rates were generally very low.

Equipment and Supplies

The MOH mandated implementers use a consumables pack (including gauze, needles, scalpel blade, and gloves) and a reusable surgical instrument set for each circumcision (see Exhibit 9 for WHO-recommended VMMC supplies). After use, instruments were decontaminated, sterilized, and repacked.[2] As one CDC-funded program officer said, "We provide surgical instruments and supplies with the view that when we leave, those instruments will stay...[and] will be useful to the health system...We're criticized for not being efficient."

Implementers generally followed the WHO recommendations that surgical spaces have an operating table, instrument trolleys, and operating lamps or fluorescent lighting, though optimal lighting was not always possible.

Delivery Models

Both USAID and CDC implementers delivered services through "fixed" and "outreach" sites. Fixed sites existed in health facilities that had surgical capabilities, such as regional hospitals and health centers. Outreach sites, such as dispensaries, were set up for temporary services. CDC implementers also performed circumcisions in remote areas at non-clinical settings such as schools, churches, or temporary tents, termed mobile sites. Mobile and outreach sites accounted for 90% of the program's circumcisions (see Exhibit 10 for images of mobile service delivery).[1]

Kenyan policy had originally restricted surgery to medical officers. When the Male Circumcision Consortium found that task-sharing would increase the number of facilities capable of participating in VMMC from 12% to 85%, the government allowed nurses to perform VMMC, starting in June 2009.[1, 42]

USAID-Funded Delivery

APHIA-II Nyanza worked in its assigned districts starting in November 2008 to train public providers to provide circumcisions, however none of the 81 facilities in two key districts was prepared to offer VMMC (see Exhibit 11 for assessment criteria).[42] Eight of the 59 public hospitals were able to participate (see Exhibit 12 for facilities meeting criteria).[43] All 140 facilities were renovated by 2010.

At capacity, district hospital sites could theoretically support 10–20 procedures per day. In practice, many public providers prioritized contractual responsibilities and acute medical care, which did not include VMMC. "If you have a convulsing child and a person waiting for [VMMC], then the [VMMC] client must wait", explained one implementer.[38] Public providers had a much higher rate of adverse events than those working for CDC-funded projects.[41,43]

In addition to the 9 health facilities, public providers also provided VMMC in 11 outreach settings, which saw much greater demand for VMMC. At one site, the team provided 343 circumcisions in one three-week period. Regular outreach was not possible due to workforce shortage, however. Public-sector staff working through APHIA-II performed about 12% of VMMCs in Nyanza. The average cost per USAID-funded VMMC procedure was USD 38·62.[44]

CDC-Funded Delivery

CDC-funded implementers were free to set up sites anywhere.[1] Surgical teams were each expected to provide 12 or more circumcisions per day, and implementers frequently worked late performing circumcisions or holding after-hours meetings to maximize daylight procedure time.[45]

Mobile services were the most expensive service delivery model to set up. Established in hard-to-reach places, implementers transported staff, tents, water, and generators to the sites. When distance or weather required, they increased staff compensation to account for onsite camping. Mobile sites' counseling was sometimes done under nearby trees. A 100-square-foot tent with one surgical table could be the operating theater. One officer commented, "When it rains, the tent floods. When it's sunny, the tent is hot. If it's dry, the dust ...drifts through. But we work with all of this." A single mobile team with a regular Friday scheduled provided as many as 18 circumcisions per day and maintained an 80% follow-up rate. CDC implementers performed 88% of all procedures in Nyanza.[46] The average cost of CDC-funded procedures was USD 44·24.[44]

***Exhibit 9:* WHO-Recommended Male Circumcision Equipment and Supplies**

"Pre-packs" or "consumables" contained:

- two sizes of latex gloves
- plain and petroleum jelly impregnated gauze
- one scalpel knife handle and two blades
- one 10-milliliter syringe
- one 18- or 21-gauge needle
- chromic gut or vicryl 3-0 and 4-0 sutures with a three-eighths circle reverse
- cutting needle

