

**Quarterly Research Digest**  
**On Voluntary Medical Male Circumcision for HIV Prevention**

1. Abuelezam, N. N., et al. **Can the heterosexual HIV epidemic be eliminated in South Africa using combination prevention? A modeling analysis.** *Am J Epidemiol* 2016;184(3):239-48.

Little is known about how combining efficacious interventions for human immunodeficiency virus (HIV) prevention could lead to HIV elimination. We used an agent-based simulation model, the HIV calibrated dynamic model, to assess the potential for HIV elimination in South Africa. We examined several scenarios (from continuation of the current status quo to perfect achievement of targets) with differing combinations of male condom use, adult male circumcision, HIV testing, and early antiretroviral therapy (ART). We varied numerous parameters, including the proportion of adult males circumcised, the frequency of condom use during sex acts, acceptance of HIV testing, linkage to health care, criteria for ART initiation, ART viral suppression rates, and loss to follow-up. Maintaining current levels of combination prevention would lead to increasing HIV incidence and prevalence in South Africa, while the perfect combination scenario was projected to eliminate HIV on a 50-year time scale from 2013 to 2063. Perfecting testing and treatment, without changing condom use or circumcision rates, resulted in an 89% reduction in HIV incidence but not elimination. Universal adult male circumcision alone resulted in a 21% incidence reduction within 20 years. Substantial decreases in HIV incidence are possible from sufficient uptake of both primary prevention and ART, but with continuation of the status quo, HIV elimination in South Africa is unlikely within a 50-year time scale.

2. Alfonso, Y. N., et al. **Trends in the marginal cost of male circumcision in rural Rakai Uganda.** *J Acquir Immune Defic Syndr* 2016 Aug 1. [Epub ahead of print]

Male circumcision (MC) is an effective intervention to reduce HIV acquisition in men in Africa. We conducted a cost analysis using longitudinal data on expenditures on services and community mobilization to estimate the marginal cost of MC over time and understand cost drivers during scale up. We used a time-series with monthly records from 2008 to 2013, for a total of 72 monthly observations from the Rakai MC program in Uganda. GLM models were used to estimate the marginal cost of a MC procedure. The marginal cost per MC in a mobile camp was \$23 ( $p < 0.01$ ) and in static facilities was \$35 ( $p < 0.1$ ). Major cost drivers included supplies in mobile camps with increasing numbers of surgeries, savings due to task shifting from physicians to clinical officers and increased efficiency as personnel became more experienced. As scale up continues, marginal costs may increase due to mobilization needed for less motivated late adopters, but improved efficiency could contain costs.

3. Amuri, M., et al. **Bringing early infant male circumcision information home to the family: demographic characteristics and perspectives of clients in a pilot project in Tanzania.** *Glob Health Sci Pract* 2016;4(Suppl 1):S29-41.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S29.long](http://www.ghspjournal.org/content/4/Supplement_1/S29.long)

Iringa region of Tanzania has had great success reaching targets for voluntary medical male circumcision (VMMC). Looking to sustain high coverage of male circumcision, the government introduced a pilot project to offer early infant male circumcision (EIMC) in Iringa in 2014. From April 2013 to December 2014, a total of 2,084 male infants were circumcised in 8 health facilities in the region, representing 16.4% of all male infants born in those facilities. Most circumcisions took place 7 days or more after birth. The procedure proved safe, with only 3 mild and 3 moderate adverse events (0.4% overall adverse event rate). Overall, 93% of infants were brought back for a second-day visit and 71% for a seventh-day visit. These percentages varied significantly by urban and rural residence (97.4% urban versus 84.6% percent rural for day 2 visit; 82.2% urban versus 49.9% rural for day 7 visit). Mothers were more likely than fathers to have received information about EIMC. However, fathers tended to be key decision makers regarding circumcision of their sons. This suggests the importance of addressing fathers with behavioral change communication about EIMC. Successes in scaling up VMMC services in Iringa did not translate into immediate acceptability of EIMC. EIMC programs will require targeted investments in demand creation to expand and thrive in traditionally non-circumcising settings such as Iringa.

4. Balzer, L. B., et al. **Adaptive pre-specification in randomized trials with and without pair-matching.** *Stat Med* 2016 Jul 19. [Epub ahead of print]

In randomized trials, adjustment for measured covariates during the analysis can reduce variance and increase power. To avoid misleading inference, the analysis plan must be pre-specified. However, it is often unclear a priori which baseline covariates (if any) should be adjusted for in the analysis. Consider, for example, the Sustainable East Africa Research in Community Health (SEARCH) trial for HIV prevention and treatment. There are 16 matched pairs of communities and many potential adjustment variables, including region, HIV prevalence, male circumcision coverage, and measures of community-level viral load. In this paper, we propose a rigorous procedure to data-adaptively select the adjustment set, which maximizes the efficiency of the analysis. Specifically, we use cross-validation to select from a pre-specified library the candidate targeted maximum likelihood estimator (TMLE) that minimizes the estimated variance. For further gains in precision, we also propose a collaborative procedure for estimating the known exposure mechanism. Our small sample simulations demonstrate the promise of the methodology to maximize study power, while maintaining nominal confidence interval coverage. We show how our procedure can be tailored to the scientific question (intervention effect for the study sample vs. for the target

population) and study design (pair-matched or not). Copyright (c) 2016 John Wiley & Sons, Ltd.

5. Bazant, E., et al. **A randomized evaluation of a demand creation lottery for voluntary medical male circumcision among adults in Tanzania.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S280-7.

**BACKGROUND:** Uptake of voluntary medical male circumcision (VMMC) among adult men has fallen short of targets in Tanzania. We evaluated a smartphone raffle intervention designed to increase VMMC uptake in three regions.

**METHODS:** Among 7 matched pairs of health facilities, 1 in each pair was randomly assigned to the intervention, consisting of a weekly smartphone raffle for clients returning for follow-up and monthly raffle for peer promoters and providers. VMMC records of clients aged 20 and older were analyzed over three months, with the number performed compared with the same months in the previous year. In multivariable models, the intervention's effect on number of VMMCs was adjusted for client factors and clustering. Focus groups with clients and peer promoters explored preferences for VMMC incentives.

**RESULTS:** VMMCs increased 47% and 8% in the intervention and control groups, respectively; however, the changes were not significantly different from one another. In the Iringa region subanalysis, VMMCs in the intervention group increased 336% (exponentiated coefficient of 3.36, 95% CI: 1.14 to 9.90;  $P = 0.028$ ), after controlling for facility pair, percentage of clients  $\geq$  age 30, and percentage testing HIV positive; the control group had a more modest 63% significant increase (exponentiated coefficient 1.63, 95% CI: 1.18 to 2.26;  $P = 0.003$ ). The changes were not significantly different. Focus group respondents expressed mixed opinions about smartphone raffles; some favored smaller cash incentive or transportation reimbursement.

**IMPLICATIONS:** A smartphone raffle might increase VMMC uptake in some settings by helping late adopters move from intention to action; however, there is no recommendation for this intervention more generally.

6. Bórquez, A., et al. **The incidence patterns model to estimate the distribution of new HIV infections in sub-Saharan Africa: development and validation of a mathematical model.** *PLoS Med* 2016;13(9):e1002121.

Online at:

<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002121>

**BACKGROUND:** Programmatic planning in HIV requires estimates of the distribution of new HIV infections according to identifiable characteristics of individuals. In sub-Saharan Africa, robust routine data sources and historical epidemiological observations are available to inform and validate such estimates.

**METHODS AND FINDINGS:** We developed a predictive model, the Incidence Patterns Model (IPM), representing populations according to factors that have been demonstrated to be strongly associated with HIV acquisition risk: gender, marital/sexual activity status, geographic location, “key populations” based on risk behaviours (sex work, injecting drug use, and male-to-male sex), HIV and ART status within married or cohabiting unions, and circumcision status. The IPM estimates the distribution of new infections acquired by group based on these factors within a Bayesian framework accounting for regional prior information on demographic and epidemiological characteristics from trials or observational studies. We validated and trained the model against direct observations of HIV incidence by group in seven rounds of cohort data from four studies (“sites”) conducted in Manicaland, Zimbabwe; Rakai, Uganda; Karonga, Malawi; and Kisesa, Tanzania. The IPM performed well, with the projections’ credible intervals for the proportion of new infections per group overlapping the data’s confidence intervals for all groups in all rounds of data. In terms of geographical distribution, the projections’ credible intervals overlapped the confidence intervals for four out of seven rounds, which were used as proxies for administrative divisions in a country. We assessed model performance after internal training (within one site) and external training (between sites) by comparing mean posterior log-likelihoods and used the best model to estimate the distribution of HIV incidence in six countries (Gabon, Kenya, Malawi, Rwanda, Swaziland, and Zambia) in the region. We subsequently inferred the potential contribution of each group to transmission using a simple model that builds on the results from the IPM and makes further assumptions about sexual mixing patterns and transmission rates. In all countries except Swaziland, individuals in unions were the single group contributing to the largest proportion of new infections acquired (39%–77%), followed by never married women and men. Female sex workers accounted for a large proportion of new infections (5%–16%) compared to their population size. Individuals in unions were also the single largest contributor to the proportion of infections transmitted (35%–62%), followed by key populations and previously married men and women. Swaziland exhibited different incidence patterns, with never married men and women accounting for over 65% of new infections acquired and also contributing to a large proportion of infections transmitted (up to 56%). Between- and within-country variations indicated different incidence patterns in specific settings.

**CONCLUSIONS:** It is possible to reliably predict the distribution of new HIV infections acquired using data routinely available in many countries in the sub-Saharan African region with a single relatively simple mathematical model. This tool would complement more specific analyses to guide resource allocation, data collection, and programme planning.

7. Boyee, D., et al. **What messages are adolescent voluntary medical male circumcision (VMMC) clients getting and how? Findings from an observational study in Tanzania.** *AIDS Behav* 2016 Aug 24. [Epub ahead of print]  
Online at: <http://link.springer.com/article/10.1007%2Fs10461-016-1515-6>

Uncircumcised adolescent males in sub-Saharan Africa are an important group to reach with voluntary medical male circumcision (VMMC) services due to high HIV burden occurring among this age group. Appropriateness of the content and delivery of sexual health and HIV prevention messages to adolescent VMMC clients has not been extensively described. A study was conducted in Tanzania to examine quality, delivery and content of messages provided to adolescent (aged 15-19) and adult (aged 20+) VMMC clients (n = 320). Results show that counseling of mixed age groups during group education lacked selected key messages, compared to more age-homogeneous groups. Additionally, adolescents received more comprehensive information in individual counseling compared to group education. We recommend that health care providers are provided with skills and job aides to assist them to segment VMMC clients by age; provide age-appropriate messages; and increase use of individual counseling as a means to communicate with adolescent clients.

8. Campain, N. J., et al. **Use of a simulated model to teach male adult circumcision in sub-Saharan Africa.** *World J Surg* 2016 Aug 2. [Epub ahead of print]

Male adult circumcision (MC) has been shown to reduce the risk of HIV transmission in men by 50-60 %. An upscaling in the training of providers to perform circumcision is necessary to meet demand since MC is a key component of essential surgery in the context of universal health coverage. We piloted a low-cost, high-fidelity model for training adult circumcision. Multi-centre, multinational data were collected on 74 trainees and clinicians (trainers) in sub-Saharan Africa. Both trainers and trainees gave excellent feedback for the model (content and face validity). The simulated model enables a safe and realistic simulation experience to perform MC. The model is quick to set up and easily transportable to multiple teaching sites.

9. Chang, L. W., et al. **Heterogeneity of the HIV epidemic in agrarian, trading, and fishing communities in Rakai, Uganda: an observational epidemiological study.** *Lancet HIV* 2016;3(8):e388-96.  
Online at: [http://www.thelancet.com/journals/lanhiv/article/PIIS2352-3018\(16\)30034-0/abstract](http://www.thelancet.com/journals/lanhiv/article/PIIS2352-3018(16)30034-0/abstract)

**BACKGROUND:** Understanding the extent to which HIV burden differs across communities and the drivers of local disparities is crucial for an effective and targeted HIV response. We assessed community-level variations in HIV prevalence, risk factors, and treatment and prevention service uptake in Rakai, Uganda.

