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Using smartphone raffles to increase demand for voluntary medical male circumcision in Tanzania

October 2016

Impact
Evaluation
Report 51

HIV and AIDS



International
Initiative for
Impact Evaluation

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3ie accepted the final version of this report, *Using smartphone raffles to increase demand for voluntary medical male circumcision in Tanzania*, in November 2015 as partial fulfilment of requirements under grant TW3.12, issued under Thematic Window 3. The content has been copy edited and formatted for publication by 3ie. All of the content is the sole responsibility of the authors and does not represent the opinions of 3ie, its donors or its Board of Commissioners. Any errors and omissions are also the sole responsibility of the authors. All affiliations of the authors listed in the title page are those that were in effect at the time the report was accepted. Any comments or queries should be directed to the corresponding author, Hally Mahler, at Hally.Mahler@jhpiego.org.

Funding for this thematic window was provided by the Bill & Melinda Gates Foundation.

Suggested citation: Mahler, H and Bazant, E, 2016. *Using smartphone raffles to increase demand for voluntary medical male circumcision in Tanzania*, 3ie Impact Evaluation Report 51. New Delhi: International Initiative for Impact Evaluation (3ie)

3ie Impact Evaluation Report Series executive editors: Jyotsna Puri and Beryl Leach

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Cover design: John F McGill and Akarsh Gupta

Printer: VIA Interactive

Cover Photo: Tatiana Morozova

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Acknowledgements

The study was conducted through a collaboration between Jhpiego and the Ministry of Health and Social Welfare with funding from the International Initiative for Impact Evaluation (3ie). The study was implemented at voluntary medical male circumcision (VMMC) sites supported by Jhpiego with funding from the US President's Emergency Plan for AIDS Relief through USAID/Tanzania. We would like to express our gratitude to the National AIDS Control Program (NACP) and to regional, district and health facility administrations and local community leaders for their support during the study implementation period.

We are especially grateful to Gayane Yenokyan, Molly Strachan and Marya Plotkin during the study conceptualisation and start-up period and to Denise Dorchak-Ochola, Gayane Yenokyan, Supriya Sarkar, Mary Drake, Emma Williams and Jennifer Huang for their technical support in the analysis of the quantitative and qualitative data and writing. We appreciate the editorial and formatting assistance of Jhpiego's publication unit on this report.

We thank Jhpiego's VMMC programme staff in Tanzania, and we are especially grateful to Augustino Hellar, Alice Christensen, Mbaraka Amuri, Maende Makokha, Yusuph Kulindwa, Mustafa Njozi, Michael Machaku, Ruth Lemwayi, Kanisiusy Ngonyani, Raymond Bandio, Dorica Boyee, Touma Ng'wanakilala, Rajabu Muhombolage and Abel Mwaipopo for their support and contributions in the implementation of the study and report.

We would also like to give special thanks to co-investigators from the NACP – Dr Jackson Gisenge Lija, James Juma and Baraka Mpora – for their support and leadership to this study. We thank all field staff (health care providers, peer promoters, research assistants and data clerks) who provided services during this period.

Finally, we would like to express our special thanks to all VMMC clients who attended the 14 health facilities during the implementation of the *Bwana Mkubwa* study. The study could not have been done with them.

Summary

Introduction: To reduce the incidence of HIV in Tanzania, in 2010 the Ministry of Health and Social Welfare (MOHSW) set regional targets for voluntary medical male circumcision (VMMC) service uptake in Iringa, Njombe and Tabora – regions with recent efforts targeting men aged 20 to 34 years. Because targets for this age group were not being met, the use of financial or in-kind incentives in the form of lotteries or raffles was thought to be an innovative approach well-suited to promoting VMMC services to men aged 20 years and older. The project, '*Using smartphone raffles to increase demand for male circumcision in Tanzania*,' evaluated the impact of an incentive programme on uptake of VMMC by men in the targeted age group.

Objectives: The project's goal was to increase uptake of VMMC by men aged 20 and above at fixed service delivery sites in Iringa, Njombe and Tabora regions during a three-month promotional period by offering clients, peer promoters and healthcare providers the opportunity to enter smartphone raffles.

Methods: The study used a matched-pair, cluster-randomised study design comprising 14 health facilities (7 pairs) matched on facility type, region and client volume.

In quantitative data analysis of VMMC counts, we used generalised linear modelling with Poisson distribution, exchangeable working correlation structure and robust variance estimates. We compared total VMMCs performed for each study group for the intervention period and the same three-month period in the prior year, using a difference-in-difference approach.

Qualitative data was collected from intervention sites, where clients were asked about exposure to VMMC and raffle-related communications, mobile phone ownership and socio-demographic characteristics. In focus group discussions with clients and peer promoters in both study groups, we assessed the perceived risk of HIV, attitudes and norms towards VMMC, factors influencing uptake of VMMC and perceptions of appropriate incentives, including lotteries. We surveyed healthcare providers at all 14 sites.

Results – description of profiles: Across all sites, some client characteristics changed significantly from the prior year period to the *Bwana Mkubwa* intervention period: the percentage of the clients who were older than 30 years increased from 20 per cent to 30.5 per cent ($p < 0.001$); the percentage testing HIV-positive at VMMC services increased from 1.6 per cent to 11.9 per cent ($p < 0.001$); and clients who returned for the recommended first follow-up visit increased significantly, from 84.8 per cent to 89.2 per cent ($p = 0.026$).

Results – intervention implementation: Of 388 clients at the seven intervention sites, 352 returned for the recommended follow-up visit (90.7 per cent). Of these, 264 consented to be in the smartphone raffle. Ninety-one raffles were planned, but only 79 were held, due to the fact that in some weeks there were no raffle joiners and therefore, no raffle.

Two peer promoters worked in each intervention and comparison site. Among surveyed clients, 60 per cent saw messages about the smartphone raffle in posters. In the three months prior to the survey, 46 per cent of clients received a message regarding the smartphone raffle from a peer promoter, 17 per cent from a neighbour, 8 per cent from a healthcare provider, and less frequently from a relative, spouse or girlfriend.

Key results

Uptake of VMMC: At intervention sites, 388 clients aged 20 and above had VMMC, up from 264 in the prior-year period, a 47 per cent increase. At comparison sites 278 clients had VMMC, compared with 257 in the prior-year period – an 8 per cent increase. None of these changes were statistically significant in models accounting for clustering. However, in a subgroup analysis of the Iringa region, which had six facilities (three pairs), the intervention group had a 3.36-fold significant increase in VMMCs from the prior year ($p < 0.028$), while the control group had a more modest 63 per cent increase ($p = 0.003$) in the model that accounted for clustering and adjusted for the two client characteristics, 'per cent over age 30 years' and 'per cent testing HIV positive'. The changes in VMMC counts in the study groups were not significantly different one from another.

Referrals to VMMC services: During the intervention period, 76 per cent and 67 per cent of VMMC clients aged 20 and above in the intervention and control groups, respectively, reported being referred by peer promoters, a significant difference ($p < 0.001$). However, in the multivariate analysis that accounted for clustering and other potential confounders, the effect of study group was no longer significant.

Client preferences: Twelve focus group discussions were conducted with 40 VMMC clients and 28 peer promoters at intervention and comparison sites. The advantages and barriers of VMMC were confirmed and previous qualitative research related to the reluctance of older clients to seek VMMC were reinforced.

The smartphone raffle received mixed reviews. Participants in both intervention and comparison sites recommended the VMMC programme offer smaller, less expensive incentives that would be available to all clients, including T-shirts, food, farming inputs or transportation reimbursement.

Health provider opinions: In the survey of 43 healthcare providers, of which two-thirds were nurses, 80 per cent thought that an incentive could influence men's uptake of VMMC. Reimbursing or providing transportation or giving away branded materials was thought to be more influential than smartphone raffles.

Cost of intervention: The incremental cost per additional client was US\$88.65, considering all phones raffled.

Recommendations

Based on the overall study results and the subgroup analysis in Iringa region, there is no clear mandate to recommend or not recommend the use of a smartphone raffle to increase uptake of VMMC services. However, placed in the right geographic location

at the right time in VMMC scale-up, a raffle such as this one may help late adopters move from intention to action. Our findings point to a strong need for programme managers and policymakers to consider the stage of VMMC scale-up and the characteristics of uncircumcised men and, if necessary, devise incentive strategies that respond to each situation. Communities that are early or later in VMMC scale-up may require different incentives.

Our qualitative research suggests that the introduction of a financial or in-kind incentive for an already 'free' service may have potential negative effects. Policymakers seeking to increase VMMC uptake should conduct formative research to better understand community perceptions around VMMC and incentives for VMMC uptake, and may wish to repeat this study in different seasons and regions and with different types of incentives.

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Abbreviations and acronyms

3ie	International Initiative for Impact Evaluation
FGD	focus group discussion
GEE	generalised estimating equations
IRB	institutional review board
MOHSW	Ministry of Health and Social Welfare
NACP	National AIDS Control Program
NIMR	National Institute of Medical Research
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
RIDIE	Registry for International Development Impact Evaluations
USAID	United States Agency for International Development
VMMC	voluntarily medical male circumcision

1. Introduction

1.1 Background

In 2009 the Ministry of Health and Social Welfare (MOHSW) of Tanzania initiated a pilot of voluntary medical male circumcision (VMMC) services in three regions, and in 2010 began scaling up VMMC services to 12 regions. In the regions of Iringa, Njombe and Tabora, the work of the MOHSW has been supported by Jhpiego with funding from USAID through the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through three funding mechanisms/programmes: the Maternal and Child Health Integrated Program, Accelovate and AIDSFree. Iringa region initiated VMMC activities in 2010, Njombe in 2011 and Tabora in 2012. To address high HIV prevalence and low VMMC prevalence in these regions (table 1), in 2010 the MOHSW set a target of 264,990 VMMCs in Iringa and Njombe (at the time, they were part of a single region called Iringa) and 316,417 VMMCs in Tabora (National AIDS Control Program [NACP] 2010). Across the three regions, 17 fixed sites offer routine VMMC services two to three days per week, and outreach services delivered as part of campaigns have been provided in more than 450 sites (Jhpiego Tanzania, 2014). As of March 2014, technical and financial support from Jhpiego has helped the MOHSW perform 276,037 VMMCs in Iringa and Njombe and 140,509 VMMCs in Tabora.

Table 1: Prevalence of HIV testing among men and VMMC in three regions of Tanzania

	HIV prevalence among men aged 15–49 (%) (A)	Men ever tested (%)	Men tested in last 12 months and received results (%)	VMMC prevalence (%)
Iringa	6.9	55.6	28.2	59.7
Njombe	14.2	70.4	43.7	49.2
Tabora	4.5	56.1	30.5	55.6

Note: Data from Tanzania HIV/AIDS and Malaria Indicator Survey, 2011–2012.

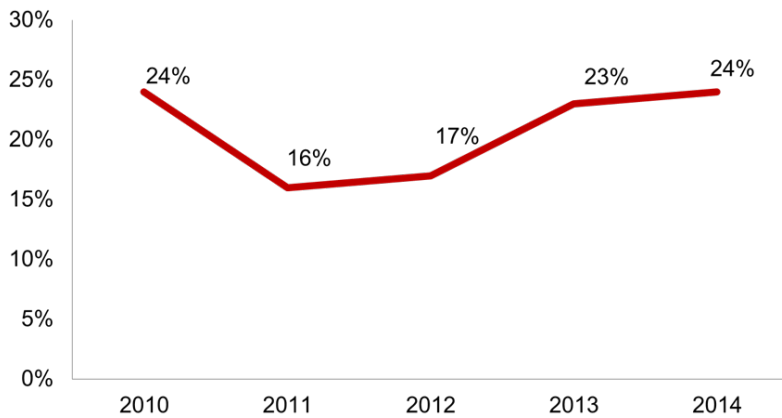
According to the 2012 study, 'Cost and Impact of Scaling up VMMC in Tanzania', for every six VMMCs in the original Iringa region and for every 12 VMMCs in Tabora region, one future HIV infection will be averted (Menon *et al.* 2014). Using this modelling information, more than 36,000 future cases of HIV have been prevented as a result of current efforts. More recent modelling efforts have put the number of VMMCs required to avert one new HIV infection at 61 in Iringa, 58 in Njombe and 243 in Tabora, with fewer VMMCs needed to avert one new HIV infection in men aged 20 to 34 (Futures Institute 2014).

The programme's operational strategies include VMMCs provided by nurses (65 per cent of VMMC clinicians), multiple surgical bays and task shifting and task sharing, among other supply- and demand-side efficiencies. On the demand side, the programme uses a variety of communication approaches and channels to recruit clients to service. The programme in Iringa, Njombe and Tabora has demonstrated

that scale-up of VMMC to 80 per cent of the general male population in a traditionally non-circumcising population is possible. However, some challenges remain.

Men aged 20 and above had low uptake of VMMC in all three regions from 2010 to 2014; only 22 per cent of VMMC clients were aged 20 and above. However, the percentage of clients aged 20 and above has increased each year since 2011 (figure 1).

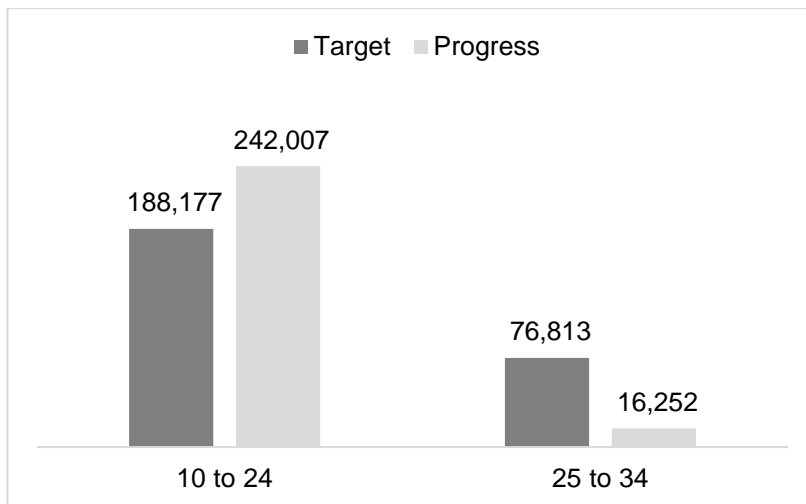
Figure 1: Percentage of VMMC clients aged 20 and above in Jhpiego-supported regions, fiscal years 2010–2014



Note: Data from Jhpiego VMMC database, December 2014.

Iringa and Njombe regions have surpassed their overall target numbers. However, as of December 2014 the programme had reached 128 per cent of the target population of 10- to 24-year-olds, but only 21 per cent of the target population of men aged 25 to 34 years (figure 2).

Figure 2: VMMC targets vs. progress by age disaggregation in Iringa/Njombe



Note: Data from Jhpiego VMMC database.

In these regions, circumcision after adolescence, and particularly after marriage, is considered shameful. Strong cultural preferences for circumcision in pre-adolescence and adolescence exist, according to Jhpiego's research (Plotkin, Castor & Mziray 2013). The shame and associated difficulties of being circumcised 'late' is at the heart of nearly all other sociocultural and service delivery barriers to VMMC uptake (Plotkin, Castor & Mziray 2013). Additionally, men and women in the Iringa region report that once a man has married, and therefore has regular access to a sexual partner, the motivation for getting circumcised decreases. This is despite the fact that men and women both report that having multiple sexual partners is a common occurrence for men, particularly in Iringa and Njombe, and that men understand and are willing to take the risk of increased exposure to HIV as a result of their sexual behaviours (Plotkin *et al.* 2011).

1.1.1 Uptake in fixed sites offering routine services

Fixed sites have the potential to serve 40 to 50 clients per day but often serve 10 or fewer, and on a typical day they see only 5 clients. Low client loads (walk-ins and referrals) result in suboptimal use of financial and medical resources. Referrals to VMMC from other services within the hospital or health centres are minimal. Recent efforts to hire and support peer promoters have had some success. VMMCs can be performed at fixed sites and during outreach campaigns in rural areas. The share of overall VMMCs performed at fixed sites is 16 per cent and has been decreasing over time (VMMC database, Jhpiego Tanzania).

Despite the challenges, maintaining fixed sites and improving VMMC uptake in them is important. Fixed sites employ healthcare providers who also conduct outreach and campaign activities needed to maintain their competency. Men aged 20 and above seek circumcision more often at the lower-volume fixed sites compared with the high-volume outreach sites (24 per cent of fixed-site clients are aged 20 and above, compared with 16 per cent of clients at outreach sites), perhaps for the privacy and relative anonymity (VMMC database, Jhpiego Tanzania).

1.1.2 Demand creation

Between 2012 and 2013, the MOHSW with Jhpiego explored a number of interventions to attract older clients at fixed sites, including:

- Revising and rebranding behaviour change communication messages and materials to place a greater focus on attracting men in their 20s and 30s. The lifestyle-focused branding emphasises the social and relational/marital benefits of being circumcised, better hygiene and being a more confident partner/lover. It also activates the influence of female intimate partners.
- Greatly increasing the use of interpersonal communication by launching a peer promoter programme, offering personal escorts for clients who would like to have company and encouragement on their circumcision day and working with partner agencies (governmental and nongovernmental organisations) that reach men and their intimate partners in their activities to train peer promoters and promoters in their ranks.