Surgical packages (reusable) included:

- fine-toothed dissecting forceps
- two straight and two curved artery forceps
- curved Metzenbaum's scissors
- stitch scissors
- Mayo's needle holder
- sponge-holding forceps

Other supplies kept on site included:

- surgical masks
- aprons
- lidocaine anesthetic solution
- povidone iodine
- 80 cm × 80 cm "o" drapes with 5 cm holes
- sterile marking pens to mark the line of incision
- emergency medications for anaphylactic reactions
- sterile drapes
- gallipots for antiseptic solution
- instrument trays

Source: World Health Organization. *Manual for Male Circumcision Under Local Anesthesia*; 2008.

***Exhibit 10:* Mobile Service Delivery Model Images**

Group counseling on male circumcision (A). Mobile circumcision counseling site (B). Circumcision being conducted in tented delivery site (C). Source: Nyanza Reproductive Health Society.

***Exhibit 11*: Minimum Criteria for Male Circumcision Service Provision**

1 Room available for surgery (e.g., minor theater)
2 Room available for recovery
3 Trained and available staff
4 Sterilization and infection control compliance
5 HIV voluntary counseling and testing (VCT); and risk-reduction counseling
6 STI syndromic diagnosis and treatment
7 Provision and promotion of male and female condoms

Source: Herman-Roloff A, Llewellyn E, Bailey R, Agot K. *Using Health Facility Asessment Data to Strategically Roll-Out Male Circumcision in Nyanza Province, Kenya: A Mixed Method Approach*; 2009.

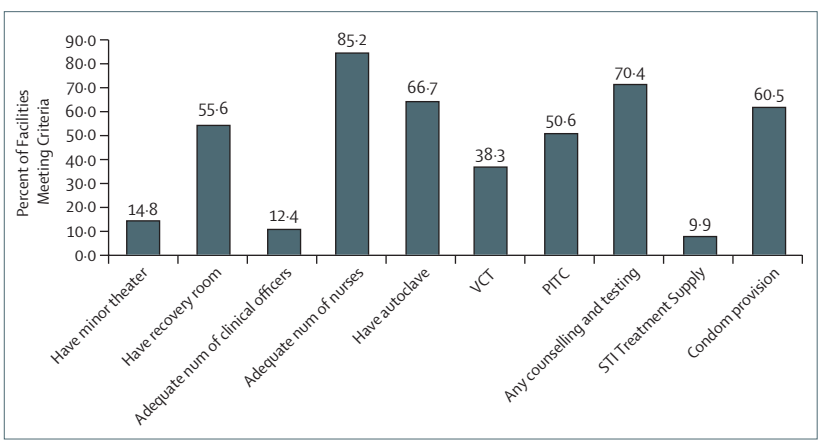

***Exhibit 12*: Percent of Government Health Facilities in Kisumu and Nyando Districts with Components of the Minimum Criteria for VMMC Service Provision**
Source: Herman-Roloff A, Llewellyn E, Obiero W, Agot K, Ndinya-Achola J, Muraguri N, Bailey RC: Implementing Voluntary Medical Male Circumcision for HIV Prevention in Nyanza Province, Kenya: Lessons Learned During The First Year. *PLoS ONE* 2011, **6:** e18299. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0018299.

	2009–10	2010–11	2011–12	2012–13	4 Year Total
Nyanza	76 500	100 000	125 000	125 000	426 500
Rift Valley	28 500	40 000	60 000	60 000	188 500
Nairobi	19 500	30 000	40 000	40 000	129 500
Western	12 000	15 000	15 000	15 000	57 000
Others	13 500	15 000	15 000	15 000	58 500
TOTALS	150 000	200 000	255 000	255 000	860 000

Source: Government of Kenya. *Kenya National AIDS Strategic Plan 2009/10– 2012/13*. Nairobi: National AIDS Control Council; 2009.