**METHODS:** The Rakai Community Cohort Study (RCCS) is an open, population-based cohort of people aged 15-49 years in 40 communities. Participants are HIV tested and interviewed to obtain sociodemographic, behavioural, and health information. RCCS data from Aug 10, 2011, to May 30, 2013, were used to classify communities as agrarian (n=27), trading (n=9), or lakeside fishing sites (n=4). We mapped HIV prevalence with Bayesian methods, and characterised variability across and within community classifications. We also assessed differences in HIV risk factors and uptake of antiretroviral therapy and male circumcision between community types.

**FINDINGS:** 17 119 individuals were included, 9215 (54%) of whom were female. 9931 participants resided in agrarian, 3318 in trading, and 3870 in fishing communities. Median HIV prevalence was higher in fishing communities (42%, range 38-43) than in trading (17%, 11-21) and agrarian communities (14%, 9-26). Antiretroviral therapy use was significantly lower in both men and women in fishing communities than in trading (age-adjusted prevalence risk ratio in men 0.64, 95% CI 0.44-0.97; women 0.53, 0.42-0.66) and agrarian communities (men 0.55, 0.42-0.72; women 0.65, 0.54-0.79), as was circumcision coverage among men (vs trading 0.48, 0.42-0.55; vs agrarian 0.64, 0.56-0.72). Self-reported risk behaviours were significantly higher in men than in women and in fishing communities than in other community types.

**INTERPRETATION:** Substantial heterogeneity in HIV prevalence, risk factors, and service uptake in Rakai, Uganda, emphasises the need for local surveillance and the design of targeted HIV responses. High HIV burden, risk behaviours, and low use of combination HIV prevention in fishing communities make these populations a priority for intervention.

**FUNDING:** National Institute of Mental Health, the National Institute of Allergy and Infectious Diseases, the National Institute of Child Health and Development, and the National Institute for Allergy and Infectious Diseases Division of Intramural Research, National Institutes of Health; the Bill & Melinda Gates Foundation; and the Johns Hopkins University Center for AIDS Research.

10. Dalal, S., et al. **Tetanus disease and deaths in men reveal need for vaccination.** *Bull World Health Organ* 2016;94(8):613-21.  
Online at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4969990/>

With efforts focused on the elimination of maternal and neonatal tetanus, less attention has been given to tetanus incidence and mortality among men. Since 2007 voluntary medical male circumcision has been scaled-up in 14 sub-Saharan African countries as an effective intervention to reduce the risk of human immunodeficiency virus (HIV) acquisition among men. As part of a review of adverse events from these programmes, we identified 13 cases of tetanus from five countries reported to the World Health Organization (WHO) up to March 2016. Eight patients died and only one patient had a known history of tetanus vaccination. Tetanus after voluntary medical male circumcision

was rare among more than 11 million procedures conducted. Nevertheless, the cases prompted a review of the evidence on tetanus vaccination coverage and case notifications in sub-Saharan Africa, supplemented by a literature review of non-neonatal tetanus in Africa over the years 2003-2014. The WHO African Region reported the highest number of non-neonatal tetanus cases per million population and lowest historic coverage of tetanus-toxoid-containing vaccine. Coverage of the third dose of diphtheria-tetanus-polio vaccine ranged from 65% to 98% across the 14 countries in 2013. In hospital-based studies, non-neonatal tetanus comprised 0.3-10.7% of admissions, and a median of 71% of patients were men. The identification of tetanus cases following voluntary medical male circumcision highlights a gender gap in tetanus morbidity disproportionately affecting men. Incorporating tetanus vaccination for boys and men into national programmes should be a priority to align with the goal of universal health coverage.

11. De Wet, H., et al. **Perceived barriers and facilitators to HIV testing in South African communities.** *J Health Psychol* 2016 Aug 30. pii: 1359105316664140. [Epub ahead of print]

We interviewed 15 South Africans seeking HIV testing to understand the factors that influenced their seeking an HIV test. Reasons in favour of testing included having had unprotected sex, availability of social support if testing HIV positive and modelling test-seeking behaviour to others. Reasons against seeking testing included fear testing HIV positive, the possibility of receiving treatment too late, HIV-related stigma and long distances to testing sites. Participants also discussed ways to increase the uptake of HIV testing, such as workplace testing, the role of the media and the role of cultural rituals such as male circumcision.

12. Diwan, V., et al. **Voluntary medical male circumcision for HIV prevention in fishing communities in Uganda: the influence of local beliefs and practice.** *Afr J Res* 2016;15(3):211-8.  
Online at: <http://www.tandfonline.com/doi/abs/10.2989/16085906.2016.1179652>

Local beliefs and practices about voluntary medical male circumcision (VMMC) may influence uptake and effectiveness. Data were gathered through interviews with 40 people from four ethnically mixed fishing communities in Uganda. Some men believed that wound healing could be promoted by contact with vaginal fluids while sex with non-regular partners could chase away spirits — practices which encouraged unsafe sexual practices. Information given by providers stressed that VMMC did not afford complete protection from sexually-transmitted infections, however, a number of male community members held the view that they were fully protected once circumcised. Both men and women said that VMMC was good not just for HIV prevention but also as a way of maintaining hygiene among the men. The implementation of VMMC in high-HIV prevalence settings needs to take account of local beliefs about circumcision,

working with local religious/social group leaders, women and peers in the roll-out of the intervention.

13. Firestone, R., et al. **The effectiveness of social marketing in global health: a systematic review.** *Health Policy Plan* 2016 Jul 31. pii: czw088. [Epub ahead of print]

Online at:

<http://heapol.oxfordjournals.org/content/early/2016/07/25/heapol.czw088.long>

Social marketing is a commonly used strategy in global health. Social marketing programmes may sell subsidized products through commercial sector outlets, distribute appropriately priced products, deliver health services through social franchises and promote behaviours not dependent upon a product or service. We aimed to review evidence of the effectiveness of social marketing in low- and middle-income countries, focusing on major areas of investment in global health: HIV, reproductive health, child survival, malaria and tuberculosis. We searched PubMed, PsycInfo and ProQuest, using search terms linking social marketing and health outcomes for studies published from 1995 to 2013. Eligible studies used experimental or quasi-experimental designs to measure outcomes of behavioural factors, health behaviours and/or health outcomes in each health area. Studies were analysed by effect estimates and for application of social marketing benchmark criteria. After reviewing 18 974 records, 125 studies met inclusion criteria. Across health areas, 81 studies reported on changes in behavioural factors, 97 studies reported on changes in behaviour and 42 studies reported on health outcomes. The greatest number of studies focused on HIV outcomes (n = 45) and took place in sub-Saharan Africa (n = 67). Most studies used quasi-experimental designs and reported mixed results. Child survival had proportionately the greatest number of studies using experimental designs, reporting health outcomes, and reporting positive, statistically significant results. Most programmes used a range of methods to promote behaviour change. Programmes with positive, statistically significant findings were more likely to apply audience insights and cost-benefit analyses to motivate behaviour change. Key evidence gaps were found in voluntary medical male circumcision and childhood pneumonia. Social marketing can influence health behaviours and health outcomes in global health; however evaluations assessing health outcomes remain comparatively limited. Global health investments are needed to (i) fill evidence gaps, (ii) strengthen evaluation rigour and (iii) expand effective social marketing approaches.

14. Fitzgerald, L., et al. **Scaling up early infant male circumcision: lessons from the Kingdom of Swaziland.** *Glob Health Sci Pract* 2016;4(Suppl 1):S76-86.

Online at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4944582/>

**BACKGROUND:** The government of the Kingdom of Swaziland recognizes that it must urgently scale up HIV prevention interventions, such as voluntary medical male circumcision (VMMC). Swaziland has adopted a 2-phase approach to male circumcision scale-up. The catch-up phase prioritizes VMMC services for adolescents and adults, while the sustainability phase involves the establishment of early infant male



circumcision (EIMC). Swaziland does not have a modern-day tradition of circumcision, and the VMMC program has met with client demand challenges. However, since the launch of the EIMC program in 2010, Swaziland now leads the Eastern and Southern Africa region in the scale-up of EIMC. Here we review Swaziland's program and its successes and challenges.

**METHODS:** From February to May 2014, we collected data while preparing Swaziland's "Male Circumcision Strategic and Operational Plan for HIV Prevention 2014-2018." We conducted structured stakeholder focus group discussions and in-depth interviews, and we collected EIMC service delivery data from an implementing partner responsible for VMMC and EIMC service delivery. Data were summarized in consolidated narratives.

**RESULTS:** Between 2010 and 2014, trained providers performed more than 5,000 EIMCs in 11 health care facilities in Swaziland, and they reported no moderate or severe adverse events. According to a broad group of EIMC program stakeholders, an EIMC program needs robust support from facility, regional, and national leadership, both within and outside of HIV prevention coordination bodies, to promote institutionalization and ownership. Providers and health care managers in 3 of Swaziland's 4 regional hospitals suggest that when EIMC is introduced into reproductive, maternal, newborn, and child health platforms, dedicated staff attention can help ensure that EIMC is performed amid competing priorities. Creating informed demand from communities also supports EIMC as a service delivery priority. Formative research shows that EIMC programs should address the fears and anxieties of parents so that they, especially fathers, understand the health benefits of EIMC before the birth of their babies.

**CONCLUSION:** The vast majority of public-sector facilities in Swaziland are led by nurses, and nurses and midwives have borne the brunt of caring for patients with HIV/AIDS in Swaziland. Like prevention of mother-to-child transmission, EIMC provides an opportunity for nurses and midwives to stand at the forefront of HIV prevention efforts. Rapid scale-up of VMMC and EIMC in Swaziland has the potential to avert more than 56,000 HIV infections and save US\$370 million in the next 20 years.

15. Friedman, B., et al. **Pros and cons of circumcision: an evidence-based overview.** *Clin Microbiol Infect* 2016 Aug 4. pii: S1198-743X(16)30268-3. [Epub ahead of print].

Based on three large randomized controlled trials (RCTs) conducted in Africa, it can clearly be stated that circumcision lowers the risk of infection with the human immunodeficiency virus (HIV) and some sexually transmitted infections (STIs) among males in settings of high HIV and STI endemicity. Similar effects on STI risk may exist for females, although this may result from an indirect effect of decreasing risk of infection among male partners. It is unknown whether circumcision prevents HIV acquisition in men who have sex with men (MSM), although there might be a protective effect for men who engage mainly in insertive anal intercourse. When the effects of adult

circumcision on sexual function and satisfaction of men are examined, high-quality evidence strongly supports lack of harm. Whether circumcision alters sexual satisfaction of female partners is not known as fewer and smaller studies reported conflicting results. Circumcision rarely causes serious complications if practiced by trained practitioners, in a sterile setting, and with a proper follow-up. These conclusions are limited by the lack of high-quality data from areas outside of Africa. RCTs have not been conducted to assess the effects of circumcising infants or MSM. Circumcision has well-proven benefits for people residing in areas with high prevalence of STIs, including HIV, and is not unethical for those who choose to be circumcised or have their children circumcised on religious, social, or cultural grounds. For many others, a definite pro or con recommendation, based on a risk-benefit ratio, cannot be made.

16. Garnett, G. P., et al. **Providing a conceptual framework for HIV prevention cascades and assessing feasibility of empirical measurement with data from east Zimbabwe: a case study.** *Lancet HIV* 2016;3(7):e297-306.

Online at: <http://www.sciencedirect.com/science/article/pii/S235230181630039X>

**BACKGROUND:** The HIV treatment cascade illustrates the steps required for successful treatment and is a powerful advocacy and monitoring tool. Similar cascades for people susceptible to infection could improve HIV prevention programming. We aim to show the feasibility of using cascade models to monitor prevention programmes.

