

Peer Effects in the Demand for Male Circumcision: Evidence from Secondary Schools in Malawi

Booyuel Kim (KDI School of Public Policy and Management)
Hyuncheol Bryant Kim (Cornell University, PAM)
Cristian Pop-Eleches (Columbia University, SIPA)

June 2016

Why Do We Care?

- ▶ Male circumcision is one of the most important HIV prevention interventions. (Auvert et al. 2005, Bailey et al. 2007, Gray et al. 2007)
- ▶ Despite of a global mobilization for scaling up, the demand for male circumcision is still very low, even with heavily subsidized price and proper information. (Chinkhumba, Godlonton, and Thornton (2014))
 - Financial constraints
 - Lack of information and awareness
 - Lack of accessibility
 - Psychological cost including fear of pain
 - Religious and cultural norms
 - Concern over a long recovery period
- ▶ Peer effect is important for take-up of health services
 - Kremer and Miguel (2004), Godlonton and Thornton (2012), Oster and Thornton (2012)

Background

- ▶ Part of a bigger HIV/AIDS prevention experiment to understand externalities and complementarities of HIV prevention programs
 - HIV/AIDS education
 - Male circumcision
 - Girls education support program
- ▶ Public secondary school in four rural districts in Malawi
 - 7,971 students of 9th, 10th, and 11th grades
 - 124 classrooms in 33 public secondary schools

Background

▶ HIV/AIDS Education

- Comprehensive HIV/AIDS education: 45-min lecture and 15-min follow-up discussion
- Transmission mechanisms, HIV biology and potential effects, ABC prevention strategy
- Information on medical benefit of male circumcision
- Relative risk of cross-generational sexual relations (Dupas 2011)

▶ Girls Education Support Program

- Total \$72: One-year tuition ($\20×3 semesters) and monthly education stipends ($\$2 \times 3$ times $\times 3$ semesters)
- Weak conditionality: school enrollment at the time of transfers

▶ Encouragement to Free Male Circumcision

- Free male circumcision at assigned hospital
- 3-day and 1-week follow-up complication check-ups at students' school
- Transportation support (direct pick-up service or voucher) is randomly provided

Background

- ▶ Today's focus: male circumcision
- ▶ Malawi is greatly affected by the HIV pandemic.
 - 10.6% of people aged 15 to 54 years are living with HIV(UNAIDS, 2012).
- ▶ Prevalence of male circumcision in Malawi
 - 21.6% in adults (Malawi National Statistical Office, 2011)
 - 10.5% among our target students
 - Mainly practiced by the Muslim population (Yao tribe)
- ▶ Male circumcision is now one of the most important national HIV prevention programs, but it was less active at the time of experiment.

Research questions

- ▶ Easy access to male circumcision to promote the demand for male circumcision
- ▶ Peer effects in the demand for male circumcision
- ▶ Short-term effects of male circumcision on sexual behaviors

Preview

- ▶ Easy access to male circumcision promotes its demand significantly.
- ▶ There are peer effects in the demand for male circumcision.
 - Evidence on general peer effects (externalities)
 - Reinforcement effects (complementarities) between one's and friends' male circumcision
- ▶ No evidence of risk compensation (increased risky sexual behavior) in the short run

Background

- Randomize the fraction of treated students within classrooms

1) HIV/AIDS Education

	Group	Assignment	Classrooms	Students
100% Treatment	E1	Treatment	41	2,480
50% Treatment	E2	Treatment	41	1,303
	E3	No treatment		1,263
No Treatment	E4	No treatment	42	2,925
Total			124	7,971

2) Male Circumcision

100% Treatment	C1	Treatment	41	1,293
50% Treatment	C2	Treatment	41	679
	C3	No treatment		679
No Treatment	C4	No treatment	42	1,323
Total			124	3,974

3) Girls Education Support Program

Treatment	S1	Treatment	62	2,102
No Treatment	S2	No treatment	62	1,895
Total			124	3,997