- Launching a programme to implement advocacy activities with community, religious, women and business leaders to gain their support for VMMC.
- Making changes in service delivery at campaign/outreach and fixed sites. During campaign/outreach and fixed services, men aged 20 and above skip to the front of the line and are able to schedule their circumcisions for late or off hours/days. The Iringa health authority and Jhpiego implemented a VIP clinic in Iringa town that was available only to men 20 and older, had only male providers, offered appointments or walk in and provided VMMC services seven days a week. In one three-week period, 219 men were circumcised; 55 per cent were aged 20 to 24, showing younger-adult bias even in adult-only services.

Through these efforts, Iringa and Njombe saw a 5 per cent increase in clients aged 20 and above from 2012 to 2013. Older men who were most at-risk for HIV remained resistant to VMMC uptake. The motivation of peer promoters and healthcare providers to refer clients to VMMC depended on individual personalities. Few healthcare providers working in other departments in the facilities referred clients to VMMC services.

In 2014, prior to the implementation of the *Bwana Mkubwa*, Jhpiego was engaged in two other studies that, in whole or in part, looked at increasing uptake of VMMC by men aged 18 and above. In the first study, called the Tanzania PrePex™ Safety and Acceptability Study, specific fixed sites recruited adults aged 18 and above to participate in the study of acceptability of PrePex vs. other VMMC surgical methods. More than 40 per cent of clients during the implementation period were aged 18 and above. The second study explored service and community efforts to increase uptake by men aged 18 and above in campaign service delivery settings. Preliminary results suggest it was successful at increasing uptake by older men in Tabora but much less so in Njombe.

1.2 Literature review

Financial incentives have been investigated across a variety of preventive health services, including those related to sexually transmitted infections (Geffen 2011; Thornton 2008; de Walque *et al.* 2012; Baird *et al.* 2012). Mantzari, Vogt and Marteau (2014) found that an incentive increased HPV vaccine completion rates by 10 percentage points among first-time and previous outreach patients, irrespective of socioeconomic disadvantage. However, participants' attitudes towards the HPV vaccination and their knowledge of its health consequences were not affected by the offer of financial incentives (Thornton 2008). In recent years, there has been a plethora of research on the application of conditional financial incentives, primarily in the form of conditional cash transfers, as motivational interventions designed to address both structural and behavioural HIV prevention barriers (Baird *et al.* 2010; de Walque, Dow & Nathan 2011; World Bank 2010; Özler & de Walque 2009). These studies have showed mixed results, in part due to the fact that the desirability effect of the conditional cash transfers seems to decrease over time (Kohler & Thornton 2011).

Lotteries are similar to fixed financial incentives in that they offer the possibility of financial pay-out, but they add an element of risk. Evidence from psychology and behavioural economics has indicated that people tend to overestimate their chance of winning a big prize even when the likelihood is small, and therefore prefer a small chance at a large reward over the certainty of a small reward (Kahneman 2011; Barberis 2013; Kahneman & Tversky 1979). Risky sexual behaviour, which is responsible for the vast majority of new HIV infections, also involves a gamble. Lottery programmes may be better at targeting those at greater risk of acquiring HIV.

The use of lotteries as an alternative incentive with monetary value to conditional or unconditional cash transfers goes back as far as 1957 when a lottery was used to increase tuberculosis screening in Scotland (Baird *et al.* 2012). However, the use of lotteries for health promotion has been rare in HIV prevention programmes (Baird *et al.* 2012). For chlamydia testing, Niza, Rudisill and Dolan (2014) showed a 7.4 per cent increase in at-home chlamydia testing with financial incentives, and vouchers were found to be more effective than lottery incentives. Gain-framed incentives were marginally more effective than loss-framed incentives (de Walque *et al.* 2012).

One example of the use of lotteries for HIV counselling and testing was described in a qualitative study by Weihs and Meyer-Weitz (2014), which found positive support for workplace HIV counselling and testing with a lottery incentive because it created strong group cohesion and mitigated HIV stigma.

The most recent successful example of such a programme assessed a lottery incentive in a randomised controlled trial in Lesotho. The programme offered a low number of expected pay-outs with high-value prizes that participants had a chance of winning, conditional on receiving negative test results for sexually transmitted infections (de Walque *et al.* 2012). Nyqvist *et al.* (2015) found that, although 'risk-loving' individuals were significantly more likely to become infected with HIV over the trial period, the risk-loving individuals responded more forcefully to the lottery intervention. The study team further found that for every US\$1 increase in the expected prize, these risk-loving individuals reduced their number of reported unprotected sexual acts by 0.3/month.

While financial incentives are effective for shifting demand for services, the magnitude of the absolute effect must be considered for policymakers and public health practitioners. Financial incentives may not be affordable or sustainable if the amount required for the incentive is too expensive. Financial incentives may not be cost-effective compared with other interventions; for example, renovating health facilities to increase the privacy of VMMC services for older men. In addition, financial incentives may not address other barriers, such as lack of autonomy, and the incentive may not be sufficient to overcome other cost considerations (delayed vs. immediate utility) (Baird *et al.* 2010; Barberis 2013).

2. Intervention, evaluation objectives and policy relevance, and theory of change

2.1 Intervention

We implemented an intervention that promoted a smartphone raffle through posters, flyers, car announcements, and peer promoters. During the intervention period, all men over 20 years old undergoing circumcision procedure at one of seven clinics randomly selected in the intervention group would have the opportunity to enter in a smartphone raffle. Moreover, peer promoters and health care providers who referred a man for circumcision during the intervention period also had the opportunity to enter a raffle to win a smartphone. The cost of smartphone was about US\$100.

2.2 Evaluation objectives and policy relevance

The aim of the project was to evaluate a smartphone raffle incentive to increase uptake of VMMC services by men aged 20 years and above at fixed service delivery sites in the Iringa, Njombe and Tabora regions of Tanzania. The project had four specific objectives:

- To assess whether a motivational incentive (entry into a raffle for a smartphone) could achieve a net 20 per cent increase in the number of VMMC clients aged 20 and above at fixed service delivery sites (25 per cent increase at intervention sites and 5 per cent in comparison sites)
- To assess whether a motivational incentive can increase the number of successful referrals (referred and received VMMC) to VMMC fixed sites made by peer promoters and health care providers during the intervention period
- To understand and document the types of motivation that men have for seeking VMMC services in sites that do not offer the motivational incentive (comparison) and in sites that do offer the motivational incentive (intervention)
- To compare the costs of providing VMMC services at intervention and comparison sites

With the introduction of the VMMC programme, Iringa, Njombe and Tabora have changed from non-traditionally circumcising regions to circumcising regions. However, the shame associated with seeking circumcision as an adult (after adolescence) and their access to female sexual partners despite not being circumcised still keep older men from seeking VMMC. The global public health community needs to find ways to strengthen the perceived personal and social benefits of being circumcised so they outweigh the perceived negative social consequences of being uncircumcised past adolescence and to appeal to men willing to risk HIV acquisition.

Demand creation and service delivery uptake focusing on various forms of motivational incentives, including cash transfer and participation in lotteries, may help motivate older men to seek VMMC services and increase the number of successful referrals (de Walque *et al.* 2012) The use of financial or in-kind incentives in the form of conditional cash transfer or lotteries for items that help convey economic and social status for men may be particularly well-suited to the promotion of VMMC services. The desired

behaviour of receiving VMMC for HIV prevention is a one-off activity. Once undertaken, VMMC's protective effects to a man from reduced risk of HIV acquisition last a lifetime. Research in Lesotho and elsewhere has demonstrated that lotteries are more likely to be successfully used for health promotion with individuals who are more attracted to risk, such as older men with multiple sexual partners who are not circumcised; and lotteries, if successful, could cost less to implement than most cash transfer programmes (de Walque *et al.* 2012).

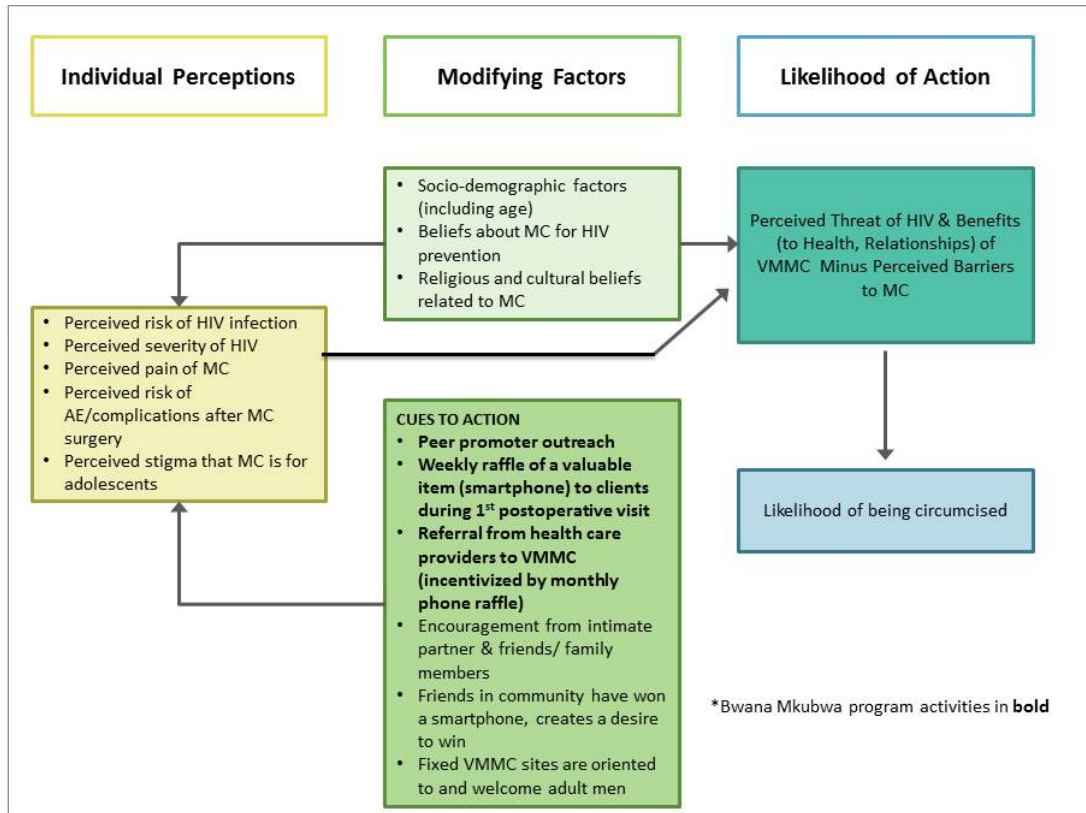
Current PEPFAR policies, generally followed by the MOHSW in Tanzania, offer mixed guidance on the use of VMMC incentives. For example, reimbursement or provision of transportation is allowed, but guidance on replacement of lost wages is murky and provision of gifts on a one-to-one basis is not currently allowed. Much has been discussed in the international community about how or whether financial or in-kind incentives might increase VMMC uptake, particularly by older men, making this study particularly relevant for decision makers. All countries where VMMC is a priority would benefit by an increase in pace and scale-up of VMMC services, according to modelling data of HIV cases to be averted. Should this intervention prove effective, individual countries will need to weigh the positive benefits against local and international concerns about incentives.

2.3 Theory of change

Our theory of change is based largely on the health belief model. The health belief model suggests that an individual's beliefs are shaped by perceptions about both the benefits and the barriers of the proposed action and that the person's ability to act is a function of self-efficacy. Using this model, we propose that men, especially older men, understand the health and social benefits of male circumcision, but they also perceive strong barriers related to social stigma, pain and risk of adverse events. We believe that a lottery affects these barriers by replacing a perceived barrier (loss of social status due to the stigma of VMMC) with a benefit (increase in social status due to owning an expensive smartphone). In addition, the health belief model suggests that a 'cue to action' is needed to increase perceptions of self-efficacy and tip the decision to take action. By adding peer promoter outreach and referrals from the health facility to the incentive of the smartphone raffle, we have added cues that may then tip the scales from inaction to action, resulting in a man's decision to seek VMMC.

At the time this study was planned, the idea of a lottery incentive to promote VMMC was entirely novel. However, historically, lotteries have been used for various other types of health promotion (Kahneman 2011). VMMC seemed well-suited to lottery promotion since it is a one-off activity (except men are expected to return for follow-up visits after surgery) and, once undertaken, the protective effects of VMMC last a lifetime. There is no need for a man to sustain a long-term behaviour change practice, and the immediate short-term benefits of VMMC (protection from HIV and HPV acquisition) are strong.

Figure 3: VMMC health belief model at project design phase



Note: In the figure, MC stands for 'male circumcision', AE stands for adverse event

There were three main reasons for promoting a lottery/raffle of a smartphone to boost demand for VMMC among men aged 20 and above in three regions of Tanzania:

- *Social status for client.* Previous research suggests that seeking VMMC temporarily decreases an older man's status in his community and family due to the need to take time off work during the healing period. One important form of social currency in all three regions, and Tanzania overall, is owning a mobile phone. Household mobile phone ownership is 60 per cent nationally and 87 per cent in urban areas, where most fixed VMMC sites are located (Tanzania Commission for AIDS 2013). However, 'feature-based' phones or smartphones are only owned by a few men, called '*bwana mkubwa*' ('big' or 'important' men). Both owning a phone and letting others use one's phone (sharing) bring additional social status (Wesolowski *et al.* 2013). At a cost of approximately US\$100/each, the *Bwana Mkubwa* design team, which included Jhpiego, regionally based experts and peer promoters, believed that a smartphone was just expensive enough to provide positive social status to those who win the raffle, thereby overcoming concerns of adult men, without being so expensive as to be perceived as unduly influential in the decision to seek VMMC.
- *Appeal to older risk-taking men.* Research has demonstrated that lotteries and raffles often appeal to individuals more attracted to risk taking (Nyqvist *et al.*

2015). The design team believed that a lottery might attract older men with multiple sexual partners who took significant HIV acquisition risks but were not motivated to seek VMMC because they already had regular access to sexual partners.

- *Low programme costs of weekly raffles of a smartphone.* At the proposal phase, Jhpiego estimated the cost of a weekly phone raffle at each health facility in the intervention group to be US\$4 per circumcision, thinking a US\$100 phone raffle would attract an additional 25 clients weekly at each site. In addition, it was believed that by increasing the number of clients so that fixed facilities were operating at a more optimal pace and scale, the cost of the phone would be offset by the increased efficiencies at the service delivery site.

The seven principles of motivational incentives identified by Kellogg *et al.* (2016) informed our intervention design at the proposal phase (table 2). These concern the target behaviour, choice of the focus population, choice of reinforcement/value, incentive magnitude, frequency of incentive distribution, timing of the incentive and duration of the incentive.

Table 2: Seven principles of motivational incentives applied to Bwana Mkubwa

Principle	Description	<i>Bwana Mkubwa</i> Intervention
1. Target behaviour	The behaviour must be problematic, in need of change and measurable. The behaviour must be the centrepiece of the behavioural contract, which, in turn, provides the framework within which incentives can be used.	Clients: Uncircumcised older men to attend fixed sites for VMMC services. Promoters/Providers: Peer promoters and health care workers to increase the number of referrals made to VMMC services.
2. Choice of target population	When resources are limited, choices need to be made regarding which group or subpopulation to target with reinforcement-based incentives.	Clients: Only men aged 20 and above eligible for incentive. These are the men most likely to face social stigma from seeking VMMC and for whom a smartphone may help overcome some of that stigma. Promoters/Providers: Those with direct access to potential clients will be eligible.
3. Choice of reinforcement	Incentives perceived as desirable are likely to have a much greater impact on behaviour than those that are perceived as being of less value or use.	Clients: A chance to win a smartphone, weekly. Promoters/Providers and Clients: Owning a smartphone increases one's social capital.

Principle	Description	Bwana Mkubwa Intervention
4. Incentive magnitude	Different levels of incentive are needed to reinforce or sustain different types of desired behaviours	Clients: A smartphone is a considerable incentive in this context, where the average family income is US\$1.10 per day (Rosenstock, Strecher & Becker 1994) Many individuals own mobile phones but not smartphones. Promoters/Providers: Same as above.
5. Frequency of incentive distribution, schedule of enforcement	Is the behaviour reinforced every time it occurs, or only some of the time?	Clients: Raffle to occur weekly; each client has chance to join. Weekly raffles allow a frequent winner while keeping the intervention affordable. Promoters/Providers: Monthly raffle; more successful referrals improve chances of winning.
6. Timing of the incentive	Reinforcement needs to follow the exhibition of the target behaviour as closely as possible. The more rapidly the incentives are distributed, the more effective they will be.	Clients: Raffle to occur at first post-operative visit every service week, encouraging clients to get circumcised AND return for follow-up. Promoters/Providers: Raffle to take place at the end of the month in a public meeting. In a healthy competition, promoters/providers will see who has the most entries.
7. Duration of the incentive	What is the duration of the incentive? A lengthier duration of incentive is more effective.	Clients: Incentive programme to occur over three intervention months; clients will see community members win the incentive, creating desire to win it for themselves. Promoters/Providers: Same as above.

3. Methods

3.1 Evaluation study design

This study used a matched-pair, cluster-randomised trial experimental design. The study used mixed methods with quantitative and qualitative (focus group) data.

In the Iringa, Njombe and Tabora regions of Tanzania, 14 health facilities were selected from 17 facilities that offered fixed-site VMMC services at the time of proposal writing. The purpose and strategy for selection and randomisation was discussed with and agreed upon with local government stakeholders.

Bwana study data was collected over a period of three months, from 17 November 2014 to 16 February 2015. Four facilities started and ended the study one or more

days later, to accommodate local events and logistical arrangements. Figure 4 shows the location of the study sites in the regions.