**METHODS:** Conceptual prevention cascades are described taking intervention-centric and client-centric perspectives to look at supply, demand, and efficacy of interventions. Data from two rounds of a population-based study in east Zimbabwe are used to derive the values of steps for cascades for voluntary medical male circumcision (VMMC) and for partner reduction or condom use driven by HIV testing and counselling (HTC).

**FINDINGS:** In 2009 to 2011 the availability of circumcision services was negligible, but by 2012 to 2013 about a third of the population had access. However, where it was available only 12% of eligible men sought to be circumcised leading to an increase in circumcision prevalence from 3.1% to 6.9%. Of uninfected men, 85.3% did not perceive themselves to be at risk of acquiring HIV. The proportions of men and women tested for HIV increased from 27.5% to 56.6% and from 61.1% to 79.6%, respectively, with 30.4% of men tested self-reporting reduced sexual partner numbers and 12.8% reporting increased condom use.

**INTERPRETATION:** Prevention cascades can be populated to inform HIV prevention programmes. In eastern Zimbabwe programmes need to provide greater access to circumcision services and the design and implementation of associated demand creation activities. Whereas, HTC services need to consider how to increase reductions in partner numbers or increased condom use or should not be considered as contributing to prevention services for the HIV-negative adults.

**FUNDING:** Wellcome Trust and Bill & Melinda Gates Foundation.

17. Gregson, S., et al. **Innovative demand creation for voluntary medical male circumcision targeting a high impact male population: a pilot study engaging pregnant women at antenatal clinics in Kampala, Uganda.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S273-9.

**BACKGROUND:** Circumcision has been shown to be an effective method of HIV prevention; however, only 27% of Ugandan men aged 15-49 years are circumcised. There is a paucity of data on the role of intimate partners in generating demand for voluntary medical male circumcision (VMMC). We conducted a pilot study to assess the feasibility of a partner-focused intervention targeting males >25 years.

**METHODS:** Among pregnant women in their third trimester attending antenatal care we evaluated the impact of a pilot behavior change intervention on VMMC through a quasi-experimental approach. We observed VMMC numbers among spouses of women as per standard practice (comparison phase), and after introducing a behavioral change communication package (intervention phase). Logistic regression was used to compare the odds of VMMC uptake between comparison and intervention phases. We used qualitative methods to evaluate the casual chain using a thematic approach.

**RESULTS:** Of the 601 women studied, 90% articulated the health benefits of VMMC and 99% expressed interest in their spouse getting circumcised. Women's knowledge was not increased by the intervention. Four men were circumcised in the comparison and 7 in the intervention phase. The intervention was not associated with higher odds of circumcision (odds ratio 1.5, 95% CI: 0.3 to 6.0, P = 0.65). We interviewed 117 individuals overall with the main enablers for VMMC being: free VMMC, transport reimbursement, and health benefits. Deterrents included misconceptions, lost wages and fear of pain. Most of the uncircumcised men interviewed reported interest in VMMC.

**CONCLUSIONS:** Our pilot intervention had no significant impact on increasing VMMC demand. The study demonstrated the feasibility of pregnant women engaging their spouses to discuss VMMC.

18. Hewett, P. C., et al. **Randomized evaluation and cost-effectiveness of HIV and sexual and reproductive health service referral and linkage models in Zambia.** *BMC Public Health* 2016;16:785.  
Online at: <http://bmcpublikealth.biomedcentral.com/articles/10.1186/s12889-016-3450-x>

**BACKGROUND:** Provision of HIV prevention and sexual and reproductive health services in Zambia is largely characterized by discrete service provision with weak client referral and linkage. The literature reveals gaps in the continuity of care for HIV and sexual and reproductive health. This study assessed whether improved service delivery models increased the uptake and cost-effectiveness of HIV and sexual and reproductive health services.

**METHODS:** Adult clients 18+ years of age accessing family planning (females), HIV testing and counseling (females and males), and male circumcision services (males) were recruited, enrolled and individually randomized to one of three study arms: 1) the standard model of service provision at the entry point (N = 1319); 2) an enhanced counseling and referral to add-on service with follow-up (N = 1323); and 3) the components of study arm two, with the additional offer of an escort (N = 1321). Interviews were conducted with the same clients at baseline, six weeks and six months. Uptake of services for HIV, family planning, male circumcision, and cervical cancer screening at six weeks and six months were the primary endpoints. Pairwise chi-square and multivariable logistic regression statistical tests assessed differences across study arms, which were also assessed for incremental cost-efficiency and cost-effectiveness.

**RESULTS:** A total of 3963 clients, 1920 males and 2043 females, were enrolled; 82 % of participants at six weeks were tracked and 81 % at six months; follow-up rates did not vary significantly by study arm. The odds of clients accessing HIV testing and counseling, cervical cancer screening services among females, and circumcision services among males varied significantly by study arm at six weeks and six months; less consistent findings were observed for HIV care and treatment. Client uptake of family planning services did not vary significantly by study arm. Integrated services were found to be more efficiently provided than vertical service provision; the cost-effectiveness for HIV/AIDS and cervical cancer was high in the enhanced service models.

**CONCLUSIONS:** Study results provide evidence for increasing the linkages and integration of a selection of HIV and sexual and reproductive health services. The study provided cost-effective service delivery models that enhanced the likelihood of clients accessing some additional needed health services.

**TRIAL REGISTRATION:** ISRCTN84228514 Retrospectively registered. The study was retrospectively registered in the ISRCTN clinical trials registry on 06 October 2015. The first recruitment of participants occurred on 17 December 2013.

18. Joseph Davey, D. L., et al. **Why wait? We need to scale-up infant male circumcision for global HIV control.** *AIDS* 2016;30(11):1847-8.

19. Kagaayi, J., et al. **Self-selection of male circumcision clients and behaviors following circumcision in a service program in Uganda.** *AIDS* 2016;30(13):2125-9.

**OBJECTIVES:** Sub-Saharan African countries have substantially scaled-up safe male circumcision (SMC) services. However, it is unclear whether services are reaching men most at risk of HIV and whether there is behavioral disinhibition after SMC. We compared characteristics of SMC acceptors and nonacceptors in Rakai, Uganda. DESIGN: Cohort design.

**METHODS:** Through the Rakai Community Cohort Study, baseline characteristics of 587 non-Muslim men who subsequently accepted SMC were compared with those of 4907 uncircumcised non-Muslim men. Behaviors after SMC were compared with those of men who remained uncircumcised. Poisson multivariable regression was used to estimate adjusted prevalence rate ratios of behaviors in circumcised versus uncircumcised men.

**RESULTS:** At baseline (pre-SMC), men subsequently circumcised were younger (mean = 26.1 years), as compared with the uncircumcised (mean = 28.5 years,  $P < 0.001$ ), more likely to live in urban areas (21.1 versus 12.4%,  $P < 0.001$ ), less likely to have been currently or previously married (36.5 versus 45.8%,  $P < 0.001$ ) and more likely to report multiple sexual partners (48.3 versus 41.6%,  $P = 0.05$ ) and genital discharge (7.4 versus 4.4%,  $P = 0.03$ ). At follow-up (post-SMC), behaviors and genital discharge did not differ between the groups. Genital ulcers were less reported among circumcised (6.8%) compared with uncircumcised men (10.5%; adjusted prevalence rate ratios = 0.60, 95% confidence interval = 0.42-0.87,  $P = 0.007$ ).

**CONCLUSION:** In Rakai district, Uganda, the circumcision service program is attracting sexually active men at higher risk of HIV and we find no evidence of behavioral disinhibition following circumcision. The SMC program in this setting has the potential to reduce the HIV epidemic among men.

20. Kagaayi, J., et al. **The history of the HIV/AIDS epidemic in Africa.** *Curr HIV/AIDS Rep* 2016;13(4):187-93.

HIV testing of African immigrants in Belgium showed that HIV existed among Africans by 1983. However, the epidemic was recognized much later in most parts of sub-Saharan Africa (SSA) due to stigma and perceived fear of possible negative consequences to the countries' economies. This delay had devastating mortality, morbidity, and social consequences. In countries where earlier recognition occurred, political leadership was vital in mounting a response. The response involved establishment of AIDS control programs and research on the HIV epidemiology and candidate preventive interventions. Over time, the number of effective interventions has grown; the game changer being triple antiretroviral therapy (ART). ART has led to a rapid decline in HIV-related morbidity and mortality in addition to prevention of onward HIV transmission.

Other effective interventions include safe male circumcision, pre-exposure prophylaxis, and post-exposure prophylaxis. However, since none of these is sufficient by itself, delivering a combination package of these interventions is important for ending the HIV epidemic as a public health threat.

21. Kaufman, Z. A., et al. **A sport-based intervention to increase uptake of voluntary medical male circumcision among adolescent male students: results from the MCUTS 2 cluster-randomized trial in Bulawayo, Zimbabwe.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S292-8.

**BACKGROUND:** Mathematical models suggest that 570,000 HIV infections could be averted between 2011 and 2025 in Zimbabwe if the country reaches 80% voluntary medical male circumcision (VMMC) coverage among 15- to 49-year-old male subjects. Yet national coverage remains well below this target, and there is a need to evaluate interventions to increase the uptake.

**METHODS:** A cluster-randomized trial was conducted to assess the effectiveness of Make-The-Cut-Plus (MTC+), a single, 60-minute, sport-based intervention to increase VMMC uptake targeting secondary school boys (14-20 years). Twenty-six schools in Bulawayo, Zimbabwe, were randomized to either receive MTC+ at the start (intervention) or end (control) of a 4-month period (March to June 2014). VMMC uptake over these 4 months was measured via probabilistic matching of participants in the trial database (n = 1226 male participants; age, 14-20 years; median age, 16.2 years) and the registers in Bulawayo's 2 free VMMC clinics (n = 5713), using 8 identifying variables.

**RESULTS:** There was strong evidence that the MTC+ intervention increased the odds of VMMC uptake by approximately 2.5 fold (odds ratio = 2.53; 95% confidence interval, 1.21 to 5.30). Restricting to participants who did not report being already circumcised at baseline, MTC+ increased VMMC uptake by 7.6% (12.2% vs 4.6%, odds ratio = 2.65; 95% confidence interval, 1.19 to 5.86). Sensitivity analyses related to the probabilistic matching did not change these findings substantively. The number of participants who would need to be exposed to the demand creation intervention to yield one additional VMMC client was 22.7 (or 13.2 reporting not already being circumcised). This translated to approximately US dollar 49 per additional VMMC client.

**CONCLUSIONS:** The MTC+ intervention was an effective and cost-effective strategy for increasing VMMC uptake among school-going adolescent male subjects in Bulawayo.

22. Kenu, E., et al. **Early infant male circumcision in Cameroon and Senegal: demand, service provision, and cultural context.** *Glob Health Sci Pract* 2016;4(Suppl 1):S18-28. Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S18.long](http://www.ghspjournal.org/content/4/Supplement_1/S18.long)

**BACKGROUND:** Male circumcision is almost universal in North and West Africa, and practiced for various reasons. Yet there is little documentation on service delivery, clinical

procedures, policies, and programmatic strategies. The United Nations Children's Fund (UNICEF) commissioned country program reviews in 2014 to shed light on the delivery of male circumcision services for infants in Cameroon and Senegal.

**METHODS:** We conducted a policy desk review, key informant interviews, and focus group discussions at health centers and in communities. Between December 2014 and January 2015, we conducted 21 key informant interviews (13 with regional and district officers, 5 with national officers, and 3 with UNICEF officials) and 36 focus group discussions (6 with men, 6 with women, 12 with adolescent boys, and 12 with service providers). Some of the men and women were parents of the adolescents who participated in the focus group discussions. In the French-speaking areas, the focus group discussions were conducted in French through an accredited translator, audio recorded, and transcribed into English.

**RESULTS:** All of the facilities we visited in Cameroon and Senegal offer medical male circumcision, with 10 out of 12 performing early infant male circumcision (EIMC) routinely. Neither country has policies, guidelines, or strategies for EIMC. The procedure is done mainly by untrained service providers, with some providers using modern circumcision devices. There are no key messages on EIMC for families; the increasing demand for EIMC is led by the community.