***Exhibit 13*: National VMMC Targets by Province, 2009–2013**

Monitoring and Evaluation

Implementers reported data electronically. PEPFAR primarily evaluated implementers on the number of circumcisions performed. By the end of 2009, the MOH adopted VMMC indicators for inclusion in its health and management information system. Providers completed an intake form for each client, with CDC and the APHIA-II sites aggregating their data separately. In 2010, providers called for greater standardization of data.

The Male Circumcision Consortium worked to assess how to improve efforts in Kenya.[47] One analysis found only 38% of sites were equipped for VCT, which could take up to 45 minutes, required a private space, and counselor training. The surgery was taking only 8–45% of total provider time. Provider-initiated counseling and testing did not require additional space or staff. The Male Circumcision Consortium's recommendation to switch from VTC to provider-initiated counseling and testing increased testing rates to 60% and eventually to 93·6%. Counseling and testing sessions dropped to less than 20 minutes.[48] The Male Circumcision Consortium supported research that found after VMMC, most men either did not alter their sexual behaviors. Most described being able to perform more rounds of sex, easier condom use, and fewer cuts on the penis during sex.[49]

The Rapid Results Initiative

National success hinged on Nyanza's goal to provide 76 500 circumcisions in the first year, 100 000 in the second, and 125 000 in each of the final two years (see Exhibit 13 for VMMC targets over four years).[15] The model predicted that 80% coverage could reduce HIV prevalence in Nyanza by 45–67%, dropping male prevalence from 17% to 10%.[50, 5, 15] USAID estimated that reaching 60% of the target population by 2014 could avert 47 000 infections by 2025, saving USD 247 million in HIV care and treatment costs.[51] Programming would use a "high-quality, high-volume" approach. The strategy codified many ongoing activities from Nyanza.[1,15]

In 2009 when the RRIs began, 50 526 circumcisions had been performed[1] (see Exhibit 14 for circumcisions performed over time), each costing an average of USD 86. Two Nyanza implementers suggested a province-wide campaign, modeled after previous Kenyan immunization campaigns, to reach targets.[52] The implementers agreed to pool resources to increase efficiency and reduce costs. The Provincial Task Force oversaw district committees and provided technical oversight, as well as a supervision team with experts on logistics, data management, and waste disposal. All 110 implementing teams used a checklist adapted from the WHO quality-assurance toolkit and aimed to serve 12 clients per day for a total of 30 000 eligible boys and men within 30 working days.[52,53] RRIs were held during school holidays, when many return home, and promoted with public outreach. [1]

NGO personnel worked with MOH and locum staff to train public hospital staff[54] and leverage human resources from different agencies.[52, 54] Experienced providers partnered with less-experienced providers and served as team leaders to ensure quality.

Initially, two- to three-day supplies of pre-packed reusable surgical kits were distributed to sites a week before the RRI; each partner tracked supplies, allowing districts to forecast needs daily. Since only reusable surgical packs were distributed, basic decontamination was done on site

and instruments were brought to district autoclaves for sterilization. Unpredicted variation in demand could lead to complex supply and waste management problems despite several vehicles helping with staff and supply distribution. Counseling and screening clients on the eve of surgery and group counseling in high-volume sites increased efficiency during the RRIs.

Over time, RRI implementers began to use two operating tables per team to reduce time between surgeries, used prepackaged supply kits, and delegate tasks to different level providers. In high-volume areas, some clients received counseling the day before surgery so surgeons could start working first thing in the morning. Intentional mobilization and advocacy efforts targeted men 15 and older, particularly those 18–49. In order to increase access, implementers also opened after hours "moonlight" services—sometimes as late as 3 a.m.—at 20 locations. RRIs began to surpass their goals at times by excesses of more than 30%.

