Voluntary medical male circumcision for HIV prevention

KEY POINTS:

- Voluntary medical male circumcision (VMMC) reduces female-to-male sexual transmission of HIV by 60%.
- The WHO and UNAIDS recommend the implementation of VMMC programmes in countries with a high HIV prevalence among the general population.
- VMMC is cost-effective and should be included, alongside behavioural and structural strategies, as part of a comprehensive HIV prevention plan.

Explore this page to find out more about WHO recommendations for the implementation of VMMC, high profile VMMC programmes, increasing uptake of VMMC programmes, the benefits and challenges of VMMC and hazards of the procedure.

In the mid-2000s, male circumcision was found to reduce the female-to-male sexual transmission of HIV by 60%.1

Since 2007, the World Health Organization (WHO) and UNAIDS have recommended voluntary medical male circumcision (VMMC) as a key component of combination HIV prevention in countries with a high HIV prevalence and low levels of male circumcision.

As a result, 14 countries in East and Southern Africa were identified as priority countries and initiated programmes to expand the provision of male circumcision (Botswana, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe).2 The Central African Republic was subsequently identified as a high priority country for VMMC programmes, taking the total to 15.3

This massive public health intervention called for 80% coverage of male circumcision by 2016 in the original 14 priority countries (aiming to reach 20.8 million people).4 By the end of 2015, the
last time global data was reported, nearly 11.6 million men in these countries had been medically circumcised.5 However, the annual number of circumcisions performed within eight of these 14 priority countries declined in 2015.6

It has been estimated that achieving 80% coverage would cost US$ 1.5 billion but would lead to savings of US$ 16.5 billion by 2025 due to averted HIV treatment and care costs. It is also estimated that reaching the target would prevent up to 3.4 million new HIV infections.7

**WHO recommendations for the implementation of VMMC**

**Who should VMMC programmes target?**

The WHO and UNAIDS recommend the implementation of VMMC programmes in countries where they will have the greatest public health benefit.

These include countries with a high HIV prevalence among the general population (over 15%) and where the vast majority of men are not circumcised (80%). VMMC is also recommended in countries where HIV prevalence is between 3% and 15% among the general population where HIV transmission occurs primarily via heterosexual sex.8

VMMC is thought to have a limited public health benefit if introduced among key affected populations such as sex workers, people who inject drugs (sometimes referred to as PWID) and men who have sex with men (sometimes referred to as MSM).9 However, individual men may benefit if they are at a higher risk of heterosexual HIV transmission because they are in a mixed-status relationship.10

**Making VMMC programmes work**

The male circumcision procedure only partially protects men from HIV transmission.

Therefore it is recommended that VMMC is included as part of a comprehensive HIV prevention strategy which includes HIV testing and counselling; treatment for sexually transmitted infections (STIs); the promotion of safer sex practices and the distribution of condoms as well as their correct and consistent use.11 Providing antiretroviral treatment (ART) to people living with HIV in order to achieve viral suppression, which is when the level of HIV in someone’s body is at such a low level they are unlikely to transmit the virus on to someone else, is also recommended.12

Countries are also advised to offer VMMC free of charge or at the lowest possible cost to the client, as for other HIV services. Experts have also stressed the need for:

- culturally appropriate strategies
- well-trained practitioners working in sanitary conditions
- informed consent, confidentiality and absence of coercion
- counselling for men and their sexual partners to prevent them developing a false sense of security.13

**Maximising public health benefit**

UNAIDS and the WHO advise that prioritising circumcision for young men (between 12 years and 30 years of age) will have the greatest public health benefit.

Nine VMMC priority countries reported age-disaggregated data to UNAIDS in 2015 (Botswana, Ethiopia, Kenya, Lesotho, Mozambique, Rwanda, Swaziland, Zambia, Zimbabwe). This found the
uptake of VMMC was highest among those aged 10–14 years, followed by those aged 15–19 years and 20–24 years.\textsuperscript{14}

One study has highlighted the benefits of prioritising male circumcision among adolescents rather than adults. This is because:

- in many places, it is more acceptable both culturally and socially for adolescents to be circumcised than adults
- if performed before becoming sexually active, the benefits of VMMC are long-term for both the individual and wider public health
- if VMMC occurs before an individual starts engaging in sexual relationships there are fewer concerns about sexual abstinence and it allows enough time for the wound to heal.\textsuperscript{15}