**CONCLUSION:** Despite the absence of national policies and strategies, EIMC is routinely offered at all levels of the health care system in Cameroon and Senegal, mainly by untrained service providers. Improving circumcision services will require guidelines for EIMC and improvements in training, equipment, supply chains, recordkeeping, and demand creation.

23. Kikaya, V., et al. **Scale-up of early infant male circumcision services for HIV prevention in Lesotho: a review of facilitating factors and challenges.** *Glob Health Sci Pract* 2016;4(Suppl 1):S87-96.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S87.long](http://www.ghspjournal.org/content/4/Supplement_1/S87.long)

**BACKGROUND:** The World Health Organization and the Joint United Nations Programme on HIV/AIDS recommend early infant male circumcision (EIMC) as a component of male circumcision programs in countries with high HIV prevalence and low circumcision rates. Lesotho began incorporating EIMC into routine maternal, newborn, and child health (MNCH) services in 2013 with funding from the United States Agency for International Development and United Nations Children's Fund. This presented unique challenges: Lesotho had no previous experience with EIMC and cultural traditions link removal of the foreskin to rites of passage. This process evaluation provides an overview of EIMC implementation.

**METHODOLOGY:** The Lesotho Ministry of Health and Jhpiego conducted a baseline assessment before service implementation. Baseline information from an initial

assessment was used to develop and implement an EIMC program that had a pilot and a scale-up phase. Key program activities such as staff training, quality assurance, and demand creation were included at the program design phase. Facilitating factors and challenges were identified from a review of information collected during the baseline assessment as well as the pilot.

**RESULTS:** Between September 2013 and March 2015, 592 infants were circumcised at 9 sites: 165 (28%) between 1 day and 6 days after birth; 196 (33%) between 7 and 30 days, and 231 (39%) between 31 and 60 days. Facilitating factors included strong support from the Ministry of Health, collaboration with stakeholders, and donor funding. Providers were enthusiastic about the opportunity to offer new services and receive training. Challenges included gaining consent from family members other than mothers, and parents' concern about pain and complications. The EIMC program also had to manage providers' expectations of compensation because overtime was paid to providers who took part in adult circumcision programming but not for EIMC. Limited human resources, including authorization only for doctors to perform EIMC, impeded provision of services.

**CONCLUSION:** Despite communication, compensation, and task-shifting challenges, integrating EIMC services with MNCH services could be a sustainable model for EIMC service delivery in Lesotho.

24. Kong, X., et al. **Association of medical male circumcision and antiretroviral therapy scale-up with community HIV incidence in Rakai, Uganda.** *JAMA* 2016;316(2):182-90. Online at: <http://jama.jamanetwork.com/article.aspx?articleid=2533067>

**IMPORTANCE:** Medical male circumcision (MMC) and antiretroviral therapy (ART) are proven HIV prevention interventions, but there are limited data on the population-level effect of scale-up of these interventions in sub-Saharan Africa. Such evaluation is important for planning and resource allocation.

**OBJECTIVE:** To examine whether increasing community MMC and ART coverage was associated with reduced community HIV incidence in Rakai District, Uganda.

**DESIGN, SETTING, AND PARTICIPANTS:** Using person-level data from population-based surveys conducted from 1999 through 2013 in 45 rural Rakai communities, community-level ART and MMC coverage, sociodemographics, sexual behaviors, and HIV prevalence and incidence were estimated in 3 periods: prior to the availability of ART and MMC (1999-2004), during early availability of ART and MMC (2004-2007), and during mature program scale-up (2007-2013).

**EXPOSURES:** Community MMC coverage in males and ART coverage in HIV-positive persons of the opposite sex based on self-reported MMC status and ART use.



**MAIN OUTCOMES AND MEASURES:** Adjusted incidence rate ratios (IRRs) for sex-specific community HIV incidence estimated using multivariable Poisson regression with generalized estimating equations.

**RESULTS:** From 1999 through 2013, 44,688 persons participated in 1 or more surveys (mean age at the first survey, 24.6 years [range, 15-49]; female, 56.5%; mean survey participation rate, 92.6% [95% CI, 92.4%-92.7%]). Median community MMC coverage increased from 19% to 39%, and median community ART coverage rose from 0% to 21% in males and from 0% to 26% in females. Median community HIV incidence declined from 1.25 to 0.84 per 100 person-years in males, and from 1.25 to 0.99 per 100 person-years in females. Among males, each 10% increase in community MMC coverage was associated with an adjusted IRR of 0.87 (95% CI, 0.82-0.93). Comparing communities with MMC coverage more than 40% (mean male community incidence, 1.03 per 100 person-years) with communities with coverage of 10% or less (mean male incidence, 1.69 per 100 person-years), the adjusted IRR was 0.61 (95% CI, 0.43-0.88). For each 10% increase in female self-reported ART coverage, there was no significant reduction in male HIV incidence (adjusted IRR, 0.95 [95% CI, 0.81-1.13]). Comparing communities with female ART coverage more than 20% (mean male incidence, 0.87 per 100 person-years) to communities with female ART coverage of 20% or less (mean male incidence, 1.17 per 100 person-years), the adjusted IRR was 0.77 (95% CI, 0.61-0.98). Neither MMC nor male ART coverage was associated with lower female community HIV incidence.

**CONCLUSIONS AND RELEVANCE:** In Rakai, Uganda, increasing community MMC and female ART coverage was associated with lower community HIV incidence in males. If similar associations are found elsewhere, this would support further scale-up of MMC and ART for HIV prevention in sub-Saharan Africa.

25. Kripke, K., et al. **Cost and impact of voluntary medical male circumcision in South Africa: focusing the program on specific age groups and provinces.** *PLoS One* 2016;11(7):e0157071.

Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157071>

**BACKGROUND:** In 2012, South Africa set a goal of circumcising 4.3 million men ages 15–49 by 2016. By the end of March 2014, 1.9 million men had received voluntary medical male circumcision (VMMC). In an effort to accelerate progress, South Africa undertook a modeling exercise to determine whether circumcising specific client age groups or geographic locations would be particularly impactful or cost-effective. Results will inform South Africa’s efforts to develop a national strategy and operational plan for VMMC.

**METHODS AND FINDINGS:** The study team populated the Decision Makers’ Program Planning Tool, Version 2.0 (DMPPT 2.0) with HIV incidence projections from the Spectrum/AIDS Impact Module (AIM), as well as national and provincial population and HIV prevalence estimates. We derived baseline circumcision rates from the 2012 South

African National HIV Prevalence, Incidence and Behaviour Survey. The model showed that circumcising men ages 20–34 offers the most immediate impact on HIV incidence and requires the fewest circumcisions per HIV infection averted. The greatest impact over a 15-year period is achieved by circumcising men ages 15–24. When the model assumes a unit cost increase with client age, men ages 15–29 emerge as the most cost-effective group. When we assume a constant cost for all ages, the most cost-effective age range is 15–34 years. Geographically, the program is cost saving in all provinces; differences in the VMMC program's cost-effectiveness across provinces were obscured by uncertainty in HIV incidence projections.

**CONCLUSION:** The VMMC program's impact and cost-effectiveness vary by age-targeting strategy. A strategy focusing on men ages 15–34 will maximize program benefits. However, because clients older than 25 access VMMC services at low rates, South Africa could consider promoting demand among men ages 25–34, without denying services to those in other age groups. Uncertainty in the provincial estimates makes them insufficient to support geographic targeting.

26. Kripke, K., et al. **Voluntary medical male circumcision for HIV prevention in Malawi: modeling the impact and cost of focusing the program by client age and geography.** *PLoS One* 2016;11(7):e0156521.  
Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157071>

**BACKGROUND:** In 2007, the World Health Organization (WHO) recommended scaling up voluntary medical male circumcision (VMMC) in priority countries with high HIV prevalence and low male circumcision (MC) prevalence. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), an estimated 5.8 million males had undergone VMMC by the end of 2013. Implementation experience has raised questions about the need to refocus VMMC programs on specific subpopulations for the greatest epidemiological impact and programmatic effectiveness. As Malawi prepared its national operational plan for VMMC, it sought to examine the impacts of focusing on specific subpopulations by age and region.

**METHODS:** We used the Decision Makers' Program Planning Toolkit, Version 2.0, to study the impact of scaling up VMMC to different target populations of Malawi. National MC prevalence by age group from the 2010 Demographic and Health Survey was scaled according to the MC prevalence for each district and then halved, to adjust for over-reporting of circumcision. In-country stakeholders advised a VMMC unit cost of \$100, based on implementation experience. We derived a cost of \$451 per patient-year for antiretroviral therapy from costs collected as part of a strategic planning exercise previously conducted in-country by UNAIDS.

**RESULTS:** Over a fifteen-year period, circumcising males ages 10–29 would avert 75% of HIV infections, and circumcising males ages 10–34 would avert 88% of infections, compared to the current strategy of circumcising males ages 15–49. The Ministry of

Health's South West and South East health zones had the lowest cost per HIV infection averted. Moreover, VMMC met WHO's definition of cost-effectiveness (that is, the cost per disability-adjusted life-year [DALY] saved was less than three times the per capita gross domestic product) in all health zones except Central East. Comparing urban versus rural areas in the country, we found that circumcising men in urban areas would be both cost-effective and cost-saving, with a VMMC cost per DALY saved of \$120 USD and with 15 years of VMMC implementation resulting in lifetime HIV treatment costs savings of \$331 million USD.

**CONCLUSIONS:** Based on the age analyses and programmatic experience, Malawi's VMMC operational plan focuses on males ages 10–34 in all districts in the South East and South West zones, as well as Lilongwe (an urban district in the Central zone). This plan covers 14 of the 28 districts in the country.

27. Kripke, K., et al. **Assessing progress, impact, and next steps in rolling out voluntary medical male circumcision for HIV prevention in 14 priority countries in eastern and southern Africa through 2014.** *PLoS One* 2016;11(7): e0158767.  
Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0158767>

**BACKGROUND:** In 2007, the World Health Organization and the Joint United Nations Programme on HIV/AIDS (UNAIDS) identified 14 priority countries across eastern and southern Africa for scaling up voluntary medical male circumcision (VMMC) services. Several years into this effort, we reflect on progress.

**METHODS:** Using the Decision Makers' Program Planning Tool (DMPPT) 2.1, we assessed age-specific impact, cost-effectiveness, and coverage attributable to circumcisions performed through 2014. We also compared impact of actual progress to that of achieving 80% coverage among men ages 15–49 in 12 VMMC priority countries and Nyanza Province, Kenya. We populated the models with age-disaggregated VMMC service statistics and with population, mortality, and HIV incidence and prevalence projections exported from country-specific Spectrum/Goals files. We assumed each country achieved UNAIDS' 90-90-90 treatment targets

**RESULTS:** More than 9 million VMMCs were conducted through 2014: 43% of the estimated 20.9 million VMMCs required to reach 80% coverage by the end of 2015. The model assumed each country reaches the UNAIDS targets, and projected that VMMCs conducted through 2014 will avert 240,000 infections by the end of 2025, compared to 1.1 million if each country had reached 80% coverage by the end of 2015. The median estimated cost per HIV infection averted was \$4,400. Nyanza Province in Kenya, the 11 priority regions in Tanzania, and Uganda have reached or are approaching MC coverage targets among males ages 15–24, while coverage in other age groups is lower. Across all countries modeled, more than half of the projected HIV infections averted were attributable to circumcising 10- to 19-year-olds.

**CONCLUSIONS:** The priority countries have made considerable progress in VMMC scale-up, and VMMC remains a cost-effective strategy for epidemic impact, even assuming near-universal HIV diagnosis, treatment coverage, and viral suppression. Examining circumcision coverage by five-year age groups will inform countries' decisions about next steps.

28. Kripke, K., et al. **Correction: Assessing progress, impact, and next steps in rolling out voluntary medical male circumcision for HIV prevention in 14 priority countries in eastern and southern Africa through 2014.** *PLoS One* 2016 11(9): e0163757.