3.1.1 Randomisation of health facilities

Seven pairs of facilities were purposefully matched based on location, patient volume and type of facility. One facility from each pair was to be assigned to intervention and the other to control. The procedure was as follows:

1. For each facility pair, the facility names were written on pieces of paper, which were folded and put in a hat. It was decided that the first name drawn/picked for each pair would be the intervention facility; the second would be the control.
2. An NACP staff member who was not part of the study team was chosen to draw the facility names.

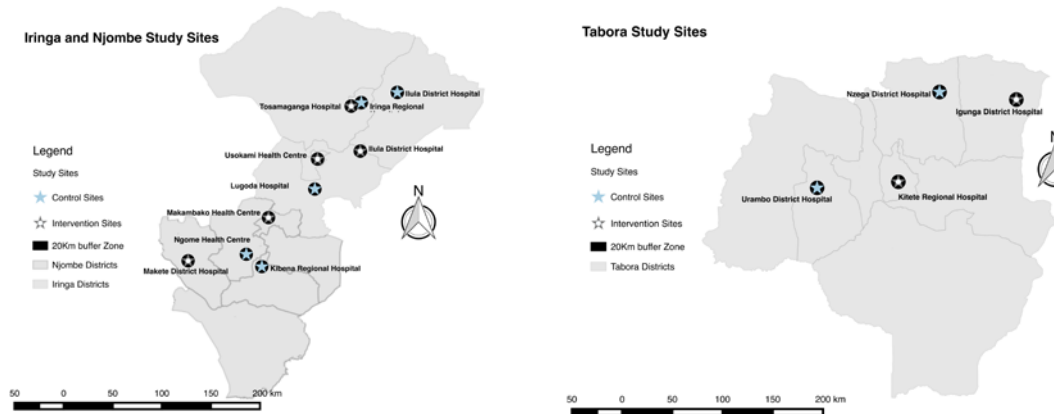
This was done for each of the pairs until all facilities were assigned to either intervention or control group.

Table 3: Facility pairs

Pair	Facility name	Urban/rural	Health facility/region	Study dates
1	Ilula District Hospital	Urban/Peri-urban	District Hospital – Iringa	17 Nov. 2014 to 16 Feb. 2015
	Mafinga District Hospital	Urban/Peri-urban	District Hospital – Iringa	17 Nov. 2014 to 16 Feb. 2015
2	Lugoda Hospital	Rural (tea plantations)	Designated District Hospital (private) – Iringa	17 Nov. 2014 to 16 Feb. 2015
	Usokami Health Centre	Rural	Health Centre – Iringa	17 Nov. 2014 to 16 Feb. 2015
3	Ngome Health Centre	Urban/Peri-urban	Health Centre – Iringa	17 Nov. 2014 to 16 Feb. 2015
	Makambako Health Centre (in Njombe, close to Iringa)	Urban/Peri-urban	Health Centre – Njombe	17 Nov. 2014 to 16 Feb. 2015
4	Kibena Regional Hospital	Urban/Peri-urban	Regional Hospital – Njombe	17 Nov. 2014 to 16 Feb. 2015
	Makete District Hospital	Urban/Peri-urban	District Hospital – Njombe	17 Nov. 2014 to 16 Feb. 2015
5	Iringa Referral Hospital	Urban	Regional Hospital – Iringa	17 Nov. 2014 to 16 Feb. 2015
	Tosamaganga Hospital	Peri-urban	District Hospital (FBO) – Iringa	17 Nov. 2014 to 16 Feb. 2015
6	Kitete Regional Hospital	Urban/Peri-urban	Regional Hospital – Tabora	19 Nov. 2014 to 18 Feb. 2015
	Nzega District Hospital	Urban/Peri-urban	District Hospital – Tabora	18 Nov. 2014 to 17 Feb. 2015
7	Igunga District Hospital	Urban/Peri-urban	District Hospital – Tabora	22 Nov. 2014 to 21 Feb. 2015
	Urambo District Hospital	Urban/Peri-urban	District Hospital – Tabora	21 Nov. 2014 to 20 Feb. 2015

Note: Intervention facilities are in **bold**.

Figure 4: Study sites by study group and region



Note: Image source: Yusup Kulindwa, Jhpiego Tanzania.

3.1.2 Ethical considerations

Ethical approval to conduct the study was granted by the National Institute for Medical Research (NIMR)'s Medical Research Coordinating Committee, reference number NIMR/HQ/R.8a/Vol. IX/1809, and Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB), reference number 5651. The study was also authorised by the Gaming Board of Tanzania to conduct a public raffle, certificate reference number GBT/PL/JC/VOL.I/244/7. As a donor requirement, the study was registered at the Registry for International Development Impact Evaluations (RIDIE), with registration number RIDIE-STUDY-ID-54610bbb892eb. All participants signed consent forms to participate in the study.

In a review of ethics related to the use of incentives for participation in research, Grant and Sugarman (2004) laid out the conditions under which the use of incentives was deemed unethical. These unethical conditions included those in which 1) the subject was in a dependent relationship with the researcher, 2) the risks were particularly high, 3) the research was degrading, 4) the participant would only consent if the incentive was relatively large because the participant's aversion to the study was strong and 5) the aversion was a principled one. In Jhpiego's estimation, the proposed *Bwana Mkubwa* intervention did not meet any of these conditions for unethical use of incentives and was therefore considered ethical.

3.1.3 Study participants

Study participants included clients and peer promoters (each for entering the raffle and participating in the focus groups) and health care providers for entering the raffle and participating in interviews. Table 4 describes the inclusion and exclusion criteria.

Table 4: Inclusion and exclusion criteria for each type of participant

Clients	Inclusion criteria	Exclusion criteria
<i>Clients (for raffle entry/joining) at intervention sites</i>	<ul style="list-style-type: none"> • Men aged 20 and above seeking VMMC services at one of the 7 intervention sites • Clients received circumcision • Clients returned for at least one follow-up visit within 7 days 	<ul style="list-style-type: none"> • VMMC clients younger than 20 were excluded from the raffle intervention and study but still offered VMMC services. • Clients who failed to return for at least one follow-up visit within 7 days of circumcision were ineligible.
<i>Clients for focus groups at intervention and comparison sites</i>	<ul style="list-style-type: none"> • Same as for raffle entry • Available at the time specified for the focus group • Clients received circumcision • Clients agreed to participate in future focus groups and provide contact information 	<ul style="list-style-type: none"> • Same as for raffle entry
<i>Peer promoters (focus group and raffle participation)</i>	<ul style="list-style-type: none"> • Working as a peer promoter at the intervention and comparison sites (survey) • Minimum 5 successful referrals for entry into peer promoter raffle at intervention sites 	<ul style="list-style-type: none"> • Peer promoters who won a phone were excluded from subsequent raffles.
<i>Providers (survey and raffle participation)</i>	<ul style="list-style-type: none"> • A non-VMMC provider who referred clients from another service to the VMMC service at the intervention and comparison sites (survey) • Available at time of survey • Minimum 5 successful referrals for entry into provider raffle at intervention sites 	<ul style="list-style-type: none"> • Healthcare providers who won a phone were excluded from subsequent raffles.

3.2 Data collection

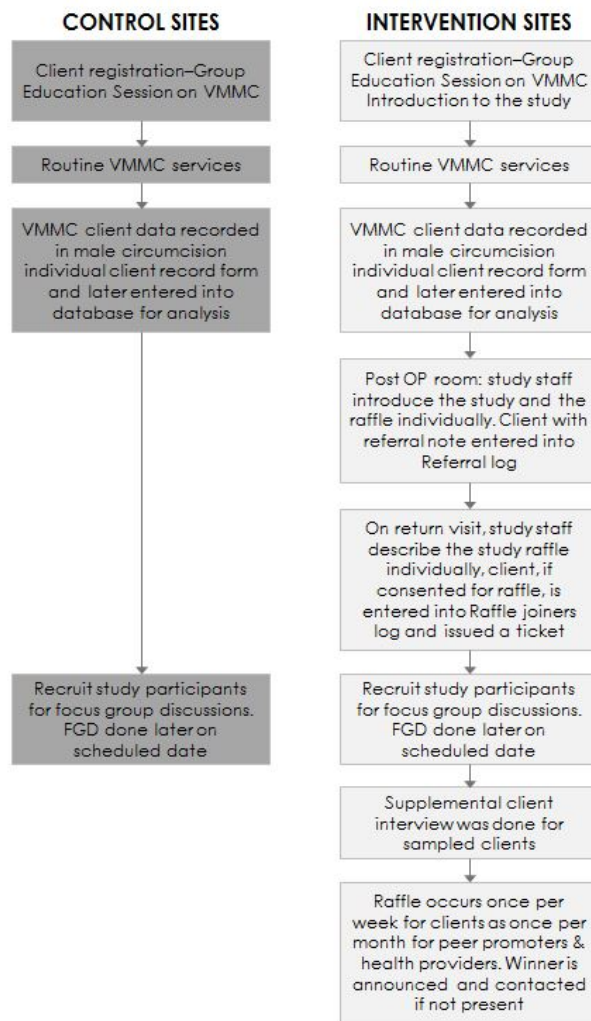
3.2.1 Research assistants

The research team included 14 research assistants, one at each site, for study implementation. A three-day training was conducted to orient research assistants on the study protocol and procedures, including research ethics and data collection tools. Practical sessions were conducted to simulate the field setting. A detailed study flow/implementation plan (figure 5), including when and how to obtain consent from study participants, was followed.

As part of normal VMMC programme operations that were carried out in both study groups, demand-side interventions included print media (posters and brochures), public announcements played on vehicle-mounted public address systems, radio advertisements and radio shows, and interpersonal activities (formal and informal individual and small-group talks and events) implemented by peer promoters, which all promoted VMMC services at 14 sites.

In the raffle intervention group only, additional posters, flyers, public announcements and peer promoters were used to promote the smartphone raffle. Programme staff believed that some men thought the vehicle-mounted announcements about the smartphone raffle were really the radio playing, but no radio messages advertised the raffles.

Figure 5: Study flow diagram for client at *Bwana Mkubwa* study sites



Note: Activities 1 through 4 were done on day zero and activities 5 through 8 were done on follow-up days, any time between days 1 and 7 following circumcision.

3.2.2 Client recruitment

For each site there was a routine group education session with waiting VMMC clients. During this session all clients received general information regarding VMMC. Facility staff introduced the study during group education sessions.

There were 28 peer promoters, two per facility, of both genders – 16 men and 12 women (table 5).

Table 5: Number of peer promoters in intervention and control sites

Facility and study group	Male	Female	Total
Intervention			
Igunga District Hospital	2		2
Kitete Regional Hospital		2	2
Mafinga District Hospital	1	1	2
Makambako Health Centre	1	1	2
Makete District Hospital	2		2
Tosamaganga District Hospital		2	2
Usokami Health Centre	2		2
Control			
Ilula District Hospital	1	1	2
Iringa Regional Hospital	1	1	2
Kibena Town Hospital	2		2
Lugoda Hospital	1	1 (a)	2
Ngome Health Centre	2		2
Nzega District Hospital	1	1	2
Urambo District Hospital		2	2
Total	16	12	28

Note: (a) This promoter left halfway into the study.

Study staff recruited clients seeking VMMC services. A client was approached by a study staff member after he had received and completed VMMC services. A recruitment script was read to the VMMC client. A client was informed on further criteria to participate in the raffle. On a follow-up visit, within one to seven days after circumcision if a client returned, informed consent was sought and, if the client consented to participate in the raffle, the name and more contact information was entered into the log of raffle joiners. A ticket was then issued and the client was informed of the date and time for the raffle.

For clients who consented to participate in the raffle, a recruitment script was read for recruiting them for focus group discussions (FGDs). When the study staff had recruited eight participants maximum, a date and time for the FGD was set and the study staff communicated the venue and time to the clients. On the day of the FGD, the informed consent process was carried out with each participant prior to starting the focus group. The consent also informed clients that their participation in the study was voluntary and that their receipt of future services was not dependent on whether they accepted or declined participation in the FGD.

3.2.3 VMMC promoter recruitment

For each region, all peer promoters in intervention or comparison sites were invited and agreed to participate in the FGD. On the day of the FGD, informed consent was carried out with each participant. Peer promoters were informed that their participation

in the study was voluntary and that their employment as VMMC promoters was not dependent on whether they accepted or declined participation in the FGD.

3.2.4 VMMC provider recruitment

Study staff recruited 42 VMMC providers for the survey. Among the staff who were providing VMMC services during the study period, three from each facility were approached to participate in the questionnaire interview and none refused. A time was scheduled for the survey to be conducted. On the day of the interview, informed consent was sought from the providers, including informing them that their participation in the study would not affect their employment as VMMC providers at the facility.

Table 6: Study samples achieved for survey and qualitative data

	Iringa	Njombe	Tabora	Total
Supplemental client surveys in intervention sites	97	56	80	233
Health care provider interviews	9	21	12	42
FGDs with clients	2	2	2	6
FGDs with peer promoters	2	2	2	6
Clients in FGD – intervention	8	6	7	21
Clients in FGD – comparison	7	6	6	19
Peer promoters in FGD – intervention	7	4	4	15
Peer promoters in FGD – comparison	8	4	5	17

3.2.5 Data entry and uploading

Data entry was done using paper and tablets. All surveys were collected using an Open Data Kit application on the tablets. Individual clients' information was filled in on individual client cards by healthcare providers and later given to research assistants, who entered them in the web-based database maintained on a Jhpiego server. Access to the database was given only to the authorised personnel.

3.2.6 Data security and confidentiality

Participants were ensured of the confidentiality of their stored information. All completed forms were stored in a metal cabinet in a room that only the research team could access. All study participants were assigned a study ID for information confidentiality. All consent forms were kept in separate files, and later at the Jhpiego office, for security and confidentiality. In the case of surveys that were done using tablets, security was guaranteed by a password for logging into the tablet. After the interview was done, the data were sent directly to the server so the research assistant could not trace that information. No client information remained in the tablets.

Table 7: Tools and information documented

#	Tool	Information documented
1	VMMC 'Individual client record'	<i>Collected routinely.</i> Age, marital status, HIV test results, post-operative reviews, adverse events and follow-up visits, referrals to and from the VMMC service.
2	Supplemental information on client raffle participants	Residence, education, employment status, marital status, religion, exposure to VMMC messaging and raffle messaging. wealth (water in house, electricity, sanitary facilities, fuel, ownership of items, including mobile phone and type), travel time to facility.
3	Peer promoter referral book	Numbered referral slips that peer promoters and providers distributed to potential clients.
4	Peer promoter referral log	Region, district, facility, date of visit, referral serial number, client ID.
5	Log of raffle entrants/joiners	Facility, region, district, client ID, client raffle number, name and telephone number; and second telephone number, age, village
6a1 6b1	Focus group guide for VMMC clients (in each study group)	Perceived susceptibility to and severity of HIV, perceived benefits of VMMC, perceived barriers to VMMC and cues to action. In intervention sites, the smartphone offer is explored in relation to the benefits, risks, and barriers. Partner encouragement, family encouragement, influence of peer networks, exposure to other VMMC materials or messages opportunity costs of having the VMMC surgery and follow-up, and fear of complications.
6a2 6b2	Demographic profile of FGD participants (in each study group)	Residence, age, marital status, occupation, children, highest level of education.
7	Focus group guide for peer promoters (in each study group)	How they perceived that the use of the motivational incentive of a smartphone affected the potential clients' decisions to attend VMMC services and peer promoter's referral practices. Explored other motivators for older clients and successful recruitment strategies.
7a	Demographic profile of FGD participants – peer promoters	Residence, age, how long worked as peer promoters, gender, marital status, other work, children, level of education.
8	VMMC provider survey (in each study group)	Cadre, whether or not they were trained as VMMC providers, years of work experience, years worked as VMMC provider, perception of VMMC client ages, challenges faced, what could be done to increase older men's uptake at community and facility levels, perceptions of incentive(s) to attract older men.
9	Raffle ticket	Region, district, health facility, date, name of client, telephone number, residence, serial number.

3.2.7 Process activities and information

Key preparation activities were as follows:

1. IRB approvals were obtained from relevant authorities (NIMR approval on 4 September 2014, certificate number NIMR/HQ/R.8a/Vol. IX/1809; Johns Hopkins School of Public Health IRB on 7 October 2014, number 5651).
2. Local approvals for conducting the proposed raffle was obtained from Tanzania Gaming Board authority on 17 September 2014.
3. This study was entered in the RIDIE public registry: RIDIE-STUDY-ID-54610bbb892eb.
4. A total of 14 research assistants for data collection, one at each site, were recruited to support study activities.
5. Training (three days) for study staff was conducted 5–7 November 2014.
6. Study orientation meetings with regional and district health official and health facility staff occurred from 10–19 November 2014.

VMMC services were carried out at all sites during the study period with no interruptions. There was no other VMMC campaign in the fixed sites where the project was operating. We are not aware of any events during the study period that would have depressed VMMC uptake.

3.3 Data, methods and analysis

3.3.1 Power calculations

During the time of proposal writing in 2013, the power calculations took into consideration actual service data from the 17 operating fixed site facilities as a baseline and ranked the facilities by the average monthly VMMCs from February through June 2013. The 14 lowest-ranked facilities were selected since, at the time, older clients preferred lower volume sites. From February through June 2013 there were an average of 338 VMMCs per month among clients aged 20 and above in the 14 facilities that would be part of the *Bwana Mkubwa* study. Simulations were conducted to assess the empirical power associated with various scenarios of the number of facilities to potentially include in the study. (Empirical power is defined as the proportion of runs where the null hypothesis is rejected at 0.05 level of significance.) One thousand simulation runs were conducted for each sample size of facilities.

