

The effects of providing fixed compensation and lottery-based rewards on uptake of medical male circumcision: a randomized trial

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Background

- Incentives can help promote use of proven health services that have low adoption
 - Growing literature on importance of price subsidies¹ as well as relatively small financial incentives
 - Immunization in India, \$1 ($\frac{3}{4}$ daily wage)²
 - Collection of HIV test results in Malawi, \$1-\$3³
 - Linkage to care and retention in India, US\$4-\$8⁴
 - Remaining free of STIs in Tanzania, \$30-\$60 per year⁵
- Behavioral economics suggests other incentive strategies that have been less widely used
 - Few studies that directly compare these to fixed incentives

¹Dupas *Science* 2014; ²Banerjee et al. *BMJ* 2010; ³Thornton *AER* 2008; ⁴Solomon et al. *CID* 2014; ⁵De Walque et al. *BMJ Open* 2013

Rationale for lottery-based incentives

- Given choice between a lottery and its expected value, most will choose latter
- But despite risk averse preferences, lotteries may be more desired when expected values are low
 - Discounting of small costs and benefits (peanuts effect)^{2,3}
 - Prospect theory: greater decision weight on low probability events¹
- Also preferred by those with risk-seeking preferences
 - Important if incentivized behavior involves risk
- Cost of incentivizing health behaviors can be significantly lower if lottery-based incentives are more effective

¹Kahneman and Tversky 1979; ²Prelec and Loewenstein; ³Weber and Chapman 2003; ⁴Nyqvist et al. 2015

Evidence on lottery-based incentives

- Promising evidence to date on effectiveness of lottery-based incentives
 - ❑ US: no impact on warfarin adherence among all participants, but more effective among those at risk for poor adherence¹
 - ❑ US: useful for promoting weight loss²
 - ❑ Lesotho: Lottery-based rewards for remaining STI free³
- Few studies have directly compared lottery-based incentives to fixed incentives
 - ❑ Employees more likely to complete health risk assessments with lottery-based incentive than fixed incentive (gift certificate)⁴

¹Kimmel et al. 2012; ²Volpp et al. 2008; ³Nyqvist et al. 2015; ⁴Haisley et al. 2012

Medical male circumcision for HIV prevention

Country	Total	% progress towards targets set in 2011
Botswana	140 689	41
Ethiopia	51 185	128
Kenya	927 156	108
Lesotho	84 735	23
Malawi	157 504	8
Mozambique	558 878	53
Namibia	18 320	6
Rwanda	454 625	26
South Africa	1 861 675	43
Swaziland	70 477	38
United Republic of Tanzania	1 226 374	89
Uganda	2 147 105	50
Zambia	950 626	49
Zimbabwe	412 544	22
Total	9 061 893	44

- 3 RCTs showing MC reduces HIV acquisition risk by 60%
 - 80% coverage can avert 3.4m HIV infections by 2025

- Last year, 3.2m circumcised in 14 priority countries (750% increase from 2010)
 - 44% coverage achieved¹
 - MC uptake generally lower among men >20 years
 - Demand creation interventions needed to achieve 80% coverage

¹WHO Progress Brief 2015

Why don't men get circumcised?

- Many studies, identifying multiple barriers^{1,2,3}
 - Financial concerns, fear of pain and adverse events, possible adverse events
 - the post-surgical abstinence period
 - Partner's beliefs and resistance
- Economic rationale for incentives
 - Conventional rationale: offsets lost wages and reduces price
 - MC: most costs are in present while benefits are in future
 - Behavioral economics rationale: offsets immediate costs, creates immediate rewards (*present-biased preferences*^{6,7})

¹Westercamp and Bailey *AIDS Behav* 2007; ²Herman-Roloff et al. *PLOS One* 2011; ³Ssekubug u et al. *Qual Health Res* 2013; ⁴Laibson *QJE* 1997; ⁵O'Donoghue and Rabin *AER* 1999