Online at:

<http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0163757>

[This corrects the article doi: 10.1371/journal.pone.0158767, see #26 above].

29. Kripke, K., et al. **Voluntary medical male circumcision for HIV prevention in Swaziland: modeling the impact of age targeting.** *PLoS One* 2016;11(7):e0156776.

Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0156776>

**BACKGROUND:** Voluntary medical male circumcision (VMMC) for HIV prevention has been a priority for Swaziland since 2009. Initially focusing on men ages 15-49, the Ministry of Health reduced the minimum age for VMMC from 15 to 10 years in 2012, given the existing demand among 10- to 15-year-olds. To understand the implications of focusing VMMC service delivery on specific age groups, the MOH undertook a modeling exercise to inform policy and implementation in 2013-2014.

**METHODS AND FINDINGS:** The impact and cost of circumcising specific age groups were assessed using the Decision Makers' Program Planning Tool, Version 2.0 (DMPPT 2.0), a simple compartmental model. We used age-specific HIV incidence from the Swaziland HIV Incidence Measurement Survey (SHIMS). Population, mortality, births, and HIV prevalence were imported from a national Spectrum/Goals model recently updated in consultation with country stakeholders. Baseline male circumcision prevalence was derived from the most recent Swaziland Demographic and Health Survey. The lowest numbers of VMMCs per HIV infection averted are achieved when males ages 15-19, 20-24, 25-29, and 30-34 are circumcised, although the uncertainty bounds for the estimates overlap. Circumcising males ages 25-29 and 20-24 provides the most immediate reduction in HIV incidence. Circumcising males ages 15-19, 20-24, and 25-29 provides the greatest magnitude incidence reduction within 15 years. The lowest cost per HIV infection averted is achieved by circumcising males ages 15-34: \$870 U.S. dollars (USD).

**CONCLUSIONS:** The potential impact, cost, and cost-effectiveness of VMMC scale-up in Swaziland are not uniform. They vary by the age group of males circumcised. Based on the results of this modeling exercise, the Ministry of Health's Swaziland Male Circumcision Strategic and Operational Plan 2014-2018 adopted an implementation

strategy that calls for circumcision to be scaled up to 50% coverage for neonates, 80% among males ages 10-29, and 55% among males ages 30-34.

30. Kripke, K., et al. **Age targeting of voluntary medical male circumcision programs using the Decision Makers' Program Planning Toolkit (DMPPT) 2.0.** *PLoS One* 2016;11(7):e0156909.  
Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0156909>

**BACKGROUND:** Despite considerable efforts to scale up voluntary medical male circumcision (VMMC) for HIV prevention in priority countries over the last five years, implementation has faced important challenges. Seeking to enhance the effect of VMMC programs for greatest and most immediate impact, the U. S. President's Plan for AIDS Relief (PEPFAR) supported the development and application of a model to inform national planning in five countries from 2013–2014.

**METHODS AND FINDINGS:** The Decision Makers' Program Planning Toolkit (DMPPT) 2.0 is a simple compartmental model designed to analyze the effects of client age and geography on program impact and cost. The DMPPT 2.0 model was applied in Malawi, South Africa, Swaziland, Tanzania, and Uganda to assess the impact and cost of scaling up age-targeted VMMC coverage. The lowest number of VMMCs per HIV infection averted would be produced by circumcising males ages 20–34 in Malawi, South Africa, Tanzania, and Uganda and males ages 15–34 in Swaziland. The most immediate impact on HIV incidence would be generated by circumcising males ages 20–34 in Malawi, South Africa, Tanzania, and Uganda and males ages 20–29 in Swaziland. The greatest reductions in HIV incidence over a 15-year period would be achieved by strategies focused on males ages 10–19 in Uganda, 15–24 in Malawi and South Africa, 10–24 in Tanzania, and 15–29 in Swaziland. In all countries, the lowest cost per HIV infection averted would be achieved by circumcising males ages 15–34, although in Uganda this cost is the same as that attained by circumcising 15- to 49-year-olds

**CONCLUSIONS:** The efficiency, immediacy of impact, magnitude of impact, and cost-effectiveness of VMMC scale-up are not uniform; there is important variation by age group of the males circumcised and countries should plan accordingly.

31. Kripke, K., et al. **The economic and epidemiological impact of focusing voluntary medical male circumcision for HIV prevention on specific age groups and regions in Tanzania.** *PLoS One* 2016;11(7):e0153363.  
Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0153363>

**BACKGROUND:** Since its launch in 2010, the Tanzania National Voluntary Medical Male Circumcision (VMMC) Program has focused efforts on males ages 10–34 in 11 priority regions. Implementers have noted that over 70% of VMMC clients are between the ages of 10 and 19, raising questions about whether additional efforts would be required to recruit men age 20 and above. This analysis uses mathematical modeling to examine the

economic and epidemiological consequences of scaling up VMMC among specific age groups and priority regions in Tanzania

**METHODS AND FINDINGS:** Analyses were conducted using the Decision Makers' Program Planning Tool Version 2.0 (DMPPT 2.0), a compartmental model implemented in Microsoft Excel 2010. The model was populated with population, mortality, and HIV incidence and prevalence projections from external sources, including outputs from Spectrum/AIDS Impact Module (AIM). A separate DMPPT 2.0 model was created for each of the 11 priority regions. Tanzania can achieve the most immediate impact on HIV incidence by circumcising males ages 20–34. This strategy would also require the fewest VMMCs for each HIV infection averted. Circumcising men ages 10–24 will have the greatest impact on HIV incidence over a 15-year period. The most cost-effective approach (lowest cost per HIV infection averted) targets men ages 15–34. The model shows the VMMC program is cost saving in all 11 priority regions. VMMC program cost-effectiveness varies across regions due to differences in projected HIV incidence, with the most cost-effective programs in Njombe and Iringa.

**CONCLUSIONS:** The DMPPT 2.0 results reinforce Tanzania's current VMMC strategy, providing newfound confidence in investing in circumcising adolescents. Tanzanian policy makers and program implementers will continue to focus scale-up of VMMC on men ages 10–34 years, seeking to maximize program impact and cost-effectiveness while acknowledging trends in demand among the younger and older age groups.

32. Kripke, K., et al. **Modeling the Impact of Uganda's Safe Male Circumcision Program: implications for age and regional targeting.** *PLoS One* 2016;11(7):e0158693. Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0158693>

**BACKGROUND:** Uganda aims to provide safe male circumcision (SMC) to 80% of men ages 15–49 by 2016. To date, only 2 million men have received SMC of the 4.2 million men required. In response to age and regional trends in SMC uptake, the country sought to re-examine its targets with respect to age and subnational region, to assess the program's progress, and to refine the implementation approach.

**METHODS AND FINDINGS:** The Decision Makers' Program Planning Tool, Version 2.0 (DMPPT 2.0), was used in conjunction with incidence projections from the Spectrum/AIDS Impact Module (AIM) to conduct this analysis. Population, births, deaths, and HIV incidence and prevalence were used to populate the model. Baseline male circumcision prevalence was derived from the 2011 AIDS Indicator Survey. Uganda can achieve the most immediate impact on HIV incidence by circumcising men ages 20–34. This group will also require the fewest circumcisions for each HIV infection averted. Focusing on men ages 10–19 will offer the greatest impact over a 15-year period, while focusing on men ages 15–34 offers the most cost-effective strategy over the same period. A regional analysis showed little variation in cost-effectiveness of scaling up SMC across eight regions. Scale-up is cost-saving in all regions. There is geographic variability



in program progress, highlighting two regions with low baseline rates of circumcision where additional efforts will be needed.

**CONCLUSION:** Focusing SMC efforts on specific age groups and regions may help to accelerate Uganda's SMC program progress. Policy makers in Uganda have already used model outputs in planning efforts, proposing males ages 10–34 as a priority group for SMC in the 2014 application to the Global Fund's new funding model. As scale-up continues, the country should also consider a greater effort to expand SMC in regions with low MC prevalence.

33. Krishnaratne, S., et al. **Interventions to strengthen the HIV prevention cascade: a systematic review of reviews.** *Lancet HIV* 2016;3(7):e307-17.

Online at: <http://www.sciencedirect.com/science/article/pii/S2352301816300388>

**BACKGROUND:** Much progress has been made in interventions to prevent HIV infection. However, development of evidence-informed prevention programmes that translate the efficacy of these strategies into population effect remain a challenge. In this systematic review, we map current evidence for HIV prevention against a new classification system, the HIV prevention cascade.

**METHODS:** We searched for systematic reviews on the effectiveness of HIV prevention interventions published in English from Jan 1, 1995, to July, 2015. From eligible reviews, we identified primary studies that assessed at least one of: HIV incidence, HIV prevalence, condom use, and uptake of HIV testing. We categorised interventions as those seeking to increase demand for HIV prevention, improve supply of HIV prevention methods, support adherence to prevention behaviours, or directly prevent HIV. For each specific intervention, we assigned a rating based on the number of randomised trials and the strength of evidence.

**FINDINGS:** From 88 eligible reviews, we identified 1964 primary studies, of which 292 were eligible for inclusion. Primary studies of direct prevention mechanisms showed strong evidence for the efficacy of pre-exposure prophylaxis (PrEP) and voluntary medical male circumcision. Evidence suggests that interventions to increase supply of prevention methods such as condoms or clean needles can be effective. Evidence arising from demand-side interventions and interventions to promote use of or adherence to prevention tools was less clear, with some strategies likely to be effective and others showing no effect. The quality of the evidence varied across categories.

**INTERPRETATION:** There is growing evidence to support a number of efficacious HIV prevention behaviours, products, and procedures. Translating this evidence into population impact will require interventions that strengthen demand for HIV prevention, supply of HIV prevention technologies, and use of and adherence to HIV prevention methods. **FUNDING:** Bill & Melinda Gates Foundation.

34. Leiby, K., et al. **The impact of SMS-based interventions on VMMC uptake in Lusaka Province, Zambia: a randomized controlled trial.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S264-72.

**INTRODUCTION:** Zambia has high HIV prevalence and low voluntary medical male circumcision (VMMC) rates, heightening the need for effective VMMC demand generation strategies for HIV prevention.

**METHODS:** A 3-arm randomized controlled trial measured the impact of 2 short message service (SMS) campaigns on self-reported and verified VMMC uptake over 6 months in Lusaka Province. The study enrolled 2312 uncircumcised males aged 15-30 previously subscribed on Zambia U-Report, an existing SMS platform providing confidential, free counseling services relevant to HIV and other sexually transmitted infections. Participants in the "Conventional" campaign group received a standard package of messages promoting VMMC. Messages sent to the "Tailored" campaign group were targeted at participants' intention level to get circumcised. The control group had routine counselor access through SMS. Data were collected using SMS surveys, and verification of self-reported VMMC uptake used health facility client data.

**RESULTS:** Six-month self-reported VMMC uptake was 11.6%, 12.6%, and 10.4% in the Conventional, Tailored, and control arms, respectively; verified uptake was 1.8%, 1.1%, and 1.5%. Using multivariate logistic regression, the adjusted odds ratio of self-reported VMMC uptake was 1.17 (95% CI: 0.80 to 1.72) in the Conventional campaign arm compared with the control arm and 1.24 (95% CI: 0.84 to 1.81) in the Tailored campaign arm. The adjusted odds ratios of verified VMMC uptake in the Conventional and Tailored campaign arms were 1.34 (95% CI: 0.45 to 4.02) and 0.67 (95% CI: 0.20 to 2.23), respectively.

**CONCLUSIONS:** Neither SMS campaign had statistically significant impact on VMMC uptake compared with routine SMS counseling. Future research is necessary to fully understand the potential of SMS-based tools for VMMC demand creation.