The goal of the simulations was to assess the sample size that was associated with at least 80 per cent power to detect 20 per cent net increase in the number of VMMCs in the intervention facilities, compared with control facilities at a 0.05 level of statistical significance. Simulations were conducted for 6, 8, 10, 12 and 14 facilities (across the two study groups). In each simulation run, half of the facilities were randomly assigned to the intervention group and the other half to the control group (the assignment of facilities to intervention and control had not yet occurred).

Study-period VMMC count data were simulated using Poisson distribution, as follows: the average number of VMMCs in intervention facilities was 25 per cent higher during the study period, compared with the baseline, and the average number of male circumcisions in control facilities was only 5 per cent higher than at baseline.

In the models, we used generalised estimating equations (GEE) and exchangeable working correlation structure. This accounts for the correlation between the number of VMMCs in the same facility (i.e. clustering). Data collected in 14 facilities are not one independent random sample and therefore are correlated within clusters. The accounting for clustering is done by estimating a within-facility correlation in model specification. A generalised linear marginal model with identity link compares differences in VMMCs between study groups during the study period against the baseline. With 1,000 simulations for 14 facilities, the power was 85 per cent to detect a 20 per cent net increase in male circumcisions and the power was 98 per cent to detect a 30 per cent net increase in male circumcisions, comparing endline-baseline differences between study groups. All calculations were done in Stata software, release 12.

3.3.2 Quantitative data analysis

The number of VMMCs performed was tracked daily and weekly at each site. Data managers on-site entered the de-identified individual-level data from Ministry of Health client records and to the routine database maintained by Jhpiego since 2009. Data were also separately aggregated on a daily tally sheet and aggregated in a weekly file, all in Microsoft Excel. These two files were used to tally the number of VMMCs performed each week at each site during the intervention period. The number of VMMCs performed was obtained via extraction from the client database.

The initial analysis was descriptive. We report the total count of VMMCs among older men for each facility, study group and time period: the *Bwana Mkubwa* intervention period compared with same three months in the prior year. In the intervention group and the control group, we calculated percentage increases from the VMMC count number for the earlier period to the *Bwana Mkubwa* period.

In the statistical analysis, the outcome of total VMMCs in the period between groups and time periods was compared using the generalised linear model with Poisson distribution, estimated using GEE and specified with exchangeable working correlation structure and robust variance estimate. This was a difference-in-difference analysis. The GEE model included an indicator (categorical) variable for the time periods, one study group variable, and interaction term to create the time-by-group variables. This model specification assumes that there is a change (from baseline to endline) in VMMCs in both groups, but that this change is different by group. We report the estimated relative percentage increase in the average number of VMMC in the intervention period compared with the same period in prior year by study group and its 95 per cent confidence interval.

The analysis was performed for the whole sample and for a subgroup. A subgroup analysis is useful to see if the pattern observed in the whole sample remains true for

the subgroups or whether subgroups saw different changes; however, a stratified or subgroup analysis results in loss of sample size. Due to the fact that the study engaged three pairs (six facilities) in Iringa, a subgroup in that region alone was conducted.

Our models adjusted for potential confounders. When studying an exposure and its association with an outcome, a third factor may be a confounder if the factor is (a) a strong predictor of the outcome and (b) associated with the exposure but is not a result of the exposure (Gordis 2000). The models are adjusted for 'facility pair'. Since the main outcome is the total number of VMMC for each facility, we adjusted for the average of VMMC client characteristics available in the VMMC medical record. Three possible confounders were available on all VMMC clients: age, HIV status and marital status. In the adjusted model, we control for 'per cent over age 30 years' and 'per cent testing HIV positive' at the facility level by including these variables in the GEE models.

Referrals were analysed descriptively for the intervention period, by facility and study group. In bivariate and multivariate logistic regression analysis, the odds ratio for promoter/provider referral vs. self-referral and clustering in the 14 facilities is taken into account. In the multivariate analysis, the models are adjusted for region and men's characteristics in the VMMC medical record database (age category, marital status and HIV test result).

3.3.3 Intervention (raffle participation)

We report on the percentage of men having a VMMC who returned for a follow-up visit within one week. This is the number of men eligible to be invited to participate in the smartphone raffle at the seven intervention sites. The actual number of men who entered the raffle was noted, along with the number of phones that were raffled off (maximum one per week at each of the seven intervention sites.). The number of peer promoters and healthcare providers who participated in the monthly smartphone raffle was also noted.

3.3.4 Qualitative data analysis

The 12 FGDs were conducted in Swahili and recorded digitally. The digital recordings were transcribed in Swahili and then translated and transcribed into English by a professional translator. A member of the study team fluent in both languages reviewed the transcripts in Swahili and English side by side and clarified the translation where necessary. An initial codebook was developed based on *a priori* themes outlined in the protocol and tools. After the initial codebook was created, several transcripts were reviewed in order to identify topics present in the data (new codes) but not mentioned in the study documents. The resulting draft codebook was presented to the study team for review and a final version was created incorporating the team's suggestions and edits.

The transcripts were then coded using ATLAS.ti 7 (ATLAS.ti GmbH, Berlin, Germany) by three analysts. After coding, all transcripts were reviewed by a single analyst to check for consistency in the application of codes as an assessment of inter-rater reliability. The codes and corresponding coded passages were then grouped based on

themes derived from the integrated behavioural model (Fishbein & Yzer 2003). The FGD data collection tools and qualitative analysis codebook were both designed using concepts from the health belief model (Rosenstock, Strecher & Becker 1994). Once the data was coded, however, it became evident that social norms were an important component of the decision to seek VMMC. Our findings are presented using concepts from the integrated behavioural model, which features elements of our original behavioural model and the theory of planned behaviour, a model in which subjective norms are a prominent feature. The concept of self-efficacy is also part of this model, and perceived economic constraints or opportunity costs of seeking VMMCs (such as from lost wages while healing) would contribute to one's self-efficacy.

Using ATLAS.ti software, codes were grouped thematically and reports on the coded passages were generated to compare content across different types of respondents and geographical regions. The thematically grouped coded passages were reviewed and summarised by one of the three analysts. Analysts used matrices for organisation themes, subthemes for each focus group and identifying patterns across focus groups, as recommended by the framework analysis approach (Ritchie *et al.* 2014). The thematic summaries were reviewed by the analysts and discussed. Each grouping of themes was described in summaries based on this review of all the data on the families of themes and subthemes. Narrative summaries were then synthesised into one summary with illustrative quotes. Each analyst reviewed the other analysts' interpretations to ensure consistency of interpretation across analysts.

4. Results

4.1 Descriptive results

According to the VMMC clinical records, the characteristics of VMMC clientele (population) aged 20 and above shifted from the prior-year period to the *Bwana Mkubwa* period (table 8). The percentage of the clients (all aged 20 or older) who were over age 30 years increased from 20 per cent in the prior-year period to 30.5 per cent in the intervention period and testing HIV positive at VMMC services increased from 1.6 per cent to 11.9 per cent (both $p < 0.001$).

In the prior-year period, overall 84.8 per cent of clients returned for the recommended first follow-up visit, and this increased significantly to 89.2 per cent ($p = 0.026$) in the intervention period. In the intervention period, 90.7 per cent of intervention-site clients came for follow-up, and 87.1 per cent of control-site clients did. (At intervention sites, it was necessary for clients to return to be enrolled in the smartphone raffle.) In each group in each time period, approximately 35 or 36 per cent of the clients were married.

Table 8: Characteristics of VMMC clients aged 20 and over in the three-month prior-year and *Bwana Mkubwa* study periods

	One Year Prior to Study Period							Study Period							p-val. (a)
	All Facilities (N=521)		Intervention (N=264)		Control (N=257)		p- val.	All Facilities (N=666)		Intervention (N=388)		Control (N=278)		p- val.	
	N	%	N	%	N	%		N	%	N	%	N	%		
Age (mean)	25.2	n/a	24.6	n/a	25.8	n/a	0.023	27.5	n/a	27.3	n/a	27.7	n/a	0.584	<0.001
(Standard deviation)	(6.1)		(5.7)		(6.4)			(9.2)		(9.0)		(9.5)			
Median age	23	n/a	23	n/a	24	n/a		24	n/a	24	n/a	24	n/a		
% aged 20–29	416	79.9	216	81.8	200	77.8	0.255	463	69.5	271	69.9	192	69.1	0.829	<0.001
% aged 30+	105	20.1	48	18.2	57	22.2		203	30.5	117	30.2	86	30.9		
Marital status (b)															
Not married	332	63.8	174	65.9	158	61.7	0.320	423	63.7	248	63.9	175	63.4	0.272	0.062
Married	188	36.2	90	34.1	98	38.3		234	35.2	138	35.6	96	34.8		
Cohabiting	0	0.0	0	0.0	0	0.0		7	1.1	2	0.5	5	1.8		
Tested HIV+ at VMMC	8	1.6	3	1.2	5	2.2	0.381	76	11.9	39	10.7	37	13.6	0.256	<0.001
First follow-up visit															
Returned	442	84.8	226	85.6	216	84.0	0.620	594	89.2	352	90.7	242	87.1	0.132	0.026
Did not return	79	15.2	38	14.4	41	16.0		72	10.8	36	9.3	36	13.0		

Note (a): Comparing totals in study period vs. one-year prior year. (b) Three observations excluded from this analysis for 'not applicable' response for marital status.

There was some regional variation. In many cases, likely due to lower sample sizes, differences were not significant. In Iringa region, VMMC clients had greater likelihood of testing positive for HIV, comparing the intervention period with the prior-year period (18.3% vs. 3.1%, $p=0.001$) (table 9). Clients returning for follow up was 66 per cent in the prior year period overall vs. 98.3 per cent in the intervention period ($p<.001$).

Table 9: Characteristics of VMMC clients aged 20 and above in the three-month prior year and *Bwana Mkubwa* study periods in Iringa

	Prior Year							Intervention Period							p-value (a)
	All Facilities (N=166)		Intervention Facilities (N=58)		Control Facilities (N=108)		p-value	All Facilities (N=302)		Intervention Facilities (N=125)		Control Facilities (N=177)		p-value	
	N	%	N	%	N	%		N	%	N	%	N	%		
Age															
% aged 30+	42	25.3	13	22.4	29	26.9	0.531	111	36.8	49	39.2	62	35.0	0.481	0.011
Marital status															
Not married	119	71.7	44	75.9	75	69.4	0.559	187	61.9	74	59.2	113	63.8	0.152	0.081
Tested HIV+	5	3.1	1	1.7	4	3.9	0.448	53	18.3	19	16.1	34	19.9	0.414	<0.001
First follow-up visit															
Returned (has visit date)	110	66.3	38	65.5	72	66.7	0.881	297	98.3	123	98.4	174	98.3	0.949	<0.001
Did not return (no visit date) or missing data	56	33.7	20	34.5	36	33.3		5	1.7	2	1.6	3	1.7		

Note: (a) Comparing totals in intervention period and prior year.

In Njombe, during the intervention period, the percent of clients over age 30 was 18 per cent in comparison facilities vs. 38 per cent in intervention facilities ($p < 0.025$) (Table 10).

In Tabora region (table 11), the percentage of clients who were not married increased more than overall: 59.7 per cent in the prior year, compared with 68.7 per cent in intervention period ($p < 0.025$). Testing HIV positive increased less than overall, but the increase was still significant: 3.1 per cent overall during intervention period, compared with 0.7 per cent during the prior-year period ($p < 0.037$). During intervention period, 'returning for 1st follow-up' was greater in intervention group facilities than the control group facilities (93.4 per cent vs. 67.7 per cent, $p < 0.001$), while rates in the prior-year period were similar. Also, intervention group clients were more likely to be unmarried than control group clients (72.6 per cent vs. 58.1 per cent, $p < 0.025$).

Table 10: Characteristics of VMMC clients aged 20+ in the three-month prior-year and *Bwana Mkubwa* study periods in Njombe

	Prior Year							Intervention Period							p-value (a)
	All Facilities (N=45)		Intervention Facilities (N=36)		Comparison Facilities (N=9)		p-value	All Facilities (N=134)		Intervention Facilities (N=95)		Comparison Facilities (N=39)		p-value	
	N	%	N	%	N	%		N	%	N	%	N	%		
Age															
% aged 30+	13	28.9	11	30.6	2	22.2	0.622	43	32.1	36	37.9	7	18.0	0.025	0.689
Marital status															
Not married	28	62.2	21	58.3	7	77.8	0.282	78	58.2	52	54.7	26	66.7	0.311	0.665
Tested HIV+ First follow-up visit	1	2.5	1	3.0	0	0.0	0.641	16	13.0	14	16.7	2	5.1	0.077	0.059
Returned (has visit date)	34	75.6	25	69.4	9	100.0	0.056	98	73.1	72	75.8	26	66.7	0.279	0.749
Did not return (no visit date) or missing data	11	24.4	11	30.6	0	0.0		36	26.9	23	24.2	13	33.3		

Note: (a) Comparing totals in intervention period and prior year.

Table 11: Characteristics of VMMC clients aged 20 and above in the three-month prior year and *Bwana Mkubwa* study periods in Tabora

	Prior Year							Intervention Period							p-value (a)
	All Facilities (N=310)		Intervention Facilities (N=170)		Comparison Facilities (N=140)		p-value	All Facilities (N=230)		Intervention Facilities (N=168)		Comparison Facilities (N=62)		p-value	
	N	%	N	%	N	%		N	%	N	%	N	%		
Age															
% aged 30+	50	16.1	24	14.1	26	18.6	0.289	49	21.3	32	19.1	17	27.4	0.169	0.124
Marital Status															
Not married	18	59.7	109	64.1	76	54.3	0.079	158	68.7	122	72.6	36	58.1	0.025	0.022
Tested HIV Positive First Follow-Up Visit	2	0.7	1	0.6	1	0.8	0.818	7	3.1	6	3.7	1	1.6	0.428	0.037
Returned (has visit date)	29	96.1	163	95.9	135	96.4	0.804	199	86.5	157	93.4	42	67.7	<0.001	<0.001
Did not return (no visit date) or missing data	8		8		5			31	13.5	11	6.6	20	32.3		

Note: (a) Comparing totals in intervention period and prior year.

4.1.1 Focus group participants' characteristics

In the focus groups, the mean age of peer promoters was 27 to 29 years (table 12). The focus group VMMC clients were, on average, 26.7 years old in control sites and 33.3 years old in intervention sites. Peer promoters were generally split equally by gender and had worked for over a year (15 to 16 months) and therefore were not new to the job. Among peer promoters, 13 to 20 per cent on average were not married. Among the VMMC clients, 33 to 42 per cent were not married. Peer promoters had a secondary education, generally, while the VMMC clients were most likely to have completed primary education. VMMC clients represented a mix of occupations: students, farmers, entrepreneurs and 'other' occupations. Participants in the focus groups in intervention sites were more likely to be farmers than in the control sites.

Table 12: Demographic information for clients and peer educators in the

Variable	Peer promoters		VMMC clients	
	Control (n=15) N (%)	Intervention (n=15) N (%)	Control (n=19) N (%)	Intervention (n=21) N (%)
Age				
Mean (standard deviation)	29.1 (5.9)	27.4 (3.5)	26.7 (8.7)	33.3 (12.7)
Gender				
Male	9 (60)	8 (53)		
Female	6 (40)	7 (47)		
Time as peer promoter (months)				
Mean (standard deviation)	15.07 (6.2)	16.93 (6.1)		
Marital status				
Never married	2 (13.3)	3 (20.0)	8 (42.1)	7 (33.3)
Unmarried but in long relationship	1 (6.7)	5 (33.3)		
Engaged	7 (46.7)	5 (33.3)	2 (10.5)	1 (4.8)
Married	5 (33.3)	2 (13.3)	8 (42.1)	12 (57.0)
Polygamous	n/a	n/a	1 (5.3)	0 (0.0)
Widowed	n/a	n/a	0 (0)	1 (4.8)
Highest education level				
No formal education	n/a	n/a	1 (5.3)	1 (4.8)
Complete primary	2 (13.3)	1 (6.7)	10 (52.6)	15 (71.4)
Secondary form 4	1 (6.7)	9 (60.0)	n/a	n/a
Completed form 6	2 (13.3)	0 (0.0)	3 (15.8)	4 (19.1)
Attended university or college	7 (46.7)	5 (33.3)	2 (10.5)	1 (4.8)
Other	3 (20.0)	0 (0.0)	3 (15.8)	0 (0.0)
Main economic activity				
Unemployed	n/a	n/a	0 (0.0)	1 (4.8)
Students	n/a	n/a	4 (21.1)	1 (4.8)
Farmers	n/a	n/a	4 (21.1)	9 (42.9)
Civil employed	n/a	n/a	1 (5.3)	1 (4.8)
Business (own small business, trade, tailor, etc.)	n/a	n/a	6 (31.6)	6 (28.6)
Other	n/a	n/a	4 (21.1)	3 (14.3)

FGDs4.1.2 Supplemental survey participants' characteristics

In the supplemental survey of intervention-site (only) VMMC clients aged 20 and above, the average age was 27.9, with nearly half of all clients between 20 and 24 years old (table 13). The majority (61.4 per cent) has completed Standard 7 education (table 14). Agriculture was the largest employment sector among VMMC patients from Iringa, while petty commerce was the main source of employment among clients in Njombe and Tabora. The intervention group was predominantly Christian, with 49 per

cent of participants having never married and 47 per cent of participants married or engaged. The clients' households had an average of 2.2 children.