In 2010, UNAIDS emphasised the need to reach older men in order to achieve the 80% coverage target and to maximise the population-wide prevention benefits of VMMC.\textsuperscript{16}

**Early-infant male circumcision (EIMC)**

The circumcision of newborn babies has also been put forward by UNAIDS and the WHO as a longer-term strategy to combat the HIV epidemic which should be implemented in parallel with adult circumcision programmes.\textsuperscript{17}

Many of the 15 priority countries have implemented or are piloting early infant male circumcision (EIMC) programmes (Botswana, Kenya, Lesotho, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe).\textsuperscript{18}

Although its impact on HIV will take longer to realise, EIMC is ultimately likely to be more effective at preventing HIV acquisition than adult male circumcision as the procedure is carried out well before the individual becomes sexually active, avoiding the risk associated with sex during the healing period. Like VMMC, EIMC will therefore protect against other STIs in addition to HIV. It is also cheaper than VMMC, with studies estimating that it is likely to be a cost-saving HIV prevention intervention in the longer term.\textsuperscript{19}

**Progress made in VMMC for HIV prevention**

Progress among priority countries varies widely. Ethiopia, Kenya and Tanzania surpassed their national coverage targets by the end of 2015, while Mozambique, South Africa, Uganda and Zambia had achieved between 50% and 70% of their targets. However, in Botswana and Swaziland, coverage was around 45%, and in Lesotho, Malawi, Namibia, Rwanda and Zimbabwe, coverage was under 35%.\textsuperscript{20}

In 2014, there was a rapid scale up of VMMC services with 3.2 million circumcisions performed in the original 14 priority countries in that year alone.\textsuperscript{21} However, the total number of VMMCs in these countries dropped to 2.6 million in 2015.\textsuperscript{22} Programme managers are examining the causes of the decline. Potential reasons may include reporting challenges, temporary disruptions caused by changes in procedures, reductions in funding and a natural decline after early adopters had been reached.\textsuperscript{23}

To reach the target laid out in the United Nations’ 2016 Political Declaration on HIV and AIDS (25 million additional young men in high-prevalence settings circumcised by 2020), the annual number of circumcisions performed in the priority countries needs to more than double.\textsuperscript{24}

To achieve this, UNAIDS recommends the following:

- integrate vertical programmes within national health systems
- promote voluntary medical male circumcision as part of a core package of health services for men
and boys, using approaches that are tailored for various age groups and locations

- increase domestic funding to ensure sustainability
- widen the use of new non-surgical circumcision devices
- develop new approaches for adolescent and early infant circumcision
- break down myths and misconceptions about circumcision.25

## High profile VMMC programmes

### Kenya

Kenya launched its VMMC programme in 2008 with an initial target of circumcising 860,000 men by July 2013 (80% coverage). Between 2008 and 2013, the number of annual VMMCs increased dramatically from 8,000 to 190,000.26 The country fell just short of its target, reaching 800,000 men (71%) but achieved its coverage goal in the Nyanza region where most of the implementation took place.27

The next phase of Kenya’s VMMC strategy aims to see 95% of men circumcised by 2019. The second stage of the programme has shifted its focus to infant male circumcision, which targets children between 0 to 60 days old, and adolescents (10 to 14 years). The country also aims to encourage safer surgical practices among traditionally circumcising communities.28

In 2015, under the new phase of the strategy, Kenya surpassed its annual target of 940,000 circumcisions by around 100,000. Kenya has achieved coverage among communities that did not previously practice male circumcision such as the Nyanza region and is targeting the counties of Turkana, Marsabit, West Pokot and Coast.29

### Lesotho

In 2009, the Lesotho Demographic and Health Survey found that only 37% of men, compared to 66% of women, had ever been tested for HIV. With one of the world’s biggest generalised HIV epidemics, VMMC was viewed primarily as another means of increasing HIV testing uptake among men.30

Launched in March 2012, Lesotho’s VMMC programme aimed to circumcise 80% of men aged 15–29. In Lesotho, 72% of men of this age live in these five districts, all of which have high HIV prevalence.