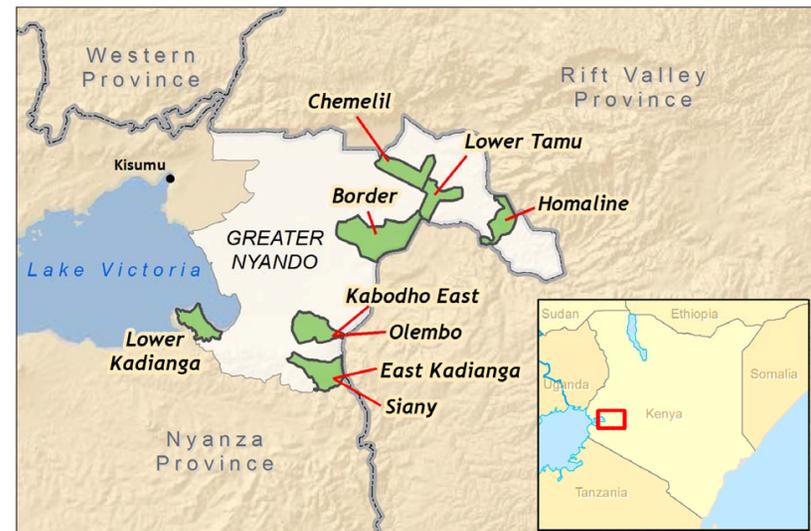
Fixed incentives can increase male circumcision uptake

- Providing compensation to those who get circumcised shown to be effective in Kenya¹
 - Food vouchers of ~US\$9-\$15 significantly increased MC uptake relative to control within a 2-month period (9% vs.1.6%)
 - Similar evidence from recent study in South Africa²
- This study: modest absolute effect of fixed incentives *and* stakeholder consultations led to development of lottery-based incentives as an additional intervention

¹Thirumurthy et al. *JAMA* 2014; ²Frade et al. *JAIDS* (in press)

Randomized trial of compensation and lottery-based rewards

- Determine effect of different types of economic interventions on MC uptake over 3-month period
 - Fixed amount of compensation
 - Lottery-based incentives



Impact Research & Development Organization

- Largest provider of VMMC services in Kenya
 - PEPFAR/CDC-supported services
 - 8 districts in western Kenya