Data: Surveys

- ▶ Baseline Survey (Oct 2011 - Apr 2012)
 - 7971 students (3,974 males and 3,997 females) in 9th - 11th grade
 - demographic characteristics, HIV knowledge, sexual behaviors, attitude to and demand for condoms, and friendship network
- ▶ Follow-up survey at school (Jan - Apr 2013)
 - 5,431 students (68.1%) stayed in follow-up school survey (2,540 students were lost).
- ▶ Intensive home-visit survey (Apr - Aug 2013)
 - 15% of 2,540 lost students (381 students) were randomly selected.
 - 271 out of 381 students (71.1%) were surveyed in the community.
 - Effective survey rate is 90.8% ($=68.1\% + 31.9\% \times 71.1\%$).
 - Weight for home survey is 6.67 (since we randomly select 15%)
- ▶ Male circumcision take-up: hospital administrative data
- ▶ Longer term follow-up survey is on-going (Oct 2015 - Present)

Data: Baseline Statistics and Balance

Dependent Variable:	Avg. at Baseline (SD) (1)	Male Circumcision Offer (2)
Age (year)	16.650 (1.942)	-0.008 (0.008)
Circumcision Ethnicity	0.170 (0.375)	0.029 (0.022)
Muslim	0.060 (0.238)	0.066 (0.042)
Orphan	0.057 (0.231)	-0.033 (0.036)
Father's Tertiary education	0.180 (0.384)	-0.014 (0.028)
Mother's Tertiary education	0.068 (0.252)	-0.009 (0.037)
Father's white-collar job	0.239 (0.426)	0.028 (0.022)
Mother's white-collar job	0.096 (0.295)	-0.030 (0.034)
Household Assets (0-16)	7.375 (3.460)	0.003 (0.006)
Received HIV/AIDS education	0.796 (0.403)	0.031 (0.030)
HIV/AIDS Knowledge (0-20)	17.324 (1.726)	-0.006 (0.007)

(continued)

Data: Baseline Statistics and Balance

Dependent Variable:	Avg. at Baseline (SD) (1)	Male Circumcision Offer (2)
Condom Attitude (0-18)	12.461 (3.168)	0.001 (0.003)
Prob. (Take-up Condom)	0.243 (0.429)	0.007 (0.054)
No of Condoms purchased	0.866 (1.620)	-0.014 (0.014)
Sex experience	0.306 (0.461)	0.037 (0.026)
Currently in sexual relation	0.092 (0.288)	-0.033 (0.036)
Multiple sex partners	0.143 (0.350)	-0.015 (0.033)
Already circumcised	0.105 (0.307)	0.013 (0.029)
MC is only for Muslim	0.389 (0.487)	0.037** (0.019)
MC is painful	0.153 (0.359)	-0.003 (0.029)
Observations		3,923
p-value of joint F-test	0.199	
R-squared		0.010

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Data: Attrition

Dependent variable	Surveyed at the follow-up	
	(1)	(2)
Male Circumcision	-0.022 (0.018)	-0.020 (0.018)
Age		-0.003 (0.004)
Orphan		-0.010 (0.030)
Father's tertiary education		-0.010 (0.023)
Mother's tertiary education		-0.022 (0.039)
Father's white-collar job		-0.007 (0.018)
Mother's white-collar job		-0.003 (0.033)
Household Assets (0-16)		-0.001 (0.003)
Observations	3,974	3,964
R-squared	0.012	0.016

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Data: Friendship Networks

- ▶ We asked students to list three best friends within classroom (including female students)
- ▶ Friendship data were reconstructed by reordering best male friends after excluding female friends and friends without baseline survey

	(1)	(2)
Panel A: Friendship Reconstruction		
	Raw count	Reordered eligible male
First-best friend	3,848	3,836
Second-best friend	3,844	3,137
Third-best friend	3,866	1,621
Panel B: Friendship link treatment status		
	Cases	Percent
No friends treated	1,702	42.8%
One friend treated	831	20.9%
Two friends treated	825	20.8%
Three friends treated	616	15.5%

Data: Outcome Variables

► Outcome Variables

- Male circumcision take-up (hospital administrative data)
- Self-reported sexual behaviors
- Condom purchase (Thornton 2008) ► correlation
- HIV knowledge

Empirical Strategy

- ▶ Whole sample:

$$MC_{ij} = \beta_0 + \beta_1 C1_{ij} + \beta_2 C2_{ij} + \beta_3 C3_{ij} + X_{ij}r' + \delta_j + \varepsilon_{ij} \quad (1)$$