35. Luo, C. **Sustaining gains made in voluntary medical male circumcision.** *Glob Health Sci Pract* 2016;4(Suppl 1):S1-2.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S1.long](http://www.ghspjournal.org/content/4/Supplement_1/S1.long)

36. Mangenah, C., et al. **Comparative cost of early infant male circumcision by nurse-midwives and doctors in Zimbabwe.** *Glob Health Sci Pract* 2016;4(Suppl 1):S68-75.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S68.long](http://www.ghspjournal.org/content/4/Supplement_1/S68.long)

**BACKGROUND:** The 14 countries that are scaling up voluntary male medical circumcision (VMMC) for HIV prevention are also considering early infant male circumcision (EIMC) to ensure longer-term reductions in HIV incidence. The cost of implementing EIMC is an important factor in scale-up decisions. We conducted a



comparative cost analysis of EIMC performed by nurse-midwives and doctors using the AccuCirc device in Zimbabwe.

**METHODS:** Between August 2013 and July 2014, nurse-midwives performed EIMC on 500 male infants using AccuCirc in a field trial. We analyzed the overall unit cost and identified key cost drivers of EIMC performed by nurse-midwives and compared these with costing data previously collected during a randomized noninferiority comparison trial of 2 devices (AccuCirc and the Mogen clamp) in which doctors performed EIMC. We assessed direct costs (consumable and nonconsumable supplies, device, personnel, associated staff training, and waste management costs) and indirect costs (capital and support personnel costs). We performed one-way sensitivity analyses to assess cost changes when we varied key component costs.

**RESULTS:** The unit costs of EIMC performed by nurse-midwives and doctors in vertical programs were US\$38.87 and US\$49.77, respectively. Key cost drivers of EIMC were consumable supplies, personnel costs, and the device price. In this cost analysis, major cost drivers that explained the differences between EIMC performed by nurse-midwives and doctors were personnel and training costs, both of which were lower for nurse-midwives.

**CONCLUSIONS:** EIMC unit costs were lower when performed by nurse-midwives compared with doctors. To minimize costs, countries planning to scale up EIMC should consider using nurse-midwives, who are in greater supply than doctors and are the main providers at the primary health care level, where most infants are born.

37. Marshall, E., et al. **Sequential cross-sectional surveys in Orange Farm, a township of South Africa, revealed a constant low voluntary medical male circumcision uptake among adults despite demand creation campaigns and high acceptability.** *PLoS One* 2016;11(7):e0158675.

Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0158675>

**BACKGROUND:** WHO recommends a male circumcision (MC) prevalence rate higher than 80% to have a substantial impact on the HIV-AIDS epidemic in Eastern and Southern Africa. Orange Farm, a township in South Africa, has a free-for-service voluntary medical male circumcision (VMMC) clinic in operation since 2008. Following an intense campaign from 2008 to 2010, MC prevalence rate increased to 55.4% (ANRS-12126). Ongoing and past VMMC campaigns focused on youths, through school talks, and adults at a community level. The main objective of the study was to assess the change in MC prevalence rate among adults aged 18-19 and 18-49 years in the past 5 years.

**METHODS:** A cross-sectional survey (ANRS-12285) was conducted among a random sample of 522 adult men in 2015. MC status and characteristics of participants were collected through a genital examination and a face-to-face questionnaire.

**RESULTS:** MC prevalence rate among young adult men aged 18-19 years increased markedly from 61.2% (95%CI: 57.4% to 65.0%) in 2010 to 87.5% (76.0% to 94.6%) in 2015 ( $p < 0.001$ ). In the same period, among men aged 18-49 years, MC prevalence rate varied slightly from 55.4% (53.6% to 57.1%) to 56.7% (52.4% to 60.9%). In 2015, 84.9% (79.2% to 89.5%) of uncircumcised adult men reported that they were willing to be circumcised. However, we estimated that only 4.6% (11/237; 2.5% to 7.9%) of the uncircumcised men underwent circumcision in 2015, despite 117/185 (63.2%; 95%CI: 56.1% to 69.9%) who reported that they were definitely willing to become circumcised.

**CONCLUSIONS:** In Orange Farm, VMMC campaigns were successful among the youth and led to a sufficiently high MC prevalence rate to have a substantial impact in the future on the HIV-AIDS epidemic. However, despite high acceptability and a free VMMC service, VMMC campaigns since 2010 have failed to increase MC prevalence rate among adults to above 80%. These campaigns should be revisited.

38. Mati, K., et al. **Factors associated with married women's support of male circumcision for HIV prevention in Uganda: a population based cross-sectional study.** *BMC Public Health* 2016 16: 696.  
Online at: <http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-016-3385-2>

**BACKGROUND:** Despite the protective effect of male circumcision (MC) against HIV in men, the acceptance of voluntary MC in priority countries for MC scale-up such as Uganda remains limited. This study examined the role of women's sociodemographic characteristics, knowledge of HIV and sexual bargaining power as determinants of women's support of male circumcision (MC).

**METHODS:** Data from the Uganda AIDS Indicator Survey, 2011 were analyzed ( $n = 4,874$ ). Bivariate and multivariate logistic regression analyses with random intercept were conducted to identify factors that influence women's support of MC.

**RESULTS:** Overall, 67.0 % ( $n = 3,276$ ) of the women in our sample were in support of MC but only 28.0 % had circumcised partners. Women who had the knowledge that circumcision reduces HIV risk were about 6 times as likely to support MC than women who lacked that knowledge [AOR (adjusted odds ratio) = 5.85, 95 % CI (confidence interval) = 4.83-7.10]. The two indicators of women's sexual bargaining power (i.e., ability to negotiate condom use and ability to refuse sex) were also positively associated with support of MC. Several sociodemographic factors particularly wealth index were also positively associated with women's support of MC.

**CONCLUSIONS:** The findings in this study will potentially inform intervention strategies to enhance uptake of male circumcision as a strategy to reduce HIV transmission in Uganda.

39. Mavhu, W., et al. **Perspectives of parents and health care workers on early infant male circumcision conducted using devices: qualitative findings from Harare, Zimbabwe.** *Glob Health Sci Pract* 2016;4(Suppl 1):S55-67.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S55.long](http://www.ghspjournal.org/content/4/Supplement_1/S55.long)

**BACKGROUND:** The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend early infant male circumcision (EIMC) for prevention of HIV. Here, we present findings from a qualitative study in Zimbabwe that assessed parental and health care workers' perspectives of EIMC conducted using devices.

**METHODS:** This qualitative study was nested within a trial of EIMC devices. Between January and May 2013, we held 4 focus group discussions (FGDs) and 12 in-depth interviews with parents and 12 in-depth interviews with clinicians (7 trial clinicians and 5 non-trial clinicians). We also conducted 95 short telephone interviews with parents who had arranged to bring their sons for EIMC but then defaulted.

**RESULTS:** Parents who had adopted EIMC spoke of their initial anxieties about the procedure. Additionally, they commented on both the procedure and outcome. Parents who decided against EIMC cited fear of harm, specifically the infant's death, penile injury, and excessive pain. Misperceptions about male circumcision in general and EIMC specifically were a significant barrier to EIMC adoption and were prevalent among health care workers as well as parents. In particular, the findings suggest strong parental concerns about the fate of the discarded foreskin. Parents who chose EIMC for their newborn sons felt that the procedure was safe and expressed satisfaction with the outcome. For their part, health care workers largely thought that EIMC was safe and that the outcome was aesthetically pleasing. They also felt that it would be feasible to offer wide-scale EIMC for HIV prevention in the public sector; they recommended strategies to increase EIMC uptake, in addition to highlighting a few concerns.

**CONCLUSIONS:** The qualitative study enables us to better understand parental and health care workers' perspectives of EIMC conducted using devices, especially their perspectives on EIMC safety, feasibility, acceptability, and barriers. These findings will be used to design demand-generation activities that support wider adoption of EIMC.

40. Mavhu, W., et al. **Safety, acceptability, and feasibility of early infant male circumcision conducted by nurse-midwives using the AccuCirc device: results of a field study in Zimbabwe.** *Glob Health Sci Pract* 2016;4(Suppl 1):S42-54.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S42.long](http://www.ghspjournal.org/content/4/Supplement_1/S42.long)

**BACKGROUND:** For prevention of HIV, early infant male circumcision (EIMC) needs to be scaled up in countries with high HIV prevalence. Routine EIMC will maintain the HIV

prevention gains anticipated from current adult male circumcision initiatives. We present here the results of a field study of EIMC conducted in Zimbabwe.

**METHODS:** The study was observational and based on the World Health Organization (WHO) framework for clinical evaluation of male circumcision devices. We recruited parents of newborn male infants between August 2013 and July 2014 from 2 clinics. Nurse-midwives used the AccuCirc device to circumcise eligible infants. We followed participants for 14 days after EIMC. Outcome measures were EIMC safety, acceptability, and feasibility.

**RESULTS:** We enrolled 500 male infants in the field study (uptake 11%). The infants were circumcised between 6 and 60 days postpartum. The procedure took a median of 17 minutes (interquartile range of 5 to 18 minutes). Mothers' knowledge of male circumcision was extensive. Of the 498 mothers who completed the study questionnaire, 91% knew that male circumcision decreases the risk of HIV acquisition, and 83% correctly stated that this prevention is partial. Asked about their community's perception of EIMC, 40% felt that EIMC will likely be viewed positively in their community; 13% said negatively; and 47% said the perception could be both ways. We observed 7 moderate or severe adverse events (1.4%; 95% confidence interval, 0.4% to 2.4%). All resolved without lasting effects. Nearly all mothers (99%) reported great satisfaction with the outcome, would recommend EIMC to other parents, and would circumcise their next sons.

**CONCLUSION:** This first field study in sub-Saharan Africa of the AccuCirc device for EIMC demonstrated that EIMC conducted by nurse-midwives with this device is safe, feasible, and acceptable to parents.

41. Milovanovic, M., et al. **Easy, faster, and not bloody: providers' perceptions on PrePex in South Africa.** *J Assoc Nurses AIDS Care* 2016 Aug 4. pii: S1055-3290(16)30104-2. [Epub ahead of print]  
Online at: <http://www.sciencedirect.com/science/article/pii/S1055329016301042>

PrePex (Circ MedTech Ltd., Tortola, British Virgin Islands) devices are being evaluated in several countries for scale-up of medical male circumcision (MMC) as an HIV prevention intervention. Health care workers' perceptions should be considered prior to scale-up. A cross-sectional open-ended questionnaire was administered to health care workers from nine MMC programs in South Africa that provided either PrePex and surgical circumcision (mixed sites) or surgical circumcision only (surgery-only sites). A total of 77 health care workers (37 at mixed sites and 40 at surgery-only sites) with median ages of 29 years (interquartile range 27-37) and 34 years (interquartile range 29-42), respectively, were recruited into the study. The perceived benefits of PrePex MMC for health care workers were: device simplicity, convenience, bloodless, and ease of use. Identified challenges included limited public knowledge of device, pain, smell of necrotic

skin, and delayed healing. Health care providers perceived the PrePex MMC device to be simple and adaptable for existing MMC programs.

42. Msyamboza, K. P., et al. **Cervical cancer screening uptake and challenges in Malawi from 2011 to 2015: retrospective cohort study.** *BMC Public Health* 2016 16(1): 806. Online at: <http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-016-3530-y>

**BACKGROUND:** Malawi has the highest cervical cancer incidence and mortality in the world with age-standardized rate (ASR) of 75.9 and 49.8 per 100,000 population respectively. In response, Ministry of Health established a cervical cancer screening programme using visual inspection with acetic acid (VIA) and treatment of precancerous lesions with cryotherapy. This paper highlights the roll out, integration with family planning services and HIV ART Programme, uptake and challenges of VIA and Cryotherapy programme.

**METHODS:** We analyzed program data, supportive supervision, quarterly and annual reports from the National Cervical Cancer Control Program. We evaluated the uptake and challenges of screening services by age, HIV serostatus and trends over a five year period (2011-2015).