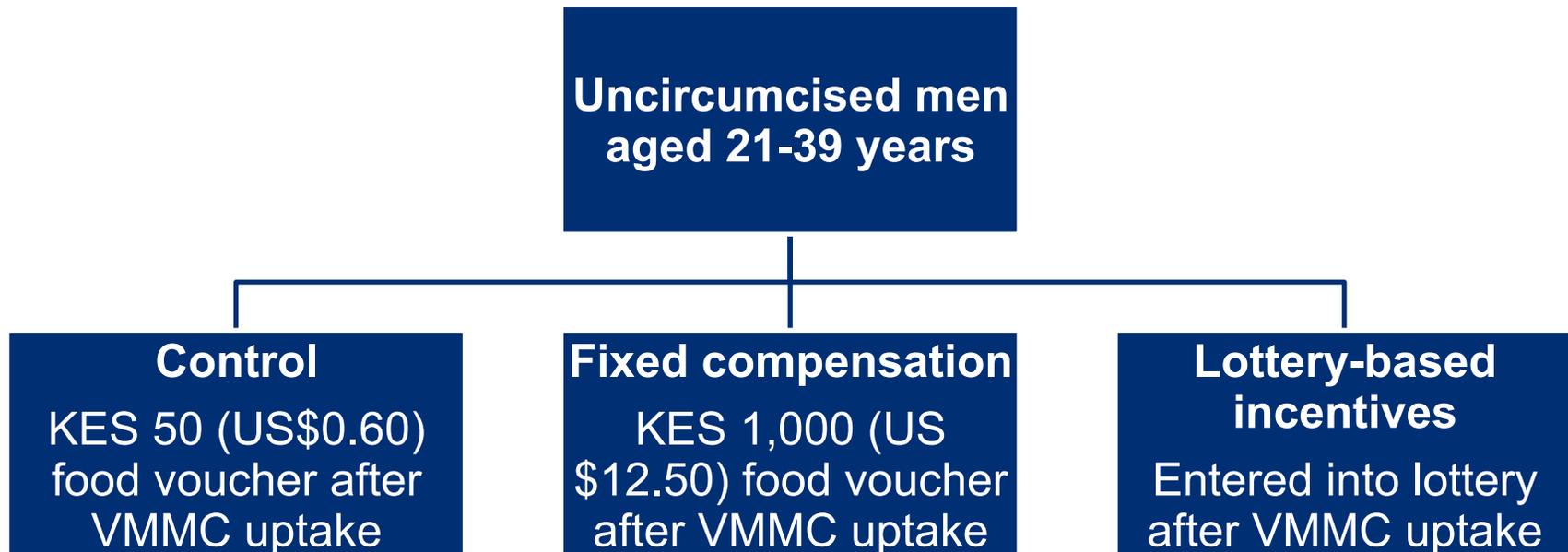
- >400,000 circumcisions to date



Study design

- Randomized controlled trial
 - Fixed compensation: guaranteed compensation of KES 1000 (US \$12.5) conditional on MC (similar to previous study)
 - Lottery-based incentives: *variable* rewards conditional on MC
 - Identical expected value
 - Primary outcome
 - Circumcision uptake within 3 months
 - Study population
 - 21-39 year-old men, self-report as uncircumcised, reside in randomly selected sub-locations
-

Control and intervention groups



- Bike or smartphone, value KES 9,500 (1/20 – 5% chance)
- Cellphone or shoes, value KES 3,600 (2/20 – 10% chance)
- Food voucher, value KES 200 (17/20 – 85% chance)
- **Expected value of fixed compensation and lottery-based rewards identical**

Procedures

- Random selection of sublocations in Nyando region
 - Household visits by RAs
 - Determine eligibility, obtain informed consent
 - Baseline questionnaire, brief education about MC
 - Random assignment to three study groups
 - Each participant given MC referral card
 - Monitoring of MC uptake and provision of compensation
-

Randomization and referral card

Please carry this card, regardless of the value, when you go for voluntary medical male circumcision [VMMC] at any of the clinics listed on the back.

Yie iting' kadi ni, ka ok idewo chiwo mondikie, chieng' ma idhi e nyange e kar thieth maro amora mondiki e tokkadi ni.



Control #

1,000 Shillings

Please carry this card when you go for VMMC within 3 months from today, and exchange it for the item above.

Yie iting' kadi ni, ka idhi e nyange kapok dweche 3 orumo kochakre kawuono, monda iwil gi gima ondik malo ka.

Thank you very much!
Erokamano ahinya!

VMMC is offered at the following clinics free of charge:

Nyange itimo e klinik mondik piny kae gi, ma ongechudo

Katito Health Centre _____

Bonde Dispensary—Lower Nyakach _____

Kadinda Health Centre _____

Tuongane Youth Centre, Ahero _____

Kinasia Dispensary _____

Masogo Health Centre—Muhoroni _____

Onyuongo Dispensary _____

St. Vincent De Paul _____

Mission Hospital—Muhoroni _____

Koru Mission Hospital—Muhoroni _____

To be eligible to receive compensation, you must receive voluntary medical male circumcision services by:

Mondo iyud mich, nyaka teri nyange kapok aromo tarik:

For answers to questions, call:

Kuom duoko penjo, go namba simu ni:

0724 601 183



Food vouchers

Client study No _____

Scratch Card No. _____

Voucher No: _____



Thank you for participating in our study!
Erokamano kuom donjo e nonro ni!