- ▶ MC_{ij} denote male circumcision take-up for student i in grade j
- ▶ $C1$, $C2$, and $C3$ refer Group C1 (*100% Treatment Classrooms*), Group C2 (*Treated students in 50% Treatment Classrooms*), and Group C3 (*Untreated students in 50% Treatment Classrooms*)
- ▶ X_{ij} is a control vector
- ▶ δ_j are grade fixed effects and ε_{ij} is a random error
- ▶ Robust standard errors are clustered by classroom

Empirical Strategy

- ▶ Restricted sample of 50% *treatment* classrooms:

$$MC_{ij} = \beta_0 + \beta_1 Offer_{ij} + \beta_2 Peer_{ij} + X_{ij}r' + \delta_j + \varepsilon_{ij} \quad (2)$$

$$MC_{ij} = \beta_0 + \beta_1 Offer_{ij} + \beta_2 Peer_{ij} + \beta_3 Offer_{ij} \cdot Peer_{ij} + X_{ij}r' + \delta_j + \varepsilon_{ij} \quad (3)$$

- ▶ $Offer_{ij}$ is a variable for male circumcision offer
- ▶ $Peer_{ic}$ is a variable for the proportion of student i 's friends who are offered male circumcision
- ▶ δ_j are a set of grade dummies
- ▶ β_3 captures reinforcement effects (boy-boy complementarities)

Peer Effects, Whole Sample

Table: Impact on Male Circumcision Take-up

Dependent Variable:	Circumcision Take-up			
	(1)	(2)	(3)	(4)
	OSL		Probit	
100% Treatment (G1)	0.138*** (0.027)	0.142*** (0.027)	0.174*** (0.035)	0.179*** (0.036)
50% Treatment (G2)	0.193*** (0.030)	0.189*** (0.031)	0.264*** (0.045)	0.261*** (0.046)
50% No Treatment (G3)	0.041** (0.020)	0.038* (0.021)	0.070* (0.036)	0.068* (0.036)
p-value of F-test: (100% treatment = 50% treatment)	0.1452	0.2181	0.0942	0.1822
Mean of Dep. Var. in control group		0.048		
Controls	No	Yes	No	Yes
Observations	3,974	3,952	3,974	3,952

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Heterogeneity, Whole Sample

Table: Heterogeneous Effects by Prior Beliefs

Dependent Var.	Circumcision Take up			
	(1)	(2)	(3)	(4)
MC offer	0.146*** (0.021)	0.144*** (0.023)	0.162*** (0.023)	0.151*** (0.023)
Knowing MC benefit		0.007 (0.012)		
MC offer x Knowing MC benefit		0.003 (0.023)		
Think that MC is very painful			-0.023** (0.010)	
MC offer x Think that MC is painful			-0.038* (0.021)	
Think that MC is only for Muslim				-0.014 (0.016)
MC offer x Think that MC is only for Muslim				-0.032 (0.029)
Observations	3,952	3,949	3,945	3,942

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Reinforcement Effects, 50% Treatment Classroom

Table: Reinforcement Effects on MC Take-up

Dependent Variable:	(1)	(2)	(3)	(4)
Panel A: Peer Effect (Externality)				
MC offer	0.151*** (0.019)	0.155*** (0.019)	0.151*** (0.033)	0.154*** (0.019)
Rate of friends who got MC offer	0.050 (0.034)	0.044 (0.033)	0.047 (0.039)	0.043 (0.035)
Panel B: Reinforcement Effect (Complementarity)				
MC offer	0.086*** (0.030)	0.093*** (0.030)	0.083** (0.038)	0.092*** (0.030)
Rate of friends who got MC offer	-0.040 (0.036)	-0.040 (0.036)	-0.047 (0.040)	-0.042 (0.040)
MC offer x Rate of friends who got MC offer	0.177*** (0.067)	0.165** (0.066)	0.186** (0.072)	0.169*** (0.064)
Mean of Dep. Var. in Control group	0.083			
Grade fixed effects	o	o		
Classroom fixed effects			o	o
Controls	No	Yes	No	Yes
Observations	1,358	1,350	1,358	1,350

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Reinforcement Effects, 50% Treatment Classroom

- Stacked sample: unit of observation is single friendship relationship

Table: Reinforcement Effects on MC Take-up

	(1)	(2)	(3)	(4)
Dep. Variable: My MC uptake				
My MC offer	0.160*** (0.022)		0.160*** (0.022)	0.129*** (0.026)
Friend's MC offer		0.007 (0.015)	0.012 (0.014)	-0.019 (0.016)
My MC offer x Friend's MC offer				0.061** (0.028)
Controls	Yes	Yes	Yes	Yes
Observations	2,924	2,924	2,924	2,924