Impact

Over the course of the Nyanza implementers' RRIs, an average of 33 000 circumcisions were performed per 30 days at USD 39 per procedure (see Exhibit 15 for circumcisions per month over time). After the first RRI, the complication rate was under 2%, and most complications resolved completely. Forty-five percent of clients were below age 15 and only 39% consented to on-site HIV counseling and testing, a lower percentage than that seen during routine service delivery. Of those tested on site, 2·8% were HIV positive, and 79% (236) of those with HIV opted for circumcision. The follow-up was 23%.[1] Focus groups in the province in early 2010 revealed 36% of observed clients engaged in sex before fully healing.[1, 46] Another challenge included appropriately combining public and private implementers into surgical teams.[1]

In subsequent RRIs, clients within the target age range comprised the majority of those served, as did those opting for HIV testing and counseling. Still, less than half of clients returned for follow-up. The cost per procedure decreased by 43%, from USD 48 during regular program implementation to as low as USD 27 during one RRI. Matching client flow with deployment of staff remained a challenge throughout the campaign.

Next Steps

Between 2008 and 2012, the program went from performing 8000 circumcisions annually to around 150 000.[55] About 80% of all circumcisions were performed in Nyanza. The percent of men circumcised in Nyanza increased from 48·2% to 66·3%. Allowing nurses to perform VMMC was critical to the success of the campaign.

Many approached Muraguri to request his guidance for their programs. While he was glad to support them, he also wondered how Kenya could adapt lessons from VMMC to other diseases. What could they learn from the VMMC campaign's success? Were there other surgical procedures that could be performed successfully by mid-level providers? How could the campaign promoting VMMC also increase surgical capacity?

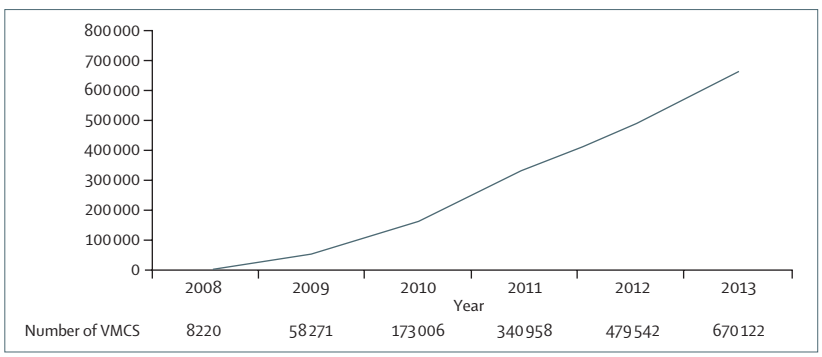

Exhibit 14: **Cumulative Circumcisions Done in Kenya, 2008–2013**

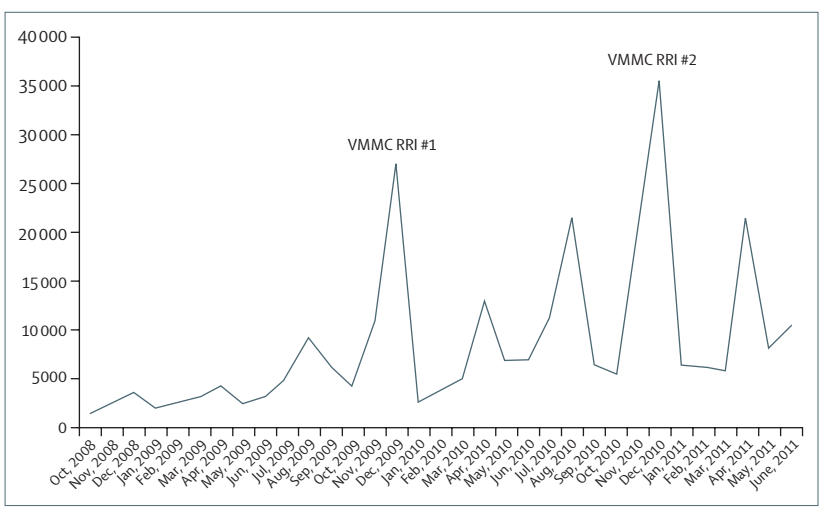

Exhibit 15: **Monthly Circumcisions Done in Kenya, 2008–2011**
Source: *PLoS Med* 2011 Nov; **8:** e1001130. Epub 2011 Nov 29. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3226459/pdf/pmed.1001130.pdf.