**RESULTS:** Between 2011 and 2015, number of cervical cancer screening sites, number of women screened and coverage per annum increased from 75 to 130, 15,331 to 49,301 and 9.3 % to 26.5 % respectively. In this five year period, a total of 145,015 women were screened. Of these, 7,349 (5.1 %) and 6,289 (4.3 %) were VIA positive and suspect cancer respectively. Overall 13,638 (9.4 %) were detected to be VIA positive or had suspect cancer. Of the 48,588 women with known age screened in 2015; 13,642 (28.1 %), 27,275 (56.1 %) and 7,671 (15.8 %) were aged 29 or less, 30-45, 46 years or more. Among 39,101 women with data on HIV serostatus; 21,546 (55.1 %) were HIV negative, 6,209 (15.9 %) were HIV positive and 11, 346 (29.0 %) status was unknown. VIA positivity rate and prevalence of suspect cancer were significantly higher in HIV positive than HIV negative women (8.8 % vs 5.0 %, 6.4 % vs 3.0 %); in women aged 30-45 years than women aged 29 years or less (5.6 % vs 2.3 %, 2.6 % vs 1.2 %) respectively, all  $p < 0.05$ ). The main challenge of the programme was failure to treat VIA positive women eligible for cryotherapy. Over the five year period, the programme only treated 1,001 (43.3 %) out of 2,311 eligible women and only 266 (31.8 %) of the 836 women with large lesion or suspect cancer who were referred, received the health care at the referral centre. The reasons for failure to provide cryotherapy treatment were stock out of gas, faulty/broken cryotherapy machine (usually connectors or probes) or no cryotherapy machine at all in the whole district. For women with large lesion or suspect cancer; lack of loop electrosurgical excision procedure (LEEP) machine or inadequate gynaecologists at the referral centre, were the major reasons. Cancer radiotherapy services were not available in Malawi.

**CONCLUSIONS:** This study provided data on VIA positivity rate, prevalence of suspect cancer, failure rate of cryotherapy and challenges in the provision of cryotherapy and LEEP treatment in Malawi. These data could be used as baseline for monitoring and evaluation of Human Papillomavirus (HPV) vaccination programme which the country introduced in 2013, the linkage of cervical cancer screening and women on HIV ART and the long term effect of ART, voluntary male medical circumcision on the prevalence and incidence of cervical cancer.

43. Njeuhmeli, E., et al. **Scaling up and sustaining voluntary medical male circumcision: maintaining HIV prevention benefits.** *Glob Health Sci Pract* 2016;4(Suppl 1):S9-s17. Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S9.long](http://www.ghspjournal.org/content/4/Supplement_1/S9.long)

44. Njeuhmeli, E., et al. **Modeling costs and impacts of introducing early infant male circumcision for long-term sustainability of the voluntary medical male circumcision program.** *PLoS One* 2016;11(7):e0159167. Online at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0159167>

Voluntary medical male circumcision (VMMC) has been shown to be an effective prevention strategy against HIV infection in males [1-3]. Since 2007, the President's Emergency Plan for AIDS Relief (PEPFAR) has supported VMMC programs in 14 priority countries in Africa. Today several of these countries are preparing to transition their VMMC programs from a scale-up and expansion phase to a maintenance phase. As they do so, they must consider the best approaches to sustain high levels of male circumcision in the population. The two alternatives under consideration are circumcising adolescents 10-14 years old over the long term or integrating early infant male circumcision (EIMC) into maternal and child health programs. The paper presents an analysis, using the Decision Makers Program Planning Tool, Version 2.0 (DMPPT 2.0), of the estimated cost and impact of introducing EIMC into existing VMMC programs in several countries in eastern and southern Africa. Limited cost data exist for the implementation of EIMC, but preliminary studies, such as the one detailed in Mangenah, et al. [4-5], suggest that the cost of EIMC may be less than that of adolescent and adult male circumcision. If this is the case, then adding EIMC to the VMMC program will increase the number of circumcisions that need to be performed but will not increase the total cost of the program over the long term. In addition, we found that a delayed or slow start-up of EIMC would not substantially reduce the impact of adding it to the program or increase cumulative long-term costs, which should make introduction of EIMC more feasible and attractive to countries contemplating such a program innovation.

45. Pintye, J., et al. **Male partner circumcision associated with lower *Trichomonas vaginalis* incidence among pregnant and postpartum Kenyan women: a prospective cohort study.** *Sex Transm Infect* 2016 Aug 12. pii: sextrans-2016-052629. [Epub ahead of print]. Online at: <http://sti.bmj.com/content/early/2016/08/12/sextans-2016-052629.long>



**OBJECTIVE:** *Trichomonas vaginalis* is the world's most common curable STI and has implications for reproductive health in women. We determined incidence and correlates of *T. vaginalis* in an HIV-uninfected peripartum cohort.

**METHODS:** Women participating in a prospective study of peripartum HIV acquisition in Western Kenya were enrolled during pregnancy and followed until 9 months post partum. *T. vaginalis* was assessed every 1–3 months using wet mount microscopy. Correlates of incident *T. vaginalis* were determined using Cox proportional hazards models.

**RESULTS:** Among 1271 women enrolled, median age was 22 years (IQR 19–27) and gestational age was 22 weeks (IQR 18–26); most (78%) were married and had uncircumcised male partners (69%). Prevalent *T. vaginalis* was detected in 81 women (6%) at enrolment. Among women without *T. vaginalis* at enrolment, 112 had *T. vaginalis* detected during 1079 person-years of follow-up (10.4 per 100 person-years). After adjustment for socio-economic factors, male partner circumcision status, pregnancy status and other STIs, *T. vaginalis* incidence was higher during pregnancy than post partum (22.3 vs 7.7 per 100 person-years, adjusted HR (aHR) 3.68, 95% CI 1.90 to 7.15,  $p < 0.001$ ). Women with circumcised male partners had a 58% lower risk of incident *T. vaginalis* compared with women with uncircumcised partners (aHR 0.42, 95% CI 0.23 to 0.76,  $p = 0.004$ ). Employed women had lower risk of incident *T. vaginalis* than unemployed women (aHR 0.49, 95% CI 0.31 to 0.79,  $p = 0.003$ ); recent STI was associated with increased *T. vaginalis* risk (aHR 2.97, 95% CI 1.49 to 5.94,  $p = 0.002$ ).

**CONCLUSIONS:** *T. vaginalis* was relatively common in this peripartum cohort. Male circumcision may confer benefits in preventing *T. vaginalis*.

46. Rudrum, S., et al. **Discourses of masculinity, femininity and sexuality in Uganda's Stand Proud, Get Circumcised campaign.** *Cult Health Sex* 2016 Aug 11:1-15. [Epub ahead of print]  
Online at: <http://www.tandfonline.com/doi/full/10.1080/13691058.2016.1214748>

This paper analyses discourses of masculinity, femininity and sexuality in Stand Proud, Get Circumcised, a public health campaign promoting circumcision as an HIV-prevention strategy in Uganda. The campaign includes posters highlighting the positive reactions of women to circumcised men, and is intended to support the national rollout of voluntary medical male circumcision. We offer a critical discourse analysis of representations of masculinity, femininity and sexuality in relation to HIV prevention. The campaign materials have a playful feel and, in contrast to ABC (Abstain, Be faithful, Use condoms) campaigns, acknowledge the potential for pre-marital and extra-marital sex. However, these posters exploit male anxieties about appearance and performance, drawing on hegemonic masculinity to promote circumcision as an idealised body aesthetic. Positioning women as the campaign's face reasserts a message that women are the

custodians of family health and simultaneously perpetuates a norm of estrangement between men and their health. The wives' slogan, 'we have less chance of getting HIV', is misleading, because circumcision only directly prevents female-to-male HIV transmission. Reaffirming hegemonic notions of appearance- and performance-based heterosexual masculinity reproduces existing unsafe norms about masculinity, femininity and sexuality. In selling male circumcision, the posters fail to promote an overall HIV-prevention message.

47. Huang, J., et al. **Assessment of different intervention models of male circumcision and their preliminary effectiveness in reducing HIV incidence among drug users in Western China.** *AIDS Res Hum Retroviruses* 2016 Aug 9. [Epub ahead of print].

World Health Organization (WHO) and Joint United Nations Program on AIDS (UNAIDS) recommend male circumcision (MC) as an additional HIV prevention measure. This study aimed to assess three models of promoting MC and their effects on preventing HIV infection among drug users in western China. We carried out a cohort study in three provinces of western China. HIV seronegative male drug users were recruited from methadone maintenance therapy clinics and cluster randomized into three intervention models. At baseline, 6, and 9 months of follow-up, changes in MC knowledge, the acceptability of MC, MC surgery uptake, and the costs of model implementation were analyzed. Of 1,304 male drug users who were screened, 1,218 were enrolled in the study. The participants' knowledge about MC was significantly increased after interventions by all three models. The one-stage model led to the highest increase in MC acceptability and the greatest increase in MC uptake. Multivariable Cox regression analysis showed that the one-stage model was also the most effective method to promote MC uptake, compared with the two-stage model [rate ratio (RR) = 0.602; 95% confidence interval (CI), 0.420-0.862] and three-stage model (RR = 0.555; 95% CI, 0.382-0.807). The HIV incidence rate in the MC group was lower than that in the non-MC group (RR = 0.234; 95% CI, 0.056-0.974). Moreover, the one-stage model required the lowest cost per circumcision. The one-stage model is the most effective and the most cost-effective intervention to increase MC uptake among male drug users in western China and could decrease the HIV incidence rate, based on a short follow-up investigation.

48. Sint, T. T., et al. **Long-term investment for infants: keys to a successful early infant male circumcision program for HIV prevention and overall child health.** *Glob Health Sci Pract* 2016;4(Suppl 1): S3-8.  
Online at: [http://www.ghspjournal.org/content/4/Supplement\\_1/S3.long](http://www.ghspjournal.org/content/4/Supplement_1/S3.long)



49. Stover, J., et al. **Aspirations and realities in a North-South partnership for health promotion: lessons from a program to promote safe male circumcision in Botswana.** *Global Health* 2016;12(1):42.  
Online at: <http://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-016-0179-3>

**BACKGROUND:** International donors support the partnership between the Government of Botswana and two international organisations: U.S. Centers for Disease Control and Prevention and Africa Comprehensive HIV/AIDS Partnership to implement Voluntary Medical Male Circumcision with the target of circumcising 80 % of HIV negative men in 5 years. Botswana Government had started integration of the program into its health system when international partners brought in the Models for Optimizing Volume and Efficiency to strengthen delivery of the service and push the target. The objective of this paper is to use a systems model to establish how the functioning of the partnership on Safe Male Circumcision in Botswana contributed to the outcome.

**METHODS:** Data were collected using observations, focus group discussions and interviews. Thirty participants representing all three partners were observed in a 3-day meeting; followed by three rounds of in-depth interviews with five selected leading officers over 2 years and three focus group discussions.

**RESULTS:** Financial resources, "ownership" and the target influence the success or failure of partnerships. A combination of inputs by partners brought progress towards achieving set program goals. Although there were tensions between partners, they were working together in strategising to address some challenges of the partnership and implementation. Pressure to meet the expectations of the international donors caused tension and challenges between the in-country partners to the extent of Development Partners retreating and not pursuing the mission further.

**CONCLUSION:** Target achievement, the link between financial contribution and ownership expectations caused antagonistic outcome. The paper contributes enlightenment that the functioning of the visible in-country partnership is significantly influenced by the less visible global context such as the target setters and donors.

50. Thirumurthy, H., et al. **The effects of providing fixed compensation and lottery-based rewards on uptake of medical male circumcision in Kenya: a randomized trial.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S299-305.

**BACKGROUND:** Effective demand creation strategies are needed to increase uptake of medical male circumcision and reduce new HIV infections in eastern and southern Africa. Building on insights from behavioral economics, we assessed whether providing compensation for opportunity costs of time or lottery-based rewards can increase male circumcision uptake in Kenya.

**METHODS:** Uncircumcised men aged 21-39 years were randomized in 1:1:1 ratio to 2 intervention groups or a control group. One intervention group was offered compensation of US \$12.50 conditional on circumcision uptake. Compensation was provided in the form of food vouchers. A second intervention group was offered the opportunity to participate in a lottery with high-value prizes on undergoing circumcision. The primary outcome was circumcision uptake within 3 months.