By 2014, this resulted in 18 hospitals and private clinics and over 100 health centres providing VMMC. The same year, nearly 85,000 men received VMMC as part of comprehensive HIV prevention services, with 56% also testing for HIV.31

In 2017, the programme aims to circumcise 38,737 men aged 15–29 years. This would achieve 80% saturation in two of the five districts (Berea and Maseru) with the remaining three districts estimated to reach 80% coverage by September 2018.32

However, a review conducted in 2013 found that a high percentage of men undergoing VMMC were lost to follow-up. To improve the situation, active links to treatment and care were introduced in October 2013, and were expanded in March 2014.33

As part of its VMMC strategy, in 2013 Lesotho began incorporating EIMC into routine maternal, newborn, and child health (MNCH) services. A review published in 2016 found demand for services has increased slowly. Between October 2014 and March 2015, 11% of male babies delivered at the nine implementation sites were circumcised; rates ranged from 27% in Berea Hospital to 2% in Leribe Hospital.34
The primary challenge to EIMC uptake was the mother’s desire to consult with the father and other family members before consenting to the procedure. In Lesotho, most fathers do not accompany mothers to antenatal visits, to the hospital for the birth, or to postnatal care visits, the main sources of EIMC information. This means most fathers are reluctant to give consent as they do not have firsthand information about the safety and benefits of the procedure.\(^\text{35}\)

Cultural practices also had an impact on uptake. Traditionally, boys in Lesotho are circumcised during ritual initiation into adolescence and adulthood. Some mothers felt that infancy was not the proper time to have their sons circumcised because they feared their sons would not be accepted for initiation.

There was also a lack of available VMMC providers, partly due to the country’s shortage of doctors, who were the only medical staff authorised to perform EIMC at the time of the study. However, guidelines have now been changed and nurses are being trained to perform the EIMC procedure.\(^\text{36}\)

**CASE STUDY: CHAPS, Johannesburg, South Africa**

In 2010, following successful VMMC trials, the Centre for HIV and AIDS Prevention Studies (CHAPS) was established in Orange Farm, a township outside Johannesburg, to contribute to the roll-out of South Africa’s national VMMC programme.\(^\text{37}\)

At this time, the healthcare system was still coping with the rapid expansion of ART and a chronic shortage of health workers. To ensure the expansion of the programme, CHAPS and the National Department of Health selected private sector clinics in high priority areas and trained private providers to deliver free VMMC.\(^\text{38}\)

As of 2017, CHAPS has partnered with 70 clinics, trained more than 4,000 health care workers on VMMC and conducted 325,000 circumcisions.\(^\text{39}\)

Due to its success, CHAPS has supported the launch of a similar programme in Swaziland and provided advice to partners of Namibia’s VMMC programme.\(^\text{40}\)

**Scaling up VMMC programmes**

A number of suggestions have been made in order to accelerate and maximise the impact of VMMC, including:

- promoting VMMC as cost-effective in order to secure more funding from donors\(^\text{41}\)
- allowing VMMC to be performed by nurses and other healthcare workers (task shifting)\(^\text{42}\)
- prioritising sub-populations (for example by age or geography) in order to maximise a programme’s impact and efficiency, for example men over the age of 25\(^\text{43}\)
- exploring the role of technologies in order to make circumcision more attractive to men.\(^\text{44}\) One device called PrePex is discussed below.

**PrePex**

In 2013, the WHO approved the first adult circumcision device for use in low-resource settings called PrePex.

PrePex is an elastic ring device that requires no injected local anaesthetic and can be placed and removed by trained mid-level healthcare workers. It works by stopping the flow of blood to the foreskin due to the compressive force of the elastic ring. Eventually the foreskin tissue dies and can be easily removed after one week.\(^\text{45}\) It is hoped that the device will accelerate the scale up of
VMMC in low-income countries and relieve the demands placed on the limited number of healthcare workers.46

In April 2014, the PrePex device was introduced in Zimbabwe as an alternative to surgery and the country included the device in its national VMMC Action Plan, with a target of circumcising 1.3 million men by 2018.47

South Africa and Uganda are in advanced stages of PrePex implementation, and have each set a goal of reaching more than four million men with VMMC. Rwanda is also implementing PrePex and aims to circumcise 800,000 men by 2016 using the device. Botswana, Kenya, Malawi, Zambia, Tanzania, Lesotho and Swaziland were in varying phases of PrePex implementation as of 2015.48

In a study of 500 men who had undergone a PrePex circumcision, 93% said they would recommend it to their peers. More than 12,000 men in the country are thought to have benefitted from PrePex since its introduction.49

By the end of 2015, the WHO pre-qualified a second non surgical VMMC device for use.50

Innovations such as this can play a key role in helping priority countries significantly increase circumcision rates.51

Increasing uptake of VMMC programmes

Community mobilisers and peer education

Using members of the community to provide one-on-one messaging to potential VMMC clients has been one of the most effective strategies. It allows men who are thinking about the procedure to ask questions in private.52

CASE STUDY: Uganda - the STAR-EC Project

In Uganda, the USAID-funded STAR-EC project worked from 2009-2016 to increase access to VMMC and other HIV prevention and treatment services in East Central Uganda.