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Footnotes

A Male circumcision was believed to be effective in aiding HIV prevention because it removed tissue most susceptible to HIV. The inner mucosal surface of the human foreskin present in uncircumcised men had a high density of HIV target cells. During intercourse, this mucosal surface was exposed to vaginal fluid that could contain HIV, providing an environment conducive to HIV transmission.

B See Manual for Male Circumcision under Local Anaesthesia (http://www.who.int/hiv/pub/malecircumcision/who_mc_local_anaesthesia.pdf)

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Appendix A
Male Circumcision

Medical Circumcision of Adults

Three methods were recommended for adult and adolescent male circumcision for HIV prevention: the forceps-guided, the dorsal slit, and the sleeve resection method. Advantages and disadvantages are summarized in the table below. Though the sleeve resection method was regarded as having the most ideal result, it required the highest level of surgical skill. The dorsal slit was the most widely used procedure by trained surgeons worldwide, but ran the risk of uneven foreskin removal, as there was no guide to ensure a uniform incision since the provider cut free-hand around the circumference of the penis. Finally, the forceps-guided method, the simplest method, was regarded as ideally suited to most resource-limited clinical settings. It was the simplest to teach and perform, and was the method used in Kenya's VMMC campaign. All recommended adult and adolescent circumcision procedures require knowledge of penile anatomy, training in draping and skin preparation, anesthesia administration, haemostasis, and suturing. Each technique removes a uniform amount of the foreskin sufficient to expose the glans whether the penis is erect or flaccid.[2]

The Forceps-Guided Method

To perform a forceps-guided circumcision, surgeons sterilize the skin with iodine and drape the body so that only the penis is exposed. After administering injected anesthesia, surgeons pull back the foreskin to separate any adhesions between the foreskin and the glans. Then, surgeons pull the foreskin forward to mark the point at which the foreskin meets the glans as the line of incision. Surgeons clamp the foreskin, evenly holding the foreskin just past the glans. Surgeons use their fingertips to ensure the glans had not been caught in the forceps and was still located before the line of incision. Then, using a scalpel, surgeons cut along the exterior line of the forceps, removing the foreskin. The surgeon retracts the skin on the shaft of the penis to tie off blood vessels as necessary. Surgeons place at least six sutures, then check for any remaining bleeding and dress the wound.[2]

	Advantages	Disadvantages
Dorsal Slit	A surgical assistant is helpful but not required Widely used by surgeons throughout the world	Requires more surgical skill than forceps-guided method Small risk of asymmetric result
Forceps Guided	Can be learned by surgeons/surgical assistants who are relatively new to surgery Ideal for use in a clinic with limited resources Can be done without a surgical assistant	Cosmetic effect may be less satisfactory Leaves 0·5–1·0 cm of mucosal skin proximal to corona
Sleeve Recession	Better cosmetic results than other two techniques	Requires highest level of surgical skill Better suited to hospital rather than clinic setting Requires an assistant More room for surgical error

Advantages and Disadvantages of Adult Male Circumcision Methods

Appendix B
Useful Abbreviations

APHIA	AIDS, Population, and Health Integrated Assistance
CDC	US Centers for Disease Control and Prevention
Gates Foundation	The Bill & Melinda Gates Foundation
PEPFAR	US President's Emergency Fund for HIV and AIDS Relief
PMTCT	prevention of mother-to-child transmission
UNAIDS	The Joint United Nations Programme on AIDS
USAID	United States Agency for International Development
USD	United States' dollar
VCT	voluntary counseling and testing
VMMC	voluntary medical male circumcision
WHO	World Health Organization