This voucher will allow you to obtain shop items worth:
Oboke ni biro miyi thuolo mar yudo gige duka mar pesa ni:

KES 1,000

This voucher is valid for only one month (**1 month**) from today. The back of this voucher indicates the shops in your area where you can use this voucher. IRDO has signed an agreement with these shops to exchange this voucher for items. The above stamp certifies validity of the voucher.

*Oboke ni inyalo tiyo go mana kuom dwe achiel (**dwe 1**) kochakore kawuono. Tok obokeni ondikie dukni mani e gweng'u ma inyalo tiyoe gi oboke ni. Migawo mar Impact oseloso winjruok gi weg duknigo mondo owil obokeni gik duka. Amuri ma ogoyie ni en ranyisi ni obokeni en mar adiera.*

Today's Date:

Expiry Date

LOTTERY STUDY - LOTTERY OPTIONS

When you participate in the lottery, you're likely to receive one of these prizes:

Prize 1	<p>Bicycle</p>  <p>KES 9,500 MAX</p>	<p>Smart Phone</p>  <p>KES 9,500 MAX</p>
Prize 2	<p>Regular Phone</p>  <p>KES 3,600 MAX</p>	<p>And 1 Pair of Shoe</p>  <p>KES 3,600 MAX</p>
Consolation prize	<p>Shopping Voucher</p> <p>KES 200</p>	

Enrollment

- 911 uncircumcised men enrolled in 2014
 - 3-month MC uptake period completed February 2015
 - 2 participants excluded due to incomplete baseline data

 - 4,663 households enumerated
 - 3,752 (80.5%) excluded
 - No resident adult male (1,182, 31.5%)
 - Resident adult male already circumcised (1,050, 28.0%)
 - Ineligible age (894, 23.8%), relocation (196, 5.2%)
 - Not at home (250, 6.7%)
 - Refused to participate (9, 0.2%).
-

Study participants

Number of participants	909
Age, mean (SD)	29 (5.9)
Married, N (%)	541 (60)
Luo ethnicity, N (%)	906 (100)
Education	
Some primary education or none, N (%)	224 (25)
Completed primary education, N (%)	308 (34)
Some secondary education, N (%)	131 (14)
Completed secondary or greater, N (%)	246 (27)
Daily earnings (US\$), median (IQR)	3.8 (2.5-6.3)

Study participants: health characteristics

	Control	\$12.50	Lottery	P-value
Have a primary sex partner	0.91	0.89	0.90	0.67
Had any other sex partner besides primary in past year	0.22	0.28	0.23	0.18
Condom used at last intercourse	0.33	0.36	0.34	0.66
Self reported chance of having HIV				
High	0.10	0.13	0.09	0.15
Moderate	0.25	0.26	0.28	0.81
Low	0.33	0.34	0.37	0.60
No risk at all	0.20	0.14	0.13	0.06
HIV-infected	0.03	0.03	0.03	0.96
Knowledge: Circumcised men less likely to get HIV	0.83	0.88	0.89	0.11

Study participants: circumcision intentions

	Control	\$12.50	Lottery	P-value
Likelihood of getting circumcised sometime in the future				
Definitely yes	0.41	0.39	0.35	0.31
Maybe	0.53	0.55	0.56	0.78
It is unlikely	0.04	0.03	0.05	0.75
Definitely not	0.02	0.03	0.05	0.09
Greatest concern about getting circumcised				
Cost of missed work	0.60	0.58	0.56	0.72
Pain	0.25	0.21	0.28	0.15
Other concern	0.15	0.21	0.15	0.08
Minimum amount needed to compensate most men	62.0	34.8	42.7	0.30
Time inconsistent preferences	0.29	0.27	0.24	0.37
High discount rate	0.60	0.61	0.70	0.02

Results: MC uptake within 3 months

	All participants	Control	\$12.50	Lottery
N	903	296	306	301
Circumcised, N	40	4	26	10
Circumcised, %	4.4%	1.4%	8.5%	3.3%