Approximately 53 per cent of households had electricity, and most relied on firewood or charcoal for their cooking fuel. Other wealth indicators included radio ownership, at 87 per cent of participants; television ownership, at 34 per cent of participants; and refrigerator ownership, at 9 per cent. Mobile phone ownership is high across the three intervention areas at 91.9 per cent ($p < 0.05$).

Health and sanitation indicators varied across the three areas. Njombe and Tabora client households were characterised by more reliable sources of water – 50.0 per cent and 45.0 per cent of participants had piped water in their homes – while in Iringa wells were the main source of water in 59.8 per cent of households ($p < 0.001$). Similar proportions were found for access to sanitary facilities. Additionally, VMMC participants from Iringa reported travelling 1.45 hours to the health facility, compared with 0.82 and 0.62 hours, respectively, in Njombe and Tabora ($p < 0.001$).

Table 13: Supplemental survey with VMMC clients aged 20 and above at intervention facilities: socio-demographic characteristics of the intervention group raffle participants (N=233)

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Age					
Mean (SD)	27.9 (8.9)	28.8 (9.3)	31.0 (10.5)	24.7 (6.0)	0.003
Age 20–24: % (n)	48.1 (112)	40.2 (39)	37.5 (21)	65.0 (52)	
Age 25–49: % (n)	48.9 (114)	54.6 (53)	58.9 (33)	35.0 (28)	<0.001
Age >50: % (n)	3.0 (7)	5.2 (5)	3.6 (2)	0.0 (0)	
Level of education					
Did not attend	13.7 (32)	9.3 (9)	14.3 (8)	18.8 (15)	
Standard 7	61.4 (143)	58.8 (57)	69.6 (39)	58.8 (47)	
Completed form 4	20.2 (47)	26.8 (26)	10.7 (6)	18.8 (15)	
Completed form 6	2.2 (5)	2.1 (2)	1.8 (1)	2.5 (2)	0.381
Attended university	2.2 (5)	2.1 (2)	3.6 (2)	1.3 (1)	
University degree	0.4 (1)	1.0 (1)	0.0 (0)	0.0 (0)	
Current occupation					
Full time, for organisation	19.7 (46)	20.6 (2)	21.4 (12)	17.5 (14)	
Full time, farming	32.2 (75)	44.3 (43)	28.6 (16)	20.0 (16)	
Full time, petty trading	25.3 (59)	11.3 (11)	32.1 (18)	37.5 (30)	<0.001
Studying	15.5 (36)	15.5 (15)	5.4 (3)	22.5 (18)	
Other	7.3 (17)	8.3 (8)	12.5 (7)	2.5 (2)	
Marital status					
Never married	49.4 (115)	45.4 (44)	41.1 (23)	60.0 (48)	
Engaged	8.6 (20)	9.3 (9)	7.1 (4)	8.8 (7)	
Currently married	38.2 (89)	38.1 (37)	48.2 (27)	31.3 (25)	0.257
Polygamous	1.7 (4)	3.1 (3)	1.8 (1)	0.0 (0)	
Divorced	1.3 (3)	2.1 (2)	1.8 (1)	0.0 (0)	
Other	0.9 (2)	2.1 (2)	0.0 (0)	0.0 (0)	
Religion					
No religion	3.9 (9)	1.0 (1)	0.0 (0)	10.0 (8)	
Christian	88.4 (206)	99.0 (96)	96.4 (54)	70.0 (56)	
Traditional religion	0.4 (1)	0.0 (0)	0.0 (0)	1.3 (1)	<0.001
Muslim	5.6 (13)	0.0 (0)	0.0 (0)	16.3 (13)	
Other	1.7 (4)	0.0 (0)	3.6 (2)	2.5 (2)	
Distance travelled (hrs.)					
	1.02 (1.1)	1.46 (1.5)	0.82 (0.69)	0.62 (0.52)	<0.001

Table 14: Socioeconomic status and phone ownership, client survey with VMMC at intervention facilities (N=233)

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Mean (SD) number of adults and children living in the same household					
Adults (18+)	2.7 (1.7)	2.6 (1.7)	2.8 (1.8)	2.3 (1.5)	0.165
Children (<18)	2.2 (1.8)	1.9 (1.6)	2.1 (1.4)	2.5 (2.2)	0.0819
Water sources					
Piped water in house	36.9 (86)	22.7 (22)	50.0 (28)	45.0 (36)	<0.001
Water from vendor	3.0 (7)	0.0 (0)	5.4 (3)	5.0 (4)	0.076
Well water	43.4 (101)	59.8 (58)	23.2 (13)	37.5 (30)	0.001
Community water	24.9 (58)	21.7 (21)	19.6 (11)	32.5 (26)	0.146
Borehole	8.2 (19)	13.4 (13)	5.4 (3)	3.8 (3)	0.045
River/dam water	18.9 (44)	23.7 (23)	7.1 (4)	21.3 (17)	0.033
Rainwater	20.2 (47)	8.3 (8)	5.4 (3)	45.0 (36)	<0.001
Other (specify)	6.9 (16)	9.3 (9)	3.6 (2)	5.3 (5)	0.502
Sanitary facilities					
Flush toilet, household	37.3 (87)	22.7 (22)	58.9 (33)	40.0 (32)	<0.001
Flush toilet, shared	11.2 (26)	2.1 (2)	7.1 (4)	25.0 (20)	
Pit toilet, household	44.5 (104)	66.0 (64)	33.9 (19)	26.3 (21)	
Pit toilet, shared	6.9 (16)	9.3 (9)	---	8.8 (7)	
Cooking fuel					
Electricity	1.7 (4)	2.1 (2)	0.0 (0)	2.5 (2)	0.512
Gas	3.4 (8)	5.2 (5)	0.0 (0)	3.8 (3)	0.237
Paraffin/kerosene	1.7 (4)	3.1 (3)	1.8 (1)	0.0 (0)	0.288
Charcoal	72.5 (169)	63.9 (62)	67.9 (38)	86.3 (69)	0.003
Firewood	63.1 (147)	84.5 (82)	55.4 (31)	42.5 (34)	<0.001
Crop residual	8.2 (19)	19.6 (19)	0.0 (0)	0.0 (0)	<0.001

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Does your household have the following?					
Electricity from co., solar, generator	52.8 (123)	46.3 (45)	41.1 (23)	68.8 (55)	0.004
Radio	87.1 (203)	89.7 (87)	92.9 (52)	80.0 (64)	0.054
Television	33.9 (79)	27.8 (27)	28.6 (16)	45.0 (36)	0.035
Refrigerator	9.0 (21)	5.2 (5)	1.8 (1)	18.8 (15)	0.001
Mobile phone	91.9 (214)	86.6 (84)	94.6 (53)	96.3 (77)	0.045
Type of mobile phone					
Basic cell phone	52.9 (117)	59.5 (53)	45.4 (25)	50.7 (39)	
Camera phone	41.2 (91)	33.7 (30)	50.9 (28)	42.9 (33)	
Smartphone	3.6 (8)	3.4 (3)	0.0 (0)	6.5 (5)	0.102
Don't know	1.8 (4)	3.4 (3)	1.8 (1)	---	
Other	0.5 (1)	---	1.8 (1)	---	

Men reported high exposure to mass media and interpersonal relations for information about VMMC (table 15); 83 per cent and 71 per cent of respondents were exposed to these sources of information 'many times' across the three study areas. Among mass media campaigns, radio, posters, brochures and experimental approaches each had more than 75 per cent coverage. An estimated 62.2 per cent of participants said that community events had influenced their decision to seek VMMC 'a lot' and 64 per cent said the same in regards to interpersonal relations. However, media was the greatest driver in VMMC decision making, with more than 89 per cent of participants reporting that it influenced their decision 'a lot'.

Table 15: Exposure to VMMC communications, client survey at intervention sites (N=233)

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Mass media					
Radio	92.3 (215)	99.0 (96)	98.2 (55)	80.0 (64)	<0.001
Poster on wall	86.3 (201)	83.5 (81)	96.4 (54)	82.5 (66)	0.039
Brochure received	77.7 (181)	78.4 (76)	80.4 (45)	75.0 (60)	0.745
Experimental media	84.6 (197)	85.6 (83)	91.1 (51)	78.8 (63)	0.138
Social media	13.7 (32)	20.6 (20)	5.4 (3)	11.3 (0)	0.022
Other	7.3 (17)	13.4 (13)	0.0 (0)	5.0 (4)	0.006
Reported having seen or discussed VMMC in the following medium					
<i>Mass/social media</i>					
Many times	82.8 (193)	82.5 (80)	92.9 (52)	76.3 (61)	0.135
Few times	11.6 (27)	10.3 (10)	3.6 (2)	18.8 (15)	
Never	5.2 (12)	6.2 (6)	3.6 (2)	5.0 (4)	
<i>Interpersonal relations</i>					
Many times	70.8 (165)	72.2 (70)	75 (42)	66.3 (53)	0.701
Few times	23.2 (54)	20.6 (20)	21.4 (12)	27.5 (22)	
Never	6.0 (14)	7.2 (7)	3.6 (2)	6.3 (5)	
<i>Community events</i>					
Many times	38.6 (90)	28.9 (28)	46.4 (26)	45.0 (36)	0.022
Few times	27.9 (65)	35.1 (34)	30.4 (17)	17.5 (14)	
Never	33.5 (78)	36.1 (35)	23.2 (13)	37.5 (30)	
With which of the following people have you discussed or received a message regarding VMMC?					
<i>Health provider</i>					
A lot	16.7 (39)	14.4 (14)	12.5 (7)	22.5 (18)	0.089
A little	9.4 (22)	14.4 (14)	8.9 (5)	3.8 (3)	
Not at all	73.8 (172)	71.1 (69)	78.6 (44)	73.8 (59)	
<i>VMMC peer promoter</i>					
A lot	63.1 (147)	66.0 (64)	44.6 (25)	72.5 (58)	<0.001
A little	11.2 (26)	7.2 (7)	28.6 (16)	3.8 (3)	
Not at all	25.8 (60)	26.8 (26)	26.8 (15)	23.8 (19)	
<i>Spouse</i>					
A lot	27.5 (64)	26.8 (26)	39.3 (22)	20.0 (16)	<0.001
A little	1.7 (4)	2.1 (2)	3.6 (2)	0.0 (0)	
Not at all	52.8 (123)	41.2 (40)	33.9 (19)	80.0 (64)	
Don't know/Decline	18.0 (42)	29.9 (29)	23.2 (13)	0.0 (0)	

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
<i>Relative</i>					
A lot	33.9 (79)	25.8 (25)	26.8 (15)	48.8 (39)	
A little	6.9 (16)	6.2 (6)	10.7 (6)	5.0 (4)	0.010
Not at all	59.2 (138)	68.0 (66)	62.5 (35)	46.3 (37)	
<i>Girlfriend</i>					
A lot	15.5 (36)	8.3 (8)	19.6 (11)	21.3 (17)	
A little	2.6 (6)	3.1 (3)	3.6 (2)	1.3 (1)	
Not at all	69.5 (162)	62.9 (61)	69.6 (39)	77.5 (62)	<0.001
Don't know/Decline	12.5 (29)	25.8 (25)	7.1 (4)	0.0 (0)	
<i>Co-worker</i>					
A lot	26.6 (62)	17.5 (17)	28.6 (16)	36.3 (29)	
A little	9.0 (21)	1.0 (1)	25.0 (14)	7.5 (6)	
Not at all	62.7 (146)	77.3 (75)	46.4 (26)	56.3 (45)	<0.001
Don't know/Decline	1.7 (4)	4.1 (4)	0.0 (0)	0.0 (0)	
<i>Community leader</i>					
A lot	10.3 (24)	6.2 (6)	16.1 (9)	11.3 (9)	
A little	8.2 (19)	8.3 (8)	10.7 (6)	6.3 (5)	0.291
Not at all	81.6 (190)	85.6 (83)	73.2 (41)	82.5 (66)	
Neighbour					
A lot	44.2 (103)	27.8 (27)	37.5 (21)	68.8 (55)	
A little	17.6 (41)	15.5 (15)	30.4 (17)	11.3 (9)	<0.001
Not at all	37.8 (88)	55.7 (54)	32.1 (18)	20.0 (16)	

4.2 Intervention implementation

For this intervention, we anticipated 600 men coming for VMMC to the seven fixed intervention sites selected for this study, based on 2013 monthly data examined during the proposal phase. In implementation, the intervention sites attracted far fewer, 388 clients aged 20 and above – 65 per cent of the anticipated total (table 16).

The VMMC volumes examined in 2013 were higher than those in the study period, possibly for two reasons. The November to February period in which the study took place includes the farming season, during which men are unable to miss work for the VMMC healing period. This period also includes the end-of-year holidays when men may not wish to be abstinent during post-VMMC healing. The service volume data consulted during the proposal phase was from February to June 2013, months with higher volumes of VMMC. Another reason for lower VMMC volumes in 2014 to 2015 period may have been saturation. Many adult men in the community would have already been circumcised by 2014; as time goes, on fewer men are left to be

circumcised, and adolescents aging into the adult age group would be more likely to have been circumcised during adolescence.

According to the VMMC database, of 388 clients at the seven intervention sites, 352 returned the follow-up visit (90.7 per cent). Of these, 264 consented to be in the raffle (75 per cent of all VMMC clients aged 20 and above who returned), according to programme files. We had originally expected to hold 91 raffles; in actuality, 79 were held. The lower number of raffles is due to the fact that some weeks there were no raffle joiners and therefore no raffle. In the Makambako and Makete facilities in Njombe region, no VMMC clients joined the raffle for 3 of the 13 weeks (table 16). In the other regions' facilities, there was 0, 1 or 2 weeks without raffle joiners.

Table 16: Expected raffles and actual raffles implemented by facility

Region	Facility name	Expected raffles	Actual raffles	Difference (a)
Iringa	Tosamaganga Hospital	13	11	2
Iringa	Mafinga Hospital	13	12	1
Iringa	Usokami Health Centre	13	11	2
Njombe	Makambako Hospital	13	10	3
Njombe	Makete Hospital	13	10	3
Tabora	Igunga Hospital	13	13	0
Tabora	Kitete Hospital	13	12	1
Total		91	79	12

Note: (a) During these weeks in each facility, there were no raffle joiners/entrants.

VMMC clients learned about the smartphone raffle from the poster on the wall (60 per cent), but only 23 per cent of men said they had seen or heard about the smartphone raffle 'many times' (table 17). In the previous three months, clients had discussed with or received a message regarding the smartphone raffle from a health provider (8 per cent), a peer promoter (46 per cent), a neighbour (17 per cent) or a relative, spouse or girlfriend (fewer).

Table 17: Exposure to smartphone raffle: supplemental survey with intervention group

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Mass media: In the last three months, which of the following have you heard or read about and/or seen regarding the smartphone raffle ?					
Radio	35.2 (82)	30.9 (30)	21.4 (12)	50.0 (40)	0.001
Poster on wall	60.1 (140)	59.8 (58)	60.7 (34)	60.0 (48)	0.994
Brochure received	54.9 (128)	45.4 (44)	44.6 (25)	73.8 (59)	0.001
Social media	4.7 (11)	2.1 (2)	1.8 (1)	19.0 (8)	0.063
Other	18.5 (43)	15.5 (15)	44.6 (25)	3.8 (3)	<0.001
Would you say that you have heard or seen or discussed about the smartphone raffle in the following medium: 'many times', 'a few times' or 'never'?					
Mass/social media					
Many times	23.2 (54)	10.3 (10)	17.9 (10)	42.5 (34)	
Few times	20.6 (48)	18.6 (18)	19.6 (11)	23.8 (19)	<0.001
Never	55.8 (130)	71.1 (69)	60.7 (34)	33.8 (27)	
Interpersonal relations					
Many times	24.5 (57)	15.5 (15)	33.2 (18)	30.0 (24)	
Few times	31.3 (73)	38.1 (37)	19.6 (11)	31.3 (25)	0.038
Never	43.8 (102)	46.4 (45)	46.4 (26)	38.8 (41)	
Community events					
Many times	9.1 (21)	2.1 (2)	10.6 (6)	16.3 (13)	
Few times	10.8 (25)	10.4 (10)	9.1 (5)	12.5 (10)	0.021
Never	79.7 (184)	87.5 (84)	78.2 (43)	71.3 (57)	
How much did the following influence your decision to seek out the smartphone raffle?					
Mass/social media					
A lot	27.0 (63)	13.4 (13)	19.6 (11)	48.8 (39)	
A little	8.6 (20)	8.3 (8)	16.1 (9)	3.8 (3)	<0.001
Not at all	64.4 (150)	78.4 (76)	65.3 (36)	47.5 (38)	
Interpersonal relations					
A lot	30.0 (70)	12.4 (12)	35.7 (20)	47.5 (38)	
A little	7.7 (18)	10.3 (10)	5.4 (3)	6.3 (5)	0.001
Not at all	62.2 (145)	77.3 (75)	58.9 (33)	46.3 (37)	
Community events					
A lot	12.5 (29)	6.2 (6)	16.1 (9)	17.5 (14)	
A little	6.9 (16)	6.2 (6)	8.9 (5)	6.3 (5)	0.150
Not at all	80.7 (188)	87.6 (85)	75.0 (42)	76.3 (61)	
In the last three months, with which of the following people have you discussed or received a message from regarding the smartphone raffle?					