The project engaged Village Health Teams, peer educators, civil society organisations, and ‘satisfied clients’ to promote VMMC through organised events such as fairs, market days, couples testing and counselling weeks, and youth football competitions. It also used mobile surgical tents (often referred to as ‘camps’) to offer VMMC services in communities. These camps took place on weekends and on district, regional, and national commemoration days. Community resources were relied on to raise awareness about the benefits of VMMC and provide advance marketing for the outreach clinics.53

In addition to targeting single male clients, the project engaged couples and encouraged female involvement in their husbands’ decision-making around circumcision. This helped increase the cultural acceptability of, and demand for, circumcision in the region where the procedure was previously uncommon.54

By the end of the project, more than 408,000 men in East Central Uganda had been circumcised, increasing coverage from 37% to 57%.55

In Kenya, the Impact Research and Development Organisation has produced a toolkit to support counsellors to provide tailored information to the individual’s stage in the decision-making process. In Malawi, satisfied clients have been employed as community mobilisers.56
Media involvement

In Tanzania, radio spots and print materials tailored to different regions feature the voices of ‘satisfied customers’ and local health experts.57 Another programme has used geographic information systems (GIS) to map VMMC activities in order to identify areas to increase awareness among unreached populations.58

As part of the VMMC awareness drive in Tanzania, TV drama ‘Siri ya Mntungi’ (‘Secrets in the pot’), which focuses on the challenges that everyday Tanzanian families face, incorporated a VMMC storyline into a number of its episodes.59

In Kenya, journalists have been trained to report accurately on the science behind VMMC, while Zambia has incorporated key VMMC messages into radio magazine broadcasts. 60 61

Female involvement in VMMC

Women have been found to be able to influence their partner’s decision to undergo VMMC and adhere to post-operative care, which includes abstaining from sex for six weeks after the procedure to enable the wound to heal.62 For this reason, programmes to encourage women’s involvement in supporting partners through VMMC have been implemented.

For example in Uganda, the ASSIST programme aimed to improvement VMMC outcomes by involving female partners through increasing awareness about the procedure with women in a number of ways including when they came into contact with healthcare for other services such as maternal health. Between 2013 and 2016 ASSIST resulted in increased adherence to the WHO-recommended 48-hour (98%) and 7-day (96%) medical follow-ups and a decrease in adverse reactions to the procedure such as infection.63

The benefits and challenges of VMMC

VMMC is cost-effective

Male circumcision is a one-off procedure and therefore, unlike ART, has no ongoing costs. Once a man has undergone the procedure, he will benefit from the preventive effect for the rest of his life. 64

VMMC is also cost-effective as it averts new HIV infections, thereby reducing the number of people needing HIV treatment and care.65 The WHO estimates US$ 16.5 billion could be saved in HIV treatment and care costs by 2025 if coverage targets are met.66

A study from Tanzania reported the average cost of VMMC per person to be US$ 46. It also estimated that maintaining current levels of VMMC (88%) in the country would equate to savings of roughly US$ 4,200 per HIV infection averted between 2010 and 2025.67

A study in South Africa reported the cost of VMMC per person to be US$ 132. Unlike previous studies, which calculated the cost of VMMC in South Africa to be around US $49 per person, this analysis took indirect costs such as demand creation into account, as well as direct costs such as staff time. As the largest proportion of money spent on VMMC went on direct labour, accounting for 43% of costs, the study estimated that shifting the task from doctors to nurses could save at least US$ 15 million a year.68

Effectiveness

While male circumcision has been found to reduce the female-to-male sexual transmission of HIV,
circumcised men can still become infected with HIV, and if HIV-positive, can infect others. The WHO makes it clear that:

Male circumcision should never replace other known effective prevention methods and should always be considered as part of a comprehensive prevention package, which includes correct and consistent use of male or female condoms, reduction in the number of sexual partners, delaying the onset of sexual relations, and HIV testing and counselling. 69