Regression includes controls for age, education, marital status, and wealth

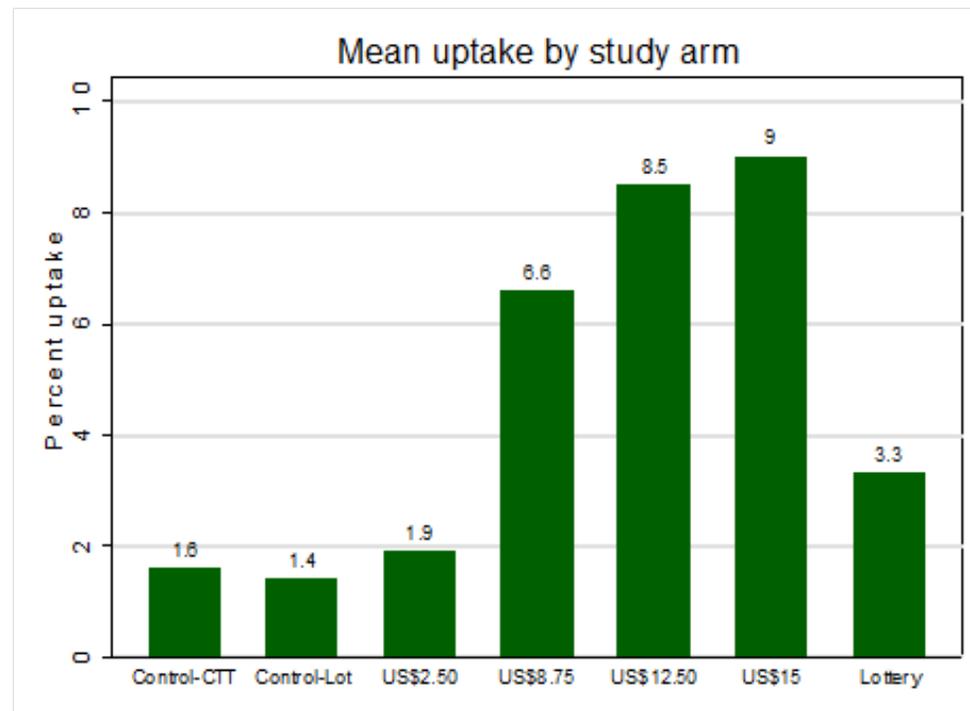
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Circumcised, %	4.4%	1.4%	8.5%	3.3%

Regression results	
Control	-
\$12.50	0.074***
	(0.017)
Lottery	0.020
	(0.012)
P-value for lottery=\$12.50	0.0059
N	903

Regression includes controls for age, education, marital status, and wealth

Fixed incentive effect same as prior study



Fixed incentive effect same as prior study

	Study 1	Study 2	Pooled
Control	-	-	-
\$2.50	0.001 (0.010)		0.006 (0.009)
\$8.75	0.050*** (0.014)		0.054*** (0.014)
\$15.00	0.074*** (0.016)		0.078*** (0.016)
\$12.50		0.074*** (0.017)	0.066*** (0.017)
Lottery		0.020 (0.012)	0.015 (0.011)
Mean of dep. var.	0.048	0.044	0.046
Control group mean	0.016	0.014	0.015
N	1,502	903	2,405

P-values from comparison of coefficients	
\$15=\$2.50	<0.01
\$15=\$8.75	0.21
\$15=\$12.50	0.58
Lottery=\$2.50	0.50
Lottery=\$8.75	0.02
Lottery=\$12.50	<0.01
Lottery=\$15	0.01