	All regions	Iringa (N=97)	Njombe (N=56)	Tabora (N=80)	p-value
Health provider					
A lot	8.6 (20)	6.2 (6)	14.3 (8)	7.5 (6)	
A little	9.9 (23)	13.4 (13)	12.5 (7)	3.8 (3)	0.074
Not at all	81.6 (190)	80.4 (78)	73.2 (41)	88.8 (71)	
VMMC peer promoter					
A lot	45.5 (106)	47.4 (46)	33.1 (18)	52.5 (42)	
A little	15.0 (35)	12.4(12)	21.4 (12)	13.8 (11)	0.160
Not at all	39.5 (92)	40.2 (39)	46.4 (26)	33.8 (27)	
Spouse					
A lot	3.9 (9)	1.0 (1)	12.5 (7)	1.3 (1)	
A little	3.4 (8)	2.1 (2)	5.4 (3)	3.8 (3)	
Not at all	75.1 (175)	66.0 (64)	62.5 (35)	95.0 (76)	<0.001
Don't know/ Decline	17.6 (41)	30.9 (30)	19.6 (11)	0.0 (0)	
Relative					
A lot	9.4 (22)	2.1 (2)	14.3 (8)	15.0 (12)	
A little	4.3 (10)	5.2 (5)	0.0 (0)	6.3 (5)	0.019
Not at all	85.8 (200)	91.8 (89)	85.7 (48)	78.8 (63)	
Girlfriend					
A lot	3.4 (8)	1.0 (1)	5.4 (3)	5.0 (4)	
A little	0.4 (1)	0.0 (0)	0.0 (0)	1.3 (1)	
Not at all	84.1 (196)	74.2 (72)	87.5 (49)	96.6 (56)	<0.001
Don't know/ Decline	12.0 (28)	24.7 (24)	7.1 (4)	0.0 (0)	
Co-worker					
A lot	14.2 (33)	3.1 (3)	19.6 (11)	23.8 (19)	
A little	3.0 (7)	2.1 (2)	8.9 (5)	0.0 (0)	
Not at all	79.8 (186)	87.6 (85)	71.4 (40)	76.3 (61)	<0.001
Don't know/ Decline	3.0 (7)	7.2 (7)	0.0 (0)	0.0 (0)	
Community leader					
A lot	3.4 (8)	1.0 (1)	8.9 (5)	2.5 (2)	
A little	3.4 (8)	3.1 (3)	3.6 (2)	3.8 (3)	0.131
Not at all	93.1 (217)	95.9 (93)	87.5 (49)	93.8 (75)	

4.3 Results to address the four evaluation objectives

4.3.1 Objective 1: number of VMMCs

Descriptive results. The 388 VMMCs in the intervention group during the intervention period is higher than 264 VMMCs in the prior-year period, a 47 per cent relative increase (table 18). The control group's 278 VMMCs in intervention period is slightly

higher than the 257 VMMC counts in the prior-year period, an 8 per cent relative increase. In the intervention group, gains were made at six of the seven sites. We saw large gains at Mafinga District Hospital, Makete District Hospital, Makambako Health Centre and Tosamaganga District Hospital. Kitete saw a decline.

In the control group, gains were also made in six of seven sites. Ilula District Hospital had very low VMMC counts at both points. Iringa District Hospital had about the same number of VMMCs in the prior year and in the intervention period. Kibena Hospital was very low in the prior year and increased. Lugoda (a tea plantation site that supported workers who sought VMMC) saw a huge increase relative to prior periods. Ngome saw a modest increase. Nzega saw large decreases. Urambo had similar low levels in both periods.

Table 18: Total VMMC counts aged 20 and above in intervention and control facilities for Bwana Mkubwa intervention and prior-year periods and changes

Study site and period dates	Region	Prior year, same months	Intervention period	Absolute change	Relative change
Intervention Facilities					
Mafinga District Hospital (a)	Iringa	25	65	40	160
Usokami Health Centre (a)	Iringa	20	28	8	40
Makambako Hospital (a)	Njombe	25	60	35	140
Makete District Hospital (a)	Njombe	11	35	24	218
Tosamaganga Hospital (a)	Iringa	13	32	19	146
Kitete Referral Hospital (b)	Tabora	119	85	-34	-29
Igunga District Hospital (c)	Tabora	51	83	32	63
Subtotal		264	388	124	47
Control Facilities					
Ilula Hospital (a)	Iringa	2	12	10	500
Lugoda Health Centre (a)	Iringa	22	67	45	205
Ngome Health Centre (a)	Iringa	33	45	12	36
Kibena Hospital (a)	Njombe	9	39	30	333
Iringa Referral Hospital (a)	Iringa	51	52	1	2
Nzega District Hospital (d)	Tabora	122	35	-87	-71
Urambo District Hospital (e)	Tabora	18	27	9	50
Subtotal		257	277	20	8

Results of statistical models. Each within-group change (47 per cent in the intervention group and 8 per cent in the control group) was not statistically significant when accounting for clustering in the 14 facilities (table 19). The changes were not significantly different one from another (i.e. all $p > 0.05$). This was also true when adjusting/controlling for facility pair, 'per cent over age 30 years' and 'per cent testing HIV positive'.

Table 19: Number of VMMCs by study group during Bwana Mkubwa study period and in prior year, for total sample and Iringa region

Region and Model	Intervention Group				Control Group				p-value for difference-in-difference (f)
	One Year Prior (a)	Study Period	Per cent Increase	Coef., 95% CI and p-value (b)	One Year Prior	Study Period	Per cent Increase	Coef., 95% CI and p-value (b)	
All Regions (14 facilities, 7 pairs)	264	388	47%		257	278	8%		
Model 1 (d)				1.47 [0.87, 2.48], p=0.150				1.08 [0.48, 2.44], p=0.850	0.535
Model 2 (e)				1.19 [0.62, 2.31], p=0.601				0.90 [0.63, 1.29], p=0.579	0.399
Iringa (6 facilities, 3 pairs) (c)	58	125	116%		75	131	75%		
Model 1 (d)				2.16 [1.55, 3.00] p<0.0001				1.74 [0.81, 3.75] p=0.153	0.621
Model 2 (e)				3.36 [1.14,9.90] p=0.028				1.63 [1.18, 2.26], p=0.003	0.131

Note: The three-month study period was 17 November 2014 to 16 February 2015. (Four facilities had a slightly different start date and thus had a slightly different end date.) The 'prior year' period was 16 November 2013 to 16 February 2014. Exponentiated coefficient from the GEE models is the relative per cent increase in VMMCs. One health centre in Iringa was excluded from the sub-analysis, as it was paired with a facility in another region. Model 1 accounts for clustering and adjusts for the facility pairs. Model 2 accounts for clustering and adjusts for the facility pairs, the per cent of clients over age 30, and per cent of clients testing HIV-positive.

Subgroup analysis. In Iringa region only, the intervention group had a 2.16-fold ($p < 0.0001$) significant increase in VMMC from the intervention period to the prior-year period in the model that accounted for clustering and adjusted for facility pair (table 20). The control group had a non-significant increase (1.74-fold, $p = 0.153$). The two groups' changes were not significantly different from one another ($p = 0.621$). In the model that also adjusted for 'per cent over age 30 years' and 'per cent testing HIV positive', the intervention group had 3.36-fold significant increase in VMMCs (95 per cent CI 1.14, 9.90, $p = 0.028$). The control group's 63 per cent increase was significant (coefficient 1.63 [1.18, 2.26], $p = 0.003$). The changes in VMMCs experienced in the study groups were not significantly different ($p = 0.131$).

4.3.2 Objective 2: referrals

Descriptive results. Some intervention sites (Makete, Tosamaganga and Makambako) had high proportions of all VMMCs among men aged 20 and above coming from peer or provider referrals, as did some control sites (Lugoda, Kibena) (table 20). Facilities that were 60 per cent or lower on this indicator were in the intervention (Mafinga, Igunga) and control groups (Ngome, Iringa Regional Hospital and Nzega).

Table 20: Number of VMMCs aged 20 and above, number of referrals during the *Bwana Mkubwa* intervention period and percentage of clients who were not self-referred, by site and study group

Pair	Health Facility – Region	Adult clients (20+), per client database	Referrals to VMMC (per client database)			
			Self	Peer-educator	Health providers	% of older VMMC referred by peer educator or provider
Intervention Sites						
1	Mafinga District Hospital – Iringa	65	27	22	16	58%
2	Usokami Health Centre – Iringa	28	3	25	0	89%
3	Makambako Hospital – Njombe	60	4	56	0	93%
4	Makete District Hospital – Njombe	35	0	35	0	100%
5	Tosamaganga Hospital – Iringa	32	0	29	3	100%
6	Kitete Referral Hospital – Tabora	85	24	61	0	72%
7	Igunga District Hospital – Tabora	83	34	48	1	59%
	Subtotal	388	92	276	20	76%
Control Sites						
1	Ilula Lutheran Hospital – Iringa	11	8	3	0	27%
2	Lugoda Hospital – Iringa	67	1	64	2	99%
3	Ngome Health Centre – Iringa	46	25	20	1	46%
4	Kibena Hospital – Njombe	39	1	38	0	97%
5	Iringa Referral Hospital – Iringa	53	29	24	0	45%
6	Nzega District Hospital – Tabora	35	21	14	0	40%
7	Urambo district Hospital – Tabora	27	9	18	0	67%
	Subtotal	278	94	181	3	66%

At the bivariate level, 76 per cent of VMMC clients aged 20 and above were referred by peer promoters and providers in the intervention group, compared with 66 per cent in the control group. In bivariate and multivariable models accounting for clustering and other potential confounders (table 21), the effect of the study group was not significant. This means that the difference in the odds of non-self-referral between intervention and control groups was not statistically significantly different between the two groups.

Table 21: Logistic regression of peer promoter or provider referral to VMMC on study group

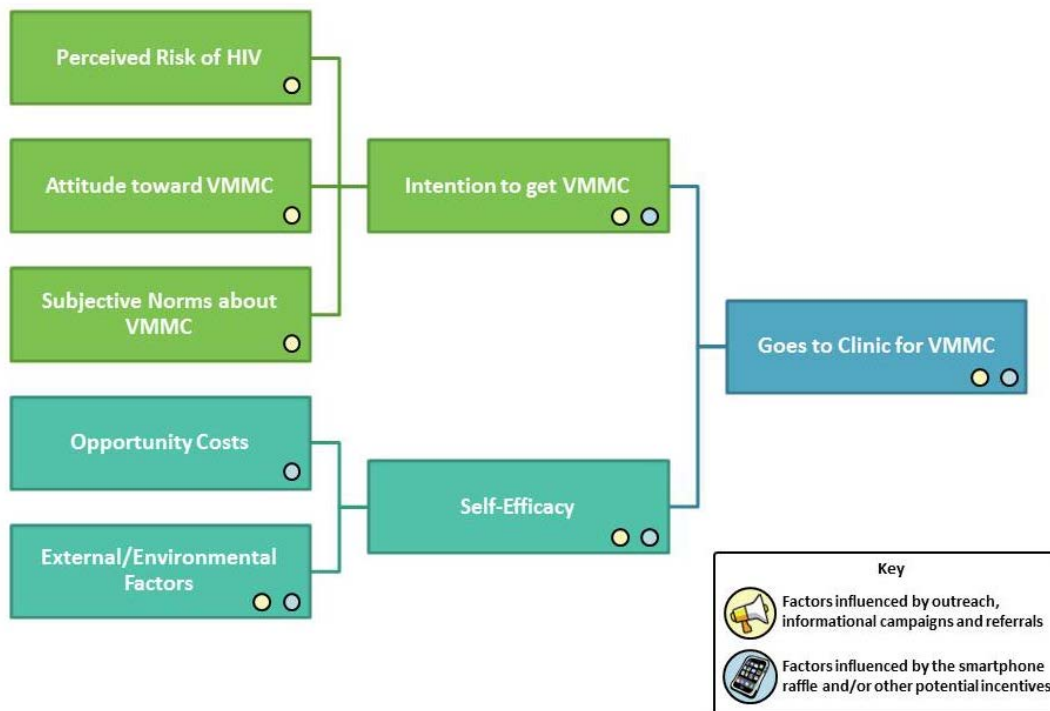
	Model 1 Odds ratio (95% CI), p-value (N=665)	Model 2 Odds ratio (95% CI), p-value (N=638)
Intervention group (ref: control group)	1.6 (0.5, 5.6) p=0.426	1.7 (0.5, 5.2) p=0.383
Per cent >age 30 years (ref: <30)	n/a	1.3 (0.8, 2.1) p=0.308
Per cent testing HIV positive (ref: negative)	n/a	2.4 (0.8, 7.2) p=0.135

Note: Model 1 accounts for clustering in 14 facilities. Model 2 accounts for clustering and adjusts for 'per cent over age 30' and 'per cent testing HIV positive'. N=67 are missing HIV test results.

4.3.3 Objective 3: results

Qualitative focus groups. The integrated behavioural model presumes that the decision to engage in a behaviour (in this case, to seek VMMC at a participating health centre) is determined by one's intention to perform the behaviour, which is influenced by a number of interrelated factors. In the application of the behaviour change model used for this study, the intention to get VMMC is informed by 1) a man's attitude towards VMMC, as guided by his beliefs about the procedure and the expected outcomes; 2) the perceived norms he associates with VMMC, which are derived from normative beliefs about male circumcision and motivations for circumcision; and 3) the perceived risk of HIV, as informed by one's perception of the severity and personal susceptibility to HIV. The intention to seek VMMC can be hindered or enhanced by self-efficacy, or one's perceived control or ability to perform the behaviour. In this study, self-efficacy was determined by the opportunity costs associated with VMMC and external or environmental factors perceived to be outside of a client's control. The programmatic components of the *Bwana Mkubwa* study – peer promoter outreach, the informational campaign, the smartphone raffle and other possible incentives – have the potential to affect every aspect of the decision to seek VMMC (Figure 6).

Figure 6: *Bwana Mkubwa* conceptual framework for qualitative analysis



In keeping with the integrated behavioural model, the topics covered in the FGDs with VMMC clients and peer promoters can be grouped under five major themes: 1) the perceived risk of HIV; 2) attitudes encompassing the positive and negative individual beliefs and outcomes related to VMMC; 3) social norms related to VMMC; 4) self-efficacy related to VMMC, including opportunity costs and external or environmental factors; and 5) feedback related to outreach and incentives.

Perceived risk of HIV. Focus group participants consistently stated that HIV was a problem of great magnitude in their communities and described knowing of many deaths due to the disease. Despite their high level of awareness, some perceived that there were still people in their communities who lacked education on HIV transmission, failed to seek testing and treatment and (therefore) continued to transmit the virus.

Circumcision clients displayed a sophisticated understanding of the causes of HIV, both biomedical and social. They described unprotected sex with an infected person as the primary mechanism for HIV transmission in their communities, while also noting that shared needles, such as those used by traditional healers or unsafe blood transfusions, are other potential sources of infection. Traditional circumcision practices in which the same instruments were used for many men were identified as another possible method of disease transmission. Men were also aware of mother-to-child HIV transmission and that this could be prevented through antiretroviral medications.

Men described social factors underlying the biological pathways that contribute to HIV transmission. Men frequently described 'lack of faithfulness' and multiple concurrent relationships as leading to increased risk. About half of participants thought that men were most affected by HIV, while the other half thought the reverse was true. Some

men described women's difficult financial circumstances as leading them to have multiple partners and thus put themselves at increased risk of HIV. 'Life is tough,' one circumcision client said, 'This is what has led to having unprotected sex with anyone without looking at the effects that happen. All they care is how she will survive to the next day'. Alcohol use was described as lowering inhibitions and leading to risky behaviour such as unprotected sex or incorrect condom use.

One circumcision client offered this suggestion:

I would advise the government to take a step to look at local drinking pubs. Most of the time when we youth enter the pub, we look like we are very careful before we are drunk. After getting drunk, the one you feared to engage with because of HIV/AIDS is the one you see as the most beautiful and attractive. So I would advise that those condoms they put at health facilities, should be put in local drinking pubs, and those peer promoters who are mobilising and educating about HIV/AIDS should also be deployed in local drinking pubs because after getting drunk we are infected a lot.

Age also was said to play a role in attitudes toward HIV and circumcision. Many respondents cited 'youth' particularly as having less accurate knowledge regarding HIV transmission or, if not lower knowledge, then lower perceived vulnerability. Some also said that youth were less likely to seek testing and treatment.

One area where some participants seemed to lack accurate knowledge regarding risk was related to quantifying the risk of risk reduction association with male circumcision. Most participants stated that circumcision offers 60 per cent protection against HIV, some suggested that it was closer to 100 per cent, and some seemed to make both statements at the same time. For example, one client said, 'Because that education taught me that if I become circumcised I will be confident and will become a man with more than 60 per cent chances of not getting HIV infection. Then I will not get sexually transmitted diseases like syphilis, gonorrhoea, AIDS and many others, this has made me realise the big importance of circumcision in my life'. Another circumcision client said, 'I was told that if I circumcise I will be free from sexually transmitted disease. So I circumcised to be free from infectious diseases'. On the other hand, others made statements similar to this client's: 'Yes, circumcision reduces the infection of AIDS virus to 60 per cent, but it does not mean that after circumcision you are allowed to go and have unprotected sex saying that you cannot be infected by the virus'.

When discussing the magnitude of the problem of HIV/AIDS, circumcision clients tended to criticise other people in their communities who practice risky sexual behaviours, giving the impression that they may have had a lower risk profile than the general population. One circumcision client said, 'You can be sure in your marriage, but if you go out you are never sure if she is infected or not. I want to advise my fellow men to stop going out of our marriages because doing that it is not profitable'. This may reflect a tendency for people in FGDs to express socially desirable sentiments. However, a few clients admitted that they had put themselves at risk. For example, one circumcision client said, 'To be honest, for me to come for circumcision I found I was getting infected with gonorrhoea frequently. That's how I came to get

circumcision'. Another alluded to being a driver and having sex with female food vendors that he met in transit.