In some places, it has been reported that circumcision is mistakenly viewed as providing complete protection from HIV and a viable alternative to more effective forms of protection such as condoms. 70 For example, a study in South Africa found 12.2% of respondents mistakenly believed you could not get HIV after being circumcised.71

Acceptability

Male circumcision is one of the oldest and most common surgical procedures worldwide. It is not only undertaken for medical reasons but also for religious, cultural and social ones.72

In East and Southern Africa where nationwide VMMC has been scaled up, high acceptance levels have been reported among men.73

A review of eight acceptability studies conducted in six sub-Saharan Africa countries in communities that do not traditionally circumcise found the median proportion of uncircumcised men who said they would be willing to be circumcised to be 65%.74

In these studies, almost 70% of the women said that they would prefer that their partners be circumcised.75 For example, in Nyanza province, Kenya, 77% of women preferred their sexual partner to be circumcised.76 Likewise, in South Africa, 78% of women in the 2011 Youth Sex Survey preferred circumcised men.77

Two randomised controlled trials of male circumcision compared data on sexual function and sexual satisfaction before and after circumcision and also between men who had been circumcised and men who had not. Participants in the trial among 4,500 men in Rakai, Uganda, reported no meaningful changes in any area of sexuality studied (including sexual desire or satisfaction, erectile function, ability to achieve penetration, or pain with intercourse) pre- and post-circumcision. More than 98% of the men in both the intervention and the control groups rated their sexual satisfaction as “satisfied” or “very satisfied” six to 24 months after enrolling in the trial. 78

In the trial conducted among 2,684 men in Kisumu, Kenya, there were no reported differences in sexual function between circumcised and uncircumcised men. 64% of the circumcised men who were available for follow-up at 24 months reported greater penile sensitivity after circumcision, and 54% reported enhanced ease in reaching orgasm.79

While male circumcision is normal practice in many communities, many cultures have no tradition of male circumcision, and some are strongly opposed to it. For example, studies of traditionally non-circumcising communities have found that older married men do not consider themselves at risk of acquiring HIV and view circumcision as more appropriate for younger men.80
In these settings, some argue that promoting circumcision as a modern medical procedure rather than as a cultural process, may increase uptake.81

**The effects on risk taking**

Circumcision is mistakenly viewed by some as a fully protective measure against HIV transmission, and there are concerns that men who have been circumcised may be more inclined to engage in risky behaviours. For example, they may stop using condoms.82

However, to date, no significant links have been made between the provision of VMMC and a decline in condom use. A large-scale study carried out in 10 East and Southern African countries found no evidence of decreased condom use or increase in other risky behavior by circumcised men. 83

A 2014 study of risky behaviour in men who had been circumcised found a 30% increase in condom use at last sex and a decline across a range of other risky behaviours such as engaging in transactional sex and having multiple partners.84

In some places (such as Lesotho), VMMC has been found to act as a critical gateway to HIV testing, treatment and care. As a result, men can learn their HIV status and reduce the risk of onwards transmission to others.85

Voluntary medical male circumcision provides a much needed entry point for reaching men and boys with other HIV prevention and health services, which would in turn benefit women and girls. We cannot reach our goals without it.

- Michel Sidibé, UNAIDS Executive Director86

**Hazards of the procedure**

Unlike other HIV prevention methods, male circumcision requires medical intervention. To carry out the procedure safely requires the right level of training and resources. Poorly performed male circumcision can lead to bleeding and damage to the penis. Moreover, if tools are not sterilised properly before each use, they can transmit HIV.87

The potential risk involved in medical interventions such as male circumcision is a concern for some as VMMC continues to be scaled up across much of sub-Saharan Africa.88 89

Moreover, because newly circumcised men have to wait a few weeks for their wounds to heal before having sex, they are at greater risk of HIV infection from an HIV-positive partner if they don't abstain.90

**Preventing the transmission of STIs**

Sexually transmitted infections are believed to be more common among uncircumcised men and lead to a greater risk of HIV transmission.91 Male circumcision has been shown to reduce the transmission of other STIs.
For example, a trial conducted in Rakai, Uganda, found that in addition to reducing the incidence of HIV infection, male circumcision also reduced the incidence of herpes simplex virus type 2 (HSV-2) and the prevalence of human papillomavirus (HPV) among adolescents and adult males.92