Fixed incentive effect same as prior study

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\$8.75	0.050*** (0.014)		0.054*** (0.014)	P-values from comparison of coefficients	
\$15.00	0.074*** (0.016)		0.078*** (0.016)	\$15=\$2.50	<0.01
\$12.50		0.074*** (0.017)	0.066*** (0.017)	\$15=\$8.75	0.21
Lottery		0.020 (0.012)	0.015 (0.011)	\$15=\$12.50	0.58
Mean of dep. var.	0.048	0.044	0.046	Lottery=\$2.50	0.50
Control group mean	0.016	0.014	0.015	Lottery=\$8.75	0.02
N	1,502	903	2,405	Lottery=\$12.50	<0.01
				Lottery=\$15	0.01

Qualitative assessments

- In-depth interviews with lottery incentives group
 - Among those who sought MC, health rationale was most common reason for going, with indication that incentive played some role (“made it easier to go”)
 - Among those who did not seek MC, primary reasons were fear of missing work or losing work, not finding time to go during study period
 - Many stated that chance of winning a lottery prize was not sufficient to compensate for costs
 - Suggests ‘peanuts effect’ not operative
 - No participants reported distrust of lottery system
-

Subgroup analyses

- Among most subgroups, fixed compensation more effective than lottery-based rewards
 - Below-median age & income, cost main concern, high & low risk
 - Similar effects: above-median income, cost not main concern
 - Baseline intention to get circumcised in future
 - Among those reporting “unlikely” or “definitely not” – none underwent MC due to compensation or lottery-based rewards
 - Fixed incentive most effective among those contemplating MC
 - Consistent with present-biased decision-making
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Comparing fixed and lottery incentives in subgroups

	VMMC uptake (%)		Adjusted OR*	95% CI	P-value	p-value for interaction**
	Fixed	Lottery				
	No. (%)	No. (%)				
Circumcised	26 (8.4)	10 (3.3)	0.4	(0.2 - 0.8)	0.01	-
Daily income						0.53
Daily income ≤US\$3.80	16 (10.1)	5 (3.3)	0.3	(0.1 - 0.8)	0.02	
Daily income >US\$3.80	10 (6.7)	5 (3.4)	0.5	(0.2 - 1.5)	0.20	
Had any other sex partner besides primary in past year						0.43
No	15 (6.8)	7 (3.0)	0.4	(0.2 - 1.1)	0.07	
Yes	11 (12.9)	2 (3.0)	0.2	(0.0 - 1.0)	0.05	
Condom used during last sex						0.57
No	17 (8.8)	7 (3.6)	0.4	(0.2 - 0.9)	0.04	
Yes	9 (8.3)	2 (2.0)	0.2	(0.0 - 1.1)	0.06	

Whose behavior is affected most by fixed incentives?

	(1)	(2)	(3)
High incentive	0.084***	0.010	0.014
	(0.014)	(0.008)	(0.016)
High earnings	0.002		-0.005
	(0.008)		(0.003)
High incentive * High earnings	-0.040**		-0.008
	(0.018)		(0.017)
High intention		0.018***	0.015**
		(0.005)	(0.007)
High incentive * High intention		0.063***	0.081***
		(0.013)	(0.023)
High earnings * High intention			0.007
			(0.010)
High incentive*High earnings*High intention			-0.036
			(0.027)
Low incentive group mean	0.016	0.016	0.016
N	2,102	2,045	2,044

Incentive and intertemporal preferences

	(1)	(2)
High incentive	0.059***	0.055***
	(0.011)	(0.015)
Time inconsistent	-0.003	
	(0.009)	
High incentive*Time inconsistent	0.021	
	(0.022)	
High discount rate		-0.013
		(0.009)
High incentive*High discount rate		0.015
		(0.019)
N	2,104	2,103

Conclusions

- Small amounts of compensation effective in promoting uptake of health service that reduces HIV risk
 - Most effective among those contemplating circumcision
 - Absolute increase modest, but large relative to annual uptake
 - Lottery-based incentives not effective
 - Could be more appropriate for behaviors without large immediate costs and that are not irreversible
 - Future work will compare with lottery-based incentives are more effective for HIV testing among men
 - Higher value lottery could be more effective
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