Positive attitudes towards VMMC. Participants most often described circumcisions as making them 'clean', and this concept was linked with prevention of HIV and other sexually transmitted infections. One circumcision client said, 'It is true, it is cleanliness; cleanliness is what brought me here to be circumcised, because I am protecting myself from the virus that causes AIDS. As I am a mature person honestly, I have decided to come because I am protecting myself from AIDS virus'. Increased sexual pleasure was occasionally mentioned as a benefit, as was cervical cancer prevention for their partners.

Negative attitudes towards VMCC. Negative attitudes about VMMC related to fears about pain, potential sexual effects, sexual abstinence during healing and being required to take an HIV test. Some clients said that they had heard from other men that the procedure would be painful. One client in Tabora stated, 'People used to spread the news that circumcision is a very painful procedure. So I was a bit afraid to come because of that'. This sentiment was echoed by clients and promoters in Iringa and Tabora, but it was not explicitly mentioned by study participants in Njombe. In addition to fears related to the pain of the procedure, fear of the anaesthesia injection was also described as a barrier.

Some men were said to believe that circumcision causes impotence or diminishes a man's sex drive, reduces the size of the penis or halts the growth of the penis in pre-adolescent and adolescent men, and that circumcision interferes with a man's ability to have children. A related concern expressed by peer promoters was that men were reluctant to go for VMMC because of the recommended six weeks of abstinence after the procedure. Promoters in Iringa and Tabora said that men were afraid that their wives would be unfaithful during this healing period. Although testing is not mandatory, one peer promoter said that some clients are reluctant to seek VMMC because of the associated HIV test.

Social norms related to VMMC. Men reported conflicting social norms regarding circumcision. Both men and women were said to prefer the appearance after circumcisions, but concerns persisted regarding the procedure. For example, some thought that it was unseemly for older men to seek circumcision.

Post-circumcision appearance. Increased confidence in the presence of other men was noted as another important benefit of circumcision. Many participants described feeling embarrassed in situations when men were swimming or bathing together before they were circumcised. As one client from Tabora noted, 'It is true that circumcision protects a person 60 per cent from the infection of HIV virus, but it also strengthens somebody's personality'.

Influence of women. Regarding women's attitudes, one client said, 'Nowadays girls are refusing to court men who are not circumcised, as they might get infected with diseases'. Another stated, 'I am very grateful for this service, because it has rescued our relationship with my lover, who threatened to leave because I was not

circumcised'. Several men in Iringa and Njombe consulted their wives before seeking VMMC services. Promoters in all three regions mentioned the need to involve and educate wives and female partners due to their influence on the men. Some suggested that women be offered an incentive, such as a *kanga* (a traditional, versatile piece of cloth), a head scarf or shoes.

Age-related concerns and the influence of male peers. Some men described having male peers encourage them or accompany them to seek circumcision. However, more often, the belief that men of a certain age were too old for circumcision and would face ridicule from their peers was seen as a significant barrier to seeking VMMC. Focus group participants said that older men felt self-conscious and embarrassed to be seen going for a medical procedure that is associated with young boys. One client described being teased by his friends for being circumcised as an adult and being told of another man who died after circumcision, implying that the same could happen to him.

Some participants mentioned that older men did not see the need to get circumcised, including one client whose friends relied on curative services for sexually transmitted infections and therefore felt that circumcision is unnecessary. Youth were perceived as being strongly influenced by their peers, as described by a promoter in Njombe: 'The majority of the youth copy from one another. If one person hasn't undergone circumcision he makes the whole group not to go for circumcision'.

Negative rumours about VMMC were also said detract from client uptake, including the suspicion that foreskins were sent to the 'freemasons' after removal. The belief that the foreskins would be used by the freemasons for witchcraft or some other unspecified evil purpose was mentioned in two client groups in Iringa and Njombe and in promoter focus groups in all three regions, but the idea was not explained in detail and was not probed. (Study staff members believed this did not have anything to do with the Western organisation called 'Freemasons'.) VMMC clients described the freemason beliefs as 'false', 'funny' or 'distorted' and thought they could be resolved with education. One client mentioned that the provider could offer the client the choice to decide what would be done with the foreskin. A peer promoter added, 'I believe after being educated, the [men] will drop their cultural beliefs'. Peer promoters were strong believers that more education was needed to counter the beliefs and fears of the community.

Need to engage community and tribal leaders. Clients and promoters mentioned the need to involve village leaders and local government in VMMC promotion. In Iringa, a promoter wanted an arrangement in which he could sit with local leaders a few times a month. One Iringa promoter wished that had been a strong focus of the study: 'When we came for *Bwana Mkubwa* study we should have sat down and talked with stakeholders in the specific community, for example teachers, religious leaders, government leaders, leaders of various organisations. At the end of the day they would have received sufficient education and it would have helped'. Leaders who are not educated about VMMC go on to misinform their communities or prevent men from accessing VMMC services. In Njombe, a promoter described various religious groups/leaders and how some opposed VMMC and others did not.

Some peer promoters mentioned that local leaders or guides who take promoters around want to be compensated, not offering their time and local knowledge for free, but promoters also suggested they should better understand the benefits for the community. Local leaders requested gifts from promoters, thinking that promoters were benefitting financially. In Iringa, a promoter focused on reaching leaders at all levels: 'I just concentrate on education of the leaders; from the cell leader to the village chairman or the whole leadership, they have to be educated on circumcision'.

In Tabora, a grandfather of a certain tribe was mentioned as having sway over all his adult male children, such that they could not seek VMMC services without his permission. After the grandfather had been convinced, the peer promoter convinced seven of his grandsons to seek VMMC. In Tabora, transport bus operators were also seen as influential. Also in Tabora, one promoter recommended promoting VMMC at the gatherings of local politicians.

Clients and promoters reported that there were men who were unlikely to come for VMMC because they came from non-circumcising religions or tribes. Other men were described as feeling that if their grandfathers managed to make it to an advanced age without being circumcised, then there was no reason for them to have the procedure. Having a traditionally non-circumcising parent was also seen as an obstacle for youth who might want to come for VMMC.

While markedly fewer in number, there were instances in which VMMC was discussed in terms of social norms supporting the practice, and even a belief that male circumcision was beneficial to the community and not just the individual. One client in Iringa noted, 'The community has many benefits from circumcision. As we have mentioned before that if you are not circumcised there is a possibility of being infected with sexually transmitted disease and AIDS virus. As we know, sexually transmitted disease affects fecundity and reduces the birth rate. The community is benefitting from circumcision as it reduces the possibility of disease infection'.

Acceptability and quality of services. Poor provider-client communication and disrespectful care were cited in FGDs with promoters in all regions and by a small number of VMMC clients. Promoters had seen or heard of instances in which staff members at the health facility were rude, uninformed and/or made clients wait for hours before receiving services and described this as a significant challenge to recruitment, as described by a peer promoter from Njombe:

The other thing is the way [clients] are treated. There are some providers that harass them so when the [client] leaves the facility and goes back to the community he pours real poison. So these providers in the facilities should mind a lot how they care for the adults because the adults once they feel bad they will go and pour poison.

Another problem was providers who questioned men about why they did not know how to read or write their names (this may refer to the consent form for the service). Some providers questioned why clients older than 40 were still having sex and needed circumcision services. In a Njombe intervention site, a promoter mentioned that a

provider spoke English to the client, when the client spoke Swahili, not English. In Tabora, promoters described the need to speak the local languages during education; and this could extend to services.

Some men expressed an aversion to being circumcised by a female healthcare worker, particularly one who lived in their own community, as described by this client from Iringa:

I have done my research and found out that after encouraging my colleagues to come for circumcision, they reported the main obstacle to their coming here is that they feel shame because the providers for circumcision are females, and they are from here and they know them. Some live with us in our communities. That also leads them not to come. If they had been providers from elsewhere and males, they would most likely come for circumcision. Now they see a person from the neighbourhood, their neighbour and again a female worker, they say that's the obstacle that prevents them from coming for circumcision services.

A client in a control site in Tabora described his own thought process related to female providers:

I remember last year 2014, I spoke to my friend about how the circumcision is done. He told me, 'When you go there you will be circumcised by a woman'. I replied, 'A woman? If it's a woman, no I can't do it'. (Participant laughed a bit.) But after a short while I seriously thought about it and decided it doesn't matter even if is a woman, or whoever I will meet, what I want is circumcision. I said these people are professional and they keep clients issues confidential. Even if you meet with him in the street will never say anything. That is what attracted me to come. There are no shortcomings, because when I came I found both women and men providers and they are so kind and I was warmly welcomed, in short there are no obstacles.

Cost of services. Clients expressed appreciation for the fact that services were free, hygienic and professional and said that this motivated them to use the services. A few men said that only private facilities had done circumcision previously, and it was expensive. One man who heard on the radio about free services said, 'You will be an impossible man if you refuse a free service'. For this respondent, circumcision had previously been only for rich people, not poor people. One promoter mentioned that a large company offered employees several days with pay when they were recovering from male circumcision and that more companies needed to offer that benefit.

Location and timing of services. The distance from the VMMC clinic to the villages was a barrier. Specific villages were named as still in need of VMMC services, and participants felt that additional service locations were needed. Several men suggested that the transport be reimbursed: 'It will help men knowing they are not using their own money for transport'. One man suggested that the VMMC teams come to each village and stay for many hours. Rather than giving out gifts, bringing the service to where it is needed would reduce the need for men to travel and take time away from work.

However, a promoter in Tabora described distance as both a challenge and a potential benefit.

The first [challenge in mobilising adults] is the distance to the area where this service is being provided. This has two dimensions: being far from the centre can prevent people to come, but on the other side being near to the centre can also hinder people from coming, because they are afraid to be seen and [have] people pointing fingers at them because they have been circumcised. To be circumcised when a person is a bit old, it is a kind of a shame in the society.

The timing of VMMC campaigns and the time of day at which services were offered also had an impact of service uptake. For older men, it was important that services be available in the evenings, when they would be less likely to be occupied by productive activities, and apart from harvesting time, so that they would be able to take time away from their work. For youth, it was important that the procedure be available during school holidays, so healing time would not interfere with their studies.

Opportunity costs for adults. Healing time after the procedure was identified as one of the biggest barriers to men seeking VMMC. Clients believed the healing time would be long and would prevent men from doing their daily work, and that this would lead to reduced income. Men working in the timber industry, farming and trading/selling were said to not be able to take days or weeks off work; this may also be due to the season of the year in which the study occurred. Despite outreach efforts, clients and peer promoters alike reported that many men still believed that their work would stop for up to six weeks following VMMC in order to allow the wound time to heal. Community members' perception of the amount of time needed for healing and taking time off work was described by promoters as unclear and incorrect; clients and promoters believed continued education efforts would solve this problem. However, even when this belief was corrected and men were informed that three to seven days was often all the time that was needed before productive activities could resume, the opportunity cost could still be perceived as too high. A promoter said, 'If he doesn't go to work, what would his children eat? And he is the head of the family'.

Opportunity costs for children and their parents. Similarly, parents of adolescents were said to be reluctant to take time away from their work to take their children for circumcision and take care of them while they recovered, and for the youths' productive activities to be put on hold during healing. As one promoter said, 'A child is still the manpower and source of earnings at home. But also still a child has to get permission from the parent even though he gets educated. That is the real situation; it becomes a challenge to us'. Students reported finding it difficult to schedule a suitable time for circumcision that would not result in missing too much class time during healing.

Mass media and promoters. In all regions, VMMC clients discussed having heard about VMMC from multiple media channels: one or more radio stations, cars with public announcements, billboards and banners, cars with tire covers on the back with advertising and telephone numbers, leaflets and brochures and education in group meetings or encounters with peer promoters. Sometimes the peer promoters met the

prospective clients in villages and other times they met them in town on market days. Most clients heard about VMMC from at least two channels of information. The diverse and large-scale media exposure appeared to be influential on the men's decision to seek services. In Njombe, a peer promoter talked about wanting to have a radio call-in show to promote circumcision and have men ask questions via their phones. Several men discussed how the VMMC campaign was a government initiative, which was considered important and positive.

Smartphone raffle. Clients in intervention sites had learned about the smartphone raffle from radio, leaflets/flyers and posters/billboards. Others learned from family members, peer promoters and public meetings. Some men learned of the phone raffle only from health providers upon arrival at the clinic.

At the intervention sites, the thoughts on the smartphone were mixed. Some liked it in conjunction with a free service or other type of incentive. Some saw the benefit of all the media exposure for VMMC and thought the idea of winning a phone added to the excitement. One man said that after seeing all the media about VMMC and raffles, he wanted to see if he 'could get lucky' and win. Some men wondered why the phone being given was not the older model phones that men know: 'Everyone knows Nokia, even the older people'. One man said that in his village people did not have phones and would like one for communication. One man who won the phone said he liked receiving a 'modern' phone and thought this would attract others. Others did not like the idea of a raffle, since only some men benefitted. Some men questioned why a smartphone was being given, when some men could not read or use it and considered it a 'waste' or an item that would just be resold. Others felt the phone was too expensive (a value of about US\$100) and was out of touch with the daily needs of men. A peer promoter from Iringa said, 'The price of smartphone is around two hundred thousand. If you buy a bicycle with that money, you can buy three bicycles. The bicycle is helpful for the people living in the villages. If in the villages there is no electricity, and you give him a smartphone for what does it help him? It is better not to give phones, but [with] bicycles or hoes or oxen, a person will feel good in the village'. In Tabora, one promoter reported the following belief: 'This touch screen phone, will it suck my blood if I put my finger on top?' [someone laughing]. However, in the same focus group, another promoter thought any motivational incentive was helpful in attracting clients.

A promoter from a Tabora intervention site suggested that the smartphone raffle had affected the distance clients were willing to travel: 'People were coming from very far for phones and [by the] goodness [of] God those from far places they were almost all of them getting phones, so these were our good ambassadors. [participants laughing]. The phone raffle succeeded in creating buzz on the streets. People would stop promoters to ask if the promotion was still ongoing. A Tabora promoter mentioned that some men felt compelled to show up to see about the phone raffle: 'There are those who were not willing to come for circumcision earlier, but now with this smartphone promotion they have shown up [laughing] and they acknowledge that this phone has forced them to show up'.

However, several peer promoters in each region mentioned that the smartphone raffle raised suspicions from the community. One question posed to promoters was, 'If [VMMC] was for my personal health, why should they bother to pay me?' Another promoter reported, '[The men] have queries a lot that "you give us the service for free, medication for free and on top you give us phones?" Then that's when they doubt and start thinking there should be something behind this'. A promoter indicated that some men believed the intervention was a plot to harm them: 'People are asking themselves number of questions, why use the smartphone to convince people of age between 20 to 100 to come for circumcision? They are saying these people have a bad plan. They are injecting us to stop men's sexual power'. In Iringa and Njombe, promoters reported mixed feelings regarding the phone raffle.

Potential alternatives to the smartphone raffle. Some men suggested more modest incentives that could be offered universally instead of as a raffle. A few men and promoters in Iringa liked the idea of VMMC clients being offering food or fruits. One promoter said that offering food (maize and beans) was important to help men provide for their families while they were earning less due to healing. This would be a way for men to continue to fulfil their social role. A few men also suggested that food as well as T-shirts and football jerseys be offered to each client. A promoter in Iringa thought the incentives should not be big and suggested school bags, sneakers, or even a *kanga* 'like the ones given for infants' circumcision'. In all three regions, promoters mentioned that T-shirts could be a consolation prize or offered routinely and would be seen as 'a very normal thing'. Peer promoters from Iringa and Njombe, where farming is the main occupation, said that farming tools or fertiliser could be a good incentive, 'If [clients] get like one bag or two of fertilisers that would be enough compared to ... giving them money'. In Tabora intervention sites, promoters advised making incentives appropriate to the work of the client: 'Adults are entrepreneurs, are doing different activities to earn a living, they should be given incentives that reflects real life ... this will increase the number of older clients'. Some promoters, however, were creative of thinking about how to create 'buzz'. One promoter from Iringa put forth the following idea:

They love football, so we can make T-shirts, then I can arrange competition with the message of circumcision, everybody will go to watch football and will see the campaign. Then netball [basketball] for women, that means we have competition for football and netball. If girls receive education and know the negative side of having sex contact with a person who is not circumcised, they will change the mind-set of their lover and convince them to go for circumcision.

When asked which incentives could make men come for VMMC services, money was mentioned most frequently. Amounts suggested ranged from TSh 1,000–15,000 (approximately US\$0.54–8.10). Money could be used immediately by men for farm inputs, such as fertiliser, to cover the opportunity costs of not working during their recovery time or to cover bus fare. Another man echoed that the money would compensate for non-work time. One man suggested that beer could be bought with this money and 'some could be saved for family use'. Another man suggested that the each of the first five men who come to clinic for services should receive TSh 15,000 to 20,000. It was said that political parties come to the villages and give out money, and it

was thought that the VMMC service should give more than TSh 2,000. However, a peer promoter mentioned that even with TSh 1,000, the clients would be satisfied.

Some clients and peer promoters disagreed that any type of incentive was needed and said that only more educational outreach was needed. A few men gave variants of 'I think the incentive should be education'. Sometimes education coupled with gifts/incentives was also recommended. One Tabora resident at an intervention site said, 'I do not believe that the phone is the thing which will attract people, the important thing is the service; if the service is good, people will still come'. Additionally, clients at both the intervention and control sites stated that the fact that the services were being offered for free was enough of an incentive: 'I think incentive are not needed here. The service itself is free of charge. In fact, giving the service free of charge, it is already an incentive'.