**RESULTS:** Among 903 participants enrolled, the group that received compensation of US \$12.50 had the highest circumcision uptake (8.4%, 26/308), followed by the lottery-based rewards group (3.3%, 10/302), and the control group (1.3%, 4/299). Logistic regression analysis showed that compared with the control group, the fixed compensation group had significantly higher circumcision uptake [adjusted odds ratio 7.1; 95% CI: 2.4 to 20.8]. The lottery-based rewards group did not have significantly higher circumcision uptake than the control group (adjusted odds ratio 2.5; 95% CI: 0.8 to 8.1).

**CONCLUSIONS:** Providing compensation was effective in increasing circumcision uptake among men over a short period. The results are consistent with studies showing that such interventions can modify health behaviors by addressing economic barriers and behavioral biases in decision making. Contrary to findings from studies of other health behaviors, lottery-based rewards did not significantly increase circumcision uptake.

**TRIAL REGISTRATION:** Registry for International Development Impact Evaluations: RIDIE-STUDY-ID-530e60df56107.

51. Thomsen, C. S., et al. **Voice-message-based mHealth intervention to reduce postoperative penetrative sex in recipients of voluntary medical male circumcision in the Western Cape, South Africa: protocol of a randomized controlled trial.** *JMIR Res Protoc* 2016;5(3):e155.  
Online at: <http://www.researchprotocols.org/2016/3/e155/>

**BACKGROUND:** There is an increased risk of transmission of sexually transmitted infections (STIs), including HIV, in the postoperative period after receiving voluntary medical male circumcision (VMMC). In South Africa, over 4 million men are being targeted with VMMC services but the health system is not able to offer quality counseling. More innovative strategies for communicating with and altering behavior in men and their partners in the postoperative period after VMMC are needed.

**OBJECTIVE:** This paper presents a study protocol to test the effectiveness of an mHealth intervention designed to task-shift behavior change communication from health care personnel to an automated phone message system, encouraging self-care.

**METHODS:** A single-blind, randomized controlled trial will be used. A total of 1188 participants will be recruited by nurses or clinicians at clinics in the study districts that have a high turnover of VMMC clients. The population will consist of men aged 18 years and older who indicate at the precounseling session that they possess a mobile phone and consent to participating in the study. Consenting participants will be randomized into either the control or intervention arm before undergoing VMMC. The control arm will receive the standard of care (pre- and postcounseling). The intervention arm will receive standard of care and will be sent 38 messages over the 6-week recovery period. Patients will be followed up after 42 days. The primary outcome is self-reported sexual intercourse during the recovery period. Secondary outcomes include nonpenetrative sexual activity, STI symptoms, and perceived risk of acquiring HIV. Analysis will be by intention-to-treat.

**RESULTS:** Enrollment is completed. Follow-up is ongoing. Loss to follow-up is under 10%. No interim analyses have been conducted.

**CONCLUSIONS:** The intervention has the potential of reducing risky sexual behavior after VMMC. The platform itself can be used for many other areas of health that require task shifting to patients for better efficiency and access.

**TRIAL REGISTRATION:** Pan-African Clinical Trial Registry: PACTR201506001182385

52. Unger, J. A., et al. **Maximising HIV prevention by balancing the opportunities of today with the promises of tomorrow: a modelling study.** *Lancet HIV* 2016;3(7):e289-96. Online at: <http://www.sciencedirect.com/science/article/pii/S2352301816300364>

**BACKGROUND:** Many ways of preventing HIV infection have been proposed and more are being developed. We sought to construct a strategic approach to HIV prevention that would use limited resources to achieve the greatest possible prevention impact through the use of interventions available today and in the coming years.

**METHODS:** We developed a deterministic compartmental model of heterosexual HIV transmission in South Africa and formed assumptions about the costs and effects of a range of interventions, encompassing the further scale-up of existing interventions (promoting condom use, male circumcision, early antiretroviral therapy [ART] initiation for all [including increased HIV testing and counselling activities], and oral pre-exposure prophylaxis [PrEP]), the introduction of new interventions in the medium term (offering intravaginal rings, long-acting injectable antiretroviral drugs) and long term (vaccine, broadly neutralising antibodies [bNAbs]). We examined how available resources could be allocated across these interventions to achieve maximum impact, and assessed how this would be affected by the failure of the interventions to be developed or scaled up.

**FINDINGS:** If all interventions are available, the optimum mix would place great emphasis on the following: scale-up of male circumcision and early ART initiation with

outreach testing, as these are available immediately and assumed to be low cost and highly efficacious; intravaginal rings targeted to sex workers; and vaccines, as these can achieve a large effect if scaled up even if imperfectly efficacious. The optimum mix would rely less on longer term developments, such as long-acting antiretroviral drugs and bNABs, unless the costs of these reduced. However, if impossible to scale up existing interventions to the extent assumed, emphasis on oral PrEP, intravaginal rings, and long-acting antiretroviral drugs would increase. The long-term effect on the epidemic is most affected by scale-up of existing interventions and the successful development of a vaccine.

**INTERPRETATION:** With current information, a strategic approach in which limited resources are used to maximise prevention impact would focus on strengthening the scale-up of existing interventions, while pursuing a workable vaccine and developing other approaches that can be used if further scale-up of existing interventions is limited.

**FUNDING:** Bill & Melinda Gates Foundation.

53. Westercamp, M., et al. **Changes in male circumcision prevalence and risk compensation in the Kisumu, Kenya Population 2008-2013.** *J Acquir Immune Defic Syndr* 2016 Sep 13. [Epub ahead of print]

**BACKGROUND:** Three randomized controlled trials (RCT) showed that voluntary medical male circumcision (VMMC) reduces the risk of female to male HIV transmission by approximately 60%. However, data from communities where VMMC programs have been implemented are needed to assess changes in circumcision prevalence and whether men and women compensate for perceived reductions in risk by increasing their HIV risk behaviors.

**METHODS:** Scale-up of free VMMC began in Kisumu, Kenya in 2008. Between 2009 and 2013 a sequence of three unlinked cross-sectional surveys was conducted. All individuals 15-49 years of age residing in randomly selected households were interviewed and offered HIV testing. MC status was confirmed by examination. Design adjusted bivariate comparisons and multivariable analyses were used for statistical inference.

**RESULTS:** The prevalence of male circumcision increased from 32% (95% CI: 26-38%) in 2009 to 60% (95% CI: 56-63%) in 2013. The aPR of HIV and genital ulcer disease (GUD) in circumcised compared to uncircumcised men was 0.48 (95% CI: 0.36-0.66) and 0.51 (95% CI: 0.37-0.69), respectively. There was no association between circumcision status and sexual behaviors, HIV knowledge, or indicators of risk perception.

**CONCLUSION:** The conditions necessary for the VMMC program to have a significant public health impact are present in Kisumu, Kenya. Between 2009 and 2013, circumcision prevalence increased from 30% to 60%; HIV prevalence in circumcised men

was half that of uncircumcised men, and there was no or minimal sexual risk compensation.

54. Wilson, N., et al. **Advertising for demand creation for voluntary medical male circumcision.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S288-91.

**OBJECTIVE:** To measure the effects of information, a challenge, and a conditional cash transfer on take-up of voluntary medical male circumcision (VMMC). **DESIGN:** A randomized, controlled experiment with 4000 postcard recipients in Soweto (Johannesburg), South Africa.

**METHODS:** We examined differences in take-up of several decisions in the VMMC cascade between the control arm and each of several intervention arms using logistic regression.

**RESULTS:** Logistic regression analysis indicated that the group offered US \$10 as compensation and the group challenged with "Are you tough enough?" had significantly higher take-up of the VMMC procedure than did the control group [odds ratios, respectively, 5.30 (CI: 2.20 to 12.76) and 2.70 (CI: 1.05 to 6.91)]. Similarly, the compensation group had significantly higher take-up of the VMMC counseling session than did the control group [odds ratio 3.76 (CI: 1.79 to 7.89)]. The analysis did not reveal significantly different take-up of either the VMMC counseling session or the procedure in the partner preference information group compared with the control group [odds ratios, respectively, 1.23 (CI: 0.51 to 2.97) and 1.67 (CI: 0.61 to 4.62)]. The analysis did not reveal significantly higher take-up of the VMMC nurse hotline in any intervention group compared with the control group [odds ratios for US \$10, information, and challenge, respectively, 1.17 (CI: 0.67 to 2.07), 0.69 (CI: 0.36 to 1.32), and 0.60 (0.31 to 1.18)].

**CONCLUSIONS:** Among adult males in Soweto, South Africa, compensation of US \$10 provided conditional on completing the VMMC counseling session compared with no compensation offer and a postcard with a challenge, "Are you tough enough?" compared with no challenge, resulted in moderate increases in take-up of circumcision.

55. Wirth, K. E., et al. **Triggering the decision to undergo medical male circumcision: a qualitative study of adult men in Botswana.** *AIDS Care* 2016;28(8):1007-12.

In 2007, the World Health Organization endorsed voluntary medical male circumcision (VMMC) as part of comprehensive HIV-prevention strategies. A major challenge facing VMMC programs in sub-Saharan Africa remains demand creation; there is urgent need for data on key elements needed to trigger the decision among eligible men to seek VMMC. Using qualitative methods, we sought to better understand the circumcision decision-making process in Botswana related to VMMC. From July to November 2013, we conducted 27 focus group discussions in four purposively selected communities in

Botswana with men (stratified by circumcision status and age), women (stratified by age) and community leaders. All discussions were facilitated by a trained same-sex interviewer, audio recorded, transcribed and translated to English, and analyzed for key themes using an inductive content analytic approach. Improved hygiene was frequently cited as a major benefit of circumcision and many participants believed that cleanliness was directly responsible for the protective effect of VMMC on HIV infection. While protection against HIV was frequently noted as a benefit of VMMC, the data indicate that increased sexual pleasure and perceived attractiveness, not fear of HIV infection, was an underlying reason why men sought VMMC. Data from this qualitative study suggest that more immediate benefits of VMMC, such as improved hygiene and sexual pleasure, play a larger role in the circumcision decision compared with protection from potential HIV infection. These findings have immediate implications for targeted demand creation and mobilization activities for increasing uptake of VMMC among adult men in Botswana.

56. Zanolini, A., et al. **Feasibility and effectiveness of a peer referral incentive intervention to promote male circumcision uptake in Zambia.** *J Acquir Immune Defic Syndr* 2016;72(Suppl 4):S257-63.

**BACKGROUND:** Medical male circumcision is a promising HIV prevention tool in countries with generalized HIV epidemics, but demand creation interventions are needed to support scale-up. We piloted a peer referral intervention in which circumcision clients were offered incentives for referring their peers for circumcision.

**METHODS:** The intervention was implemented between June 2014 and February 2015 in 6 randomly selected health facilities in Southern Province, Zambia. For the first 5 months, circumcision clients  $\geq 18$  years of age were given referral vouchers that allowed them to refer up to 5 peers for circumcision within a 3-month period. An incentive of US\$2 was offered for each referral. The primary outcome was the number of circumcisions performed per month in each facility. To assess the effect of the intervention, a difference-in-difference analysis was performed using longitudinal data from the intervention facilities and 22 nonintervention facilities. A questionnaire was also implemented to understand men's perceptions of the intervention.

**RESULTS:** During the 8-month intervention period, 1222 men over 18 years of age were circumcised in intervention facilities. In the first 5 months, 699 circumcision clients were enrolled and 385 clients brought a referral voucher given to them by an enrolled client. Difference-in-difference analyses did not show a significant increase in circumcisions performed in intervention facilities. However, circumcision clients reported that the referral incentive motivated them to encourage their friends to seek male circumcision. Peer referrals were also reported to be an important factor in men's decisions because 78% of clients who were referred reported that talking with a circumcised friend was important for their decision to get circumcised.

**CONCLUSIONS:** The peer referral incentive intervention for male circumcision was feasible and acceptable. However, the intervention did not have a significant effect on demand for male circumcision. Barriers to circumcision and features of the intervention may have limited the effect of the intervention. Further efforts regarding encouraging male-to-male communication and evaluations with larger sample sizes are needed.