One of the largest and most comprehensive analyses of syphilis incidence in men and women and the effect of male circumcision found that male circumcision significantly decreased the incidence of syphilis by 42% in circumcised men compared with uncircumcised men. The protection impact of circumcision was found to be even greater for men with HIV with a reduction of 62%. The study also found male circumcision reduced female partner syphilis incidence by 59% overall. This breaks down to a 75% reduction in female partners without HIV and a 48% reduction in female partners with HIV.93

**Male circumcision and perceptions of female genital mutilation (FGM)**

In communities where FGM is practiced and VMMC is offered, some incorrectly believe that FGM can also reduce the risk of HIV transmission.94

One survey of 494 women from communities in Kenya, Namibia, South Africa, Swaziland and Uganda found that almost one in four thought FGM could protect women from HIV.95

FGM has no health benefits and does not protect against HIV. In fact, FGM increases a woman's risk of HIV transmission.96

*Photo credit: Photo by Gil Eilam/CC BY-NC-ND 2.0*

- 4. PLOS Collections (2014) 'Assessing Voluntary Medical Male Circumcision for HIV Prevention in a Unprecedented Public Health Intervention'
- 16. UNAIDS (2011) 'Nearly 50% of people who are eligible for antiretroviral therapy now have access to lifesaving treatment'
29. SHARE (8 March, 2015) ‘Kenya male circumcision program surpasses target by 100000’
35. ibid
36. ibid
37. i-base (2011, 1 October) ‘Orange Farm circumcision results dispel concerns about risk compensation’
42. World Health Organization (WHO) (2010) ‘Considerations for implementing models for optimizing the volume and efficiency of male circumcision services’[pdf]
45. CIRCLIST (2008, 8 March) ‘The PrePex™ device’
51. UNAIDS (2015) ‘On the Fast-Track to end AIDS by 2030: Focus on location and population’

53. JSI/USAID ‘STAR-EC Technical Brief: Scaling up voluntary medical male circumcision in East Central Uganda’ [pdf]

54. ibid

55. ibid


63. USAID ‘Gender Integration in VMMC to Improve Outcomes: Involving Female Partners’ [pdf]


66. ibid


70. IRIN Africa (2008, 31 July) ‘SWAZILAND: Circumcision gives men an excuse not to use condoms’


75. ibid


77. Praekelt Foundation (2011) ‘YoungAfricaLive Youth Sex Survey’

78. Clearinghouse on Male Circumcision ‘Social and behavioural research’ (Accessed 20/4/2017)


82. AIDS MEDIT (2014, 29 July) ‘Male Circumcision Doesn't Raise Sexual Risk-Taking in Zambia’

83. Shi, C-F. et al (2017) 'Evidence that promotion of male circumcision did not lead to sexual risk compensation in prioritized Sub-Saharan countries', PLOS
• 84. Westercamp, N., Agot, K., Jaoko, W. et al. (2014) 'Risk Compensation Following Male Circumcision: Results from a Two-Year Prospective Cohort Study of Recently Circumcised and Uncircumcised Men in Nyanza Province, Kenya' AIDS Behav, 18: 1764. doi:10.1007/s10461-014-0846-4
• 85. SHARE (2013, 2 July) 'Engaging Men in HIV Prevention, Care and Treatment in Lesotho: A Counselor's Perspective'
• 86. UNAIDS (17 October, 2016) 'Feature story: Voluntary medical male circumcision: a core campaign to reach the Fast-Track Targets' (Accessed 20/4/2017)
• 87. World Health Organization (WHO) (2012) 'Factors associated with the safety of voluntary medical male circumcision in Nyanza province, Kenya'
• 88. Underhill, K. (2013) 'Study designs for identifying risk compensation behavior among users of biomedical HIV prevention technologies: balancing methodological rigor and research ethics' Social Science and Medicine 94:115-123
• 89. Wamai, R.G. (2011) 'Male circumcision for HIV prevention—current evidence and implementation in sub-Saharan Africa' JAIDS 14:49
• 90. Differding, V. (2007) 'Women may be at heightened risk of HIV infection immediately after male partner is circumcised' Aidsmap
• 91. Centers for Disease Control and Prevention (CDC) (2013) 'Male Circumcision'[pdf]
• 95. Women's HIV Prevention Tracking Project (2010) 'Making medical male circumcision work for women'[pdf]
• 96. Womenshealth.gov (2009) 'Female genital cutting fact sheet'[pdf]

Last full review: 26 June 2017

Last updated: 28 July 2017

Next full review: 26 June 2020