Comparison with PrePex study. One theme mentioned often by peer promoters but not discussed by clients was PrePex payments. In the PrePex study, which preceded the *Bwana Mkubwa* study in 5 of the 14 sites, VMMC clients received reimbursements: '... for village life, this was a big amount, it can be a week's budget'. Another promoter felt that the amount given during PrePex should continue: 'During PrePex, [participants] were given 10,000, and every day the [clients' return for visit] they were given 10,000. If now, we give them 10,000 this will help a lot'. One client believed it was not fair to routine programmes that studies made payments to participants: 'There shouldn't be money in the studies, because once the studies are done, it create a challenge to the routine VMMC services. In [the] case of PrePex clients were paid up to 40,000 shillings. "Now what are you offering?" clients asked, and "Why have you called us then?" [participants laughed]. One promoter reported a client suspicious of the PrePex payments: 'during PrePex you were giving out 10,000 shillings. Why can't I go to Igunga instead? You know clients believe they are being paid because they have been circumcised. This is what brings about the connection to freemasons'.

Healthcare provider survey. The survey of 43 providers had 65 per cent of the respondents being nurse officers in each group (table 22). The respondents included more clinical officers in the intervention group and more 'other' responses in the control group. Average time spent working was 28 months in the intervention group and 41 months in the control group. About 20 to 30 per cent of providers believed that ensuring privacy was a way to get older VMMC clients. Reasons classified as 'other' were given by half of the providers. One-quarter of providers thought that increasing health education to men in the community could improve referrals, but the main reasons were 'other'. Attracting older men to VMMC was believed to be influenced by engaging community leaders and female partners and by better explaining the VMMC benefits. Approximately 80 per cent of providers thought that an incentive could influence men's uptake of VMMC. Reimbursing or providing transportation or giving away branded materials (T-shirts, *kangas*) was thought to be more influential than smartphone raffles.

Table 22: Healthcare provider survey: beliefs on how to attract adult VMMC clients (N=43)

Variable	Control (N=20) N (%)	Intervention (N=23) N (%)
Cadre		
Medical officer	1 (5)	0 (0)
Assistant medical officer	0 (0)	3 (13)
Clinical officer	0 (0)	5 (21.7)
Nurse officer	13 (65)	13 (65.5)
Other (specify)	6 (30)	2 (8.7)
Time working as VMMC provider		
Months, mean (SD)	41 (29.4)	28.3 (19.9)
What can be done at health facility to increase the number of older men aged 20 and above to come for the VMMC services?		
Older men want more privacy	7 (35)	6 (26)
Embarrassed to be circumcised as an adult	4 (20)	5 (22)
Others	9 (45)	12 (52)
What can be done to increase the number of referrals providers make for men aged 20 and above to come for the VMMC services?		
Privacy and confidentiality for older men	8 (40)	6 (26)
Improve health education the community	5 (25)	6 (26)
Others	7 (35)	11 (47.8)
What can be done in the community to increase the number of men aged 20 and above to come for the VMMC services?		
Engage community leaders	5 (25.0)	12 (52.2)
Outreach to workplace or where men congregate	3 (15.0)	1 (4.4)
Establish male circumcision champions from satisfied clients	0 (0)	1 (4.4)
Better explain the advantages of VMMC to older men	2 (10)	7 (30.4)
Engage female partners in the community	7 (35)	0 (0)
Provide financial incentives to clients	3 (15)	2 (8.7)
Do you think an incentive might have an impact on attracting older men to be circumcised?		
Yes	16 (80)	19 (82.6)
What, if any, kinds of incentives you think might increase uptake of VMMC services by men aged 20 and above in this community?		
Raffle valuable items, such as a smartphone	3 (16.7)	5 (21.7)
Give away branded materials (such as T-shirts, kangas)	6 (33.3)	5 (21.7)

Variable	Control (N=20) N (%)	Intervention (N=23) N (%)
Reimburse transportation	5 (27.8)	7 (30.4)
Provide transportation directly	3 (16.7)	4 (17.4)
Other (specify)	1 (5.6)	2 (8.7)

4.3.4 Objective 4: costs

The incremental costs of the programme include the cost of the smartphones, peer promoter log, referral book, raffle tickets and raffle log. No air time or SIM cards were provided for the phones. Seventy-nine phones were raffled to clients, 12 to peer promoters and 6 to providers, making a total of 97 phones. Each phone cost US\$85.60, and raffle costs were US\$827.59 (table 23). The cost per additional client was US\$88.65.

Table 23: Cost of intervention per additional male circumcised

Number of VMMCs conducted (calculated from male circumcisions conducted in intervention period, minus the number of conducted in the same period the previous year)			
Intervention (388–264)	Control (278–257)	Additional circumcisions conducted	
124	21	103	
Costs (US\$)			
Phones	Raffle tickets, log book, peer promoter's log book and referral book	Total	Cost per additional client
US\$8,303.20	US\$827.59	US\$9,130.79	US\$88.65

In *Cost and impacts of scaling up voluntary medical male circumcision in Tanzania*, Menon *et al.* (2014) estimate the number of VMMCs required to avert an infection for each region at six in the original Iringa region, which represents Iringa and Njombe sites in this study, and 12 in Tabora region. The same report notes that for every infection averted, there is a cost savings of US\$11,300. Table 24 provides two scenarios, one with all 14 facilities and one with only paired facilities. Considering all facilities, there are 10.8 infections averted, for a total savings of US\$122,416. This includes the decrease in the number of male circumcisions for Iringa, which represents an expense of US\$3,766. If we consider that instead of zero cost savings, then the savings is about US\$126,183. If considering only paired facilities, the total number of infections averted is 7.17, which represents a cost savings of US\$80,983.

Table 24: Cost savings (in US dollars) due to intervention

Additional VMMCs conducted (a)	VMMCs required to avert infection per region (b)	Infections averted (a/b)	Unit cost savings per infection averted- (c)	Total cost savings per infection averted (a/b*c)	Total cost savings per infection averted	
All facilities						
Iringa	-2	6	-0.33	11,300	(3,766.67)	-
Njombe	29	6	4.83	11,300	54,616.67	54,616.67
Tabora	76	12	6.33	11,300	71,566.67	71,566.67
Total (all facilities all regions)	103	-	10.83		122,416.67	126,183.33
Facilities paired within region						
Facility pairs in Iringa and Njombe (1)	5	6	0.83	11,300	9,416.67	9,416.67
Paired facilities, all regions (2)	81	-	7.17	11,300	80,983.33	80,983.33

Note: (1) Excludes Ngome health centre in Iringa matched to Makambako health centre in Njombe; (2) includes facility pairs in Tabora.

5. Policy implications and recommendations

5.1 Discussion

The *Bwana Mkubwa* study had mixed results that make the relative benefit of a smartphone raffle promotion to increase uptake of VMMC by men aged 20 and above years complicated to interpret. As noted above, in the overall sample of 14 facilities, the intervention and control groups showed 47 per cent and 8 per cent increases in VMMCs among men aged 20 and above during the study period, compared with the prior-year period. We had hypothesised a 25 per cent increase in the raffle intervention group and a 5 per cent increase in the control group due to secular trends, and these targets were exceeded. However, each within-group change was not statistically significant. Furthermore, each change was not significantly different, one from the other, when accounting for the clustering of data in 14 facilities. When controlling for potential confounders of the relationship of intervention group and number of men seeking VMMC – the percentage of clients over age 30 and the percentage testing HIV-positive – the results were also not significant.

The situation in Iringa region was different. When examining Iringa's three matched pairs of facilities in models that account for clustering of data in facilities, the intervention group has a statistically significant increase (2.16-fold) when comparing the intervention period to the same months in the prior year ($p < 0.0001$). The control group had a non-significant increase (1.75-fold, $p = 0.161$). The two groups' changes were not significantly different from one another ($p = 0.627$) in the unadjusted analysis. However, when controlling for the two potential confounders, the percentage of clients

over age 30 and percentage testing HIV positive, the intervention group had a more than four-fold increase in VMMC (p<0.0001), which is a highly significant change; the control group had a non-significant increase; and the difference-in-difference model suggested that the changes were highly significantly different (p<0.0001). This situation in Iringa is what we would have expected when the study was designed. We expected the smartphone raffle intervention, combined with multidimensional information and outreach activities in the community, to attract more clients above age 20 than in the control sites.

The study did see an overall shift in the profile of VMMC clientele when considering the characteristics of the clients in all facilities available in the medical records. In comparing the *Bwana Mkubwa* study period to the same months in the prior year, there was a 10 percentage point increase (from 20 to 30 per cent) in all clients aged 30 and above, and the mean age increased from 25.2 to 27.6 years. Clients above age 20 years who tested HIV positive increased from 1.6 to 11.9 per cent. These shifts to older clients and higher HIV prevalence likely reflect the maturity of the VMMC programme in the regions. With the majority of younger clients now served (especially in Iringa and Njombe), the remaining adult clients are trending older, and men in their 30s are more likely to be HIV positive than younger men in all three regions. Additionally, informational campaigns favouring a social norm of being circumcised, along with peer and partner pressure to be circumcised, may be attracting more HIV-positive clients who had previously avoided VMMC services that were, for many years, promoted as an HIV prevention service for men only. The lotteries may have been attractive to men who are comfortable with risk and are sexual risk takers, which may be reflected in the higher HIV testing rate in the intervention period than the prior-year period.

Focus groups with clients and separate focus groups with peer promoters revealed that the VMMC programme in all three regions is well-known, that men have had significant exposure to VMMC messages in the media over many years and that the benefits of VMMC are well understood and accepted. There were mixed reviews about the added benefits of a smartphone raffle. While some clients believed that the raffle was a worthwhile promotion and helped them to act on an intention to circumcise, some participants also report that the raffle created suspicion ('Why do they want our foreskins so badly?') or, more benignly, did not address the more pressing needs that keep older men from VMMC (such as lost wages for days spent healing). A thread that ran throughout the FGDs was that a smartphone was actually too fancy/expensive for the communities in which the study took place, particularly in the rural communities where Internet access is a problem and where men have not been oriented to use smartphones.

Our qualitative research suggests that wages lost and the perceived economic cost of seeking VMMC (which may be partially unfounded, due to misconceptions about the length of healing time) should be considered more by VMMC programmes. In a study of incentives for VMMC in Kenya, Thirumurthy *et al.* (2014) compensated men for VMMC with a randomisation to one of four options: no incentive, incentive for transportation costs alone, incentive for transportation cost and 1 to 2 days' wages or incentive for

transportation cost and 2 to 3 days' wages (Tanzania Commission for AIDS 2013). The intervention with the additional wage incentives led to an increase in VMMCs, with odds ratios of 4.3 and 6.0, respectively, when compared with controls (Tanzania Commission for AIDS 2013). However, there are potentially significant cost implications with one-to-one incentives (such as wage reimbursement to each client) – implications we had hoped to avoid by testing the hypothetically less costly raffle.

Is there a reason why *Bwana Mkubwa* study may have worked to increase uptake by older men in Iringa region but not in the other regions? Iringa was the first region to scale up VMMC in Tanzania and has generally shown a robust acceptance of VMMC services, with little to no opposition to VMMC in the community. This is not the case in Njombe region, where the programme has struggled against reluctant religious leaders and strong myths and misconceptions about ulterior motives for providing free circumcision (particularly held by older men), which may have been fed by the incentive promotion. In Tabora, the VMMC programme is newer and less mature; VMMC coverage/scale-up is only about 50 per cent complete. Data from Iringa show that the circumcision prevalence of 10- to 19-year-olds is now nearly universal and approaching universal prevalence in 20- to 24-year-olds. Older clients (aged 25 years and above) are the ones who are still left to be circumcised in Iringa, and are 'late adopters' to the programme. It is possible that the smartphone raffle, placed in the Iringa programme at an opportune moment, played a role in helping those older late adopters move from intention to actually seeking services, whereas the other regions are not yet positioned for an intervention to increase uptake among late adopters. Other interventions, such as transportation reimbursement, may be better suited to those areas. The higher HIV prevalence among clients in the intervention period suggests that VMMC has become a social norm for men generally.

5.2 Study limitations and strengths

One limitation of this study is the sample size; this is related to the limited funding available. The sample size and power calculations were informed by months of actual service data from 2013 and indicated that 14 sites would yield enough clients to be adequate to answer the research questions. The study was designed to look at the intervention effects in all three regions combined. Another limitation is that the small number of facilities in Tabora and Njombe precludes a separate analysis on the effects of the smartphone raffle in those regions. A higher number of sites in each region would have allowed us carry out regional analyses and understand the contextual influences in greater depth.

The sample size calculations for this study were done with data from February to June 2013, while our study with raffles was carried out from November 2014 to February 2015, due to the time needed to obtain approvals from two IRBs and the Gaming Board of Tanzania. From February to June 2013, the volume of clients per month was much higher than it was in either intervention or control sites between November 2014 and February 2015.

This overall lower volume of VMMCs between November 2014 and February 2015 may be due to several reasons:

- *Saturation of VMMC generally.* The VMMC programme had performed more than 130,000 additional circumcisions between the two periods (mid-2013 to late 2014), so there were fewer people to circumcise overall and likely fewer easier-to-reach clients or 'low hanging fruit'. Our raffle intervention was designed to attract the harder-to-reach community members. As time goes on, fewer men need circumcising, except for the younger males who 'age into' the acceptable age-range for VMMC.
- *Saturation around the fixed sites.* Programme staff have noticed that VMMC uptake at 'fixed' clinic sites decreases over time. During the 'year prior' period (November 2013 to February 2014), the two Tabora region sites appeared to have had higher VMMC uptake that decreased over time. This is likely due to the fact that between November 2013 and February 2014, VMMC services were relatively new in Tabora. When services are initially offered, there are many men who will seek circumcision (early adopters), but this wanes over time as the community surrounding the fixed site becomes saturated. Nevertheless, keeping fixed sites open and serving clients at volume is a priority for VMMC programmes, since fixed sites are the home base for the health providers who provide VMMC services during rural outreach campaigns. Maintaining health providers' proficiency during non-campaign periods is important to the safety of VMMC programmes.
- *Winter season.* The months of February to June coincide with colder 'winter' months in Iringa, Njombe and Tabora regions. Winter is an especially popular time for males to seek circumcision, as it falls between growing seasons and schools are on holiday. A non-winter season will have fewer VMMCs clients because of farming and school duties. November and December, which include the Christmas holidays, when couples are together, are generally lower-demand months for VMMC. Men know that VMMC will be followed by a healing period involving abstinence, which they do not want to undergo around the year-end holidays (Plotkin *et al.* 2011).

A formative phase or a pilot study prior to conducting this full impact evaluation of a demand-side intervention would have been valuable and useful and is recommended in the future. In Tanzania, VMMC experts (programme managers and peer promoters) were consulted in the design phase. While the intervention was ongoing, FGDs occurred at the clinic. VMMC client participants who did not return for their first follow-up visit were not among the FGD participants. Clients who returned to the clinic may have been more health conscious than those who did not return. Also, the responses to questions may have been somewhat different had the individuals participated from a location in the community (not at the clinic) and by focus group moderators not affiliated with the health system. Focus group participants are probably more highly engaged or interested in the VMMC issue than others in the community. Men interested in VMMC who had not yet sought services were not interviewed.

The study had several strengths, including a strong study design. This was a cluster-randomised controlled study with intervention sites matched to control sites on several facility characteristics. There was randomisation: one of each pair of facilities was

randomly allocated to the intervention and control groups. Data from same dates and months in the prior year were compared to the intervention period from the existing VMMC client database. This was a mixed-methods study. We obtained rich, nuanced information from VMMC clients and from peer promoters in separate focus groups in both intervention and control sites. Healthcare providers' perspectives were also captured in a quantitative survey. Descriptive supplemental data from the intervention facilities' VMMC clients allowed for greater understanding of their socio-demographic characteristics and exposure to VMMC and raffle-related communications in all three regions. The information from all sources was synthesised in the short analysis phase, which informed the conclusions and recommendations. This information is valuable for VMMC implementing agencies and for organisations considering the use of lotteries to incentivise community members to seek other preventative health services.

5.3 Recommendations for policy and programmes

Based on the overall study results, there is no clear mandate to recommend or not recommend the use of a smartphone raffle to increase uptake of VMMC services generally; however, placed in the right geographic location at the right time of VMMC scale-up, a raffle such as this one implemented may help late adopters move from intention to action. If previous research in other settings hold true, raffles may also attract men at relatively greater risk of HIV. A raffle programme appeared to be effective in one region (Iringa) with a more mature and long-running VMMC programme. This finding points to a strong need for programme managers and policymakers to consider the stage of each country and/or subnational region or district's trajectory of VMMC scale-up and, if necessary, devise incentive strategies that respond to each situation. A region early in the VMMC scale-up process will likely require different motivations than one very late in the process.

The qualitative research suggested that the introduction of a financial or in-kind incentive for an already 'free' service may have the potential for negative effects. This appeared to be especially important in an environment where myths and misconceptions abound about how foreskins are used after the circumcision. Policymakers working in communities where similar myths and misconceptions exist may want to do additional research to better understand audience perceptions, and the risks associated with them, prior to considering a similar initiative. Formative research should inform the selection of appropriate incentives for attracting older men to VMMC, and funding should be made available specifically for formative research into any demand-generation innovation for VMMC and any specific considerations for local contexts.

Policymakers may wish to repeat this study in different seasons of the year and with different types of incentives.

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