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, Clustered both at one's and friend's ID

Mechanism of Peer Effects

- ▶ Hospital administrative data on timing of male circumcision
- ▶ Channels through which peer effects promote male circumcision demand
 - Organizing each other to go together: receiving circumcision on same day
 - Positive learning spillovers based on experience of one's peer: receiving circumcision on different days

Decomposition of Peer Effects

► Stacked 50% Treatment Classroom sample

VARIABLES	My take-up (1)	My take-up x no friend take-up (2)	My take-up x friend take-up before me (3)	My take-up x friend take-up with me (4)	My take-up x friend take-up after me (5)
Panel A: Overall					
My MC Offer	0.160*** (0.022)	0.114*** (0.016)	0.003 (0.006)	0.020*** (0.006)	0.023*** (0.006)
Observations	2,924	2,924	2,924	2,924	2,924
R-squared	0.071	0.048	0.005	0.012	0.010
Panel B: When Friend got MC offer					
My MC Offer	0.192*** (0.025)	0.111*** (0.019)	0.014* (0.008)	0.041*** (0.010)	0.026*** (0.007)
Observations	1,494	1,494	1,494	1,494	1,494
R-squared	0.090	0.046	0.011	0.027	0.017
Panel C: When Friend didn't get MC offer					
My MC Offer	0.130*** (0.026)	0.119*** (0.022)	-0.007 (0.007)	-0.002 (0.005)	0.019** (0.009)
Observations	1,430	1,430	1,430	1,430	1,430
R-squared	0.059	0.055	0.005	0.003	0.010

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Short-term Effects of MC on Sexual Behaviors

- ▶ Risk compensation associated with male circumcision has been a concern for male circumcision scale-up programs.
- ▶ Self reported risky sexual behaviors could be problematic
 - Demand for condom is a good proxy for demand for protected sex

Short-term Effects of MC on Sexual Behaviors

Table: Short-term Effects of Male Circumcision

Dep. Var	Attitude to Condom (1)	Prob (Purchase Condom) (2)	No. of condoms purchased (3)	Sex experience (4)	Currently in Sex relation (5)
100% Treatment	0.043 (0.220)	-0.006 (0.029)	-0.047 (0.116)	0.010 (0.031)	0.001 (0.026)
50% Treatment	0.049 (0.232)	0.038 (0.038)	0.208 (0.163)	0.004 (0.037)	-0.002 (0.034)
50% No Treatment	0.152 (0.278)	-0.011 (0.030)	-0.052 (0.121)	0.033 (0.037)	0.004 (0.028)
Mean of Dep. Var.	12.85	0.256	1.008	0.319	0.126
Observations	2,826	2,816	2,810	2,827	2,827
R-squared	0.009	0.031	0.025	0.110	0.060

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Short-term Effects of MC on Sexual Behaviors

Table: Short-term Effects of Male Circumcision

Dep. Var	Attitude to Condom (1)	Prob (Purchase Condom) (2)	No. of condoms purchased (3)	Sex experience (4)	Currently in Sex relation (5)
Panel A: Peer Effect (Externality)					
My MC offer	-0.095 (0.253)	0.054 (0.040)	0.288* (0.169)	-0.035 (0.041)	-0.004 (0.036)
Rate of Friends who got MC offer	0.783* (0.458)	-0.007 (0.078)	0.029 (0.317)	0.007 (0.078)	0.019 (0.062)
Observations	936	932	929	936	936
R-squared	0.032	0.052	0.053	0.120	0.054
Panel B: Reinforcement Effect (Complementarity)					
My MC offer	-0.514 (0.423)	-0.065 (0.067)	-0.244 (0.266)	-0.129* (0.071)	0.011 (0.058)
Rate of Friends who got MC offer	0.265 (0.666)	-0.152 (0.113)	-0.623 (0.446)	-0.108 (0.120)	0.036 (0.096)
My MC offer x Rate of Friends who got MC offer	1.094 (0.883)	0.309** (0.156)	1.383** (0.634)	0.244 (0.156)	-0.038 (0.130)
Observations	936	932	929	936	936
R-squared	0.034	0.061	0.064	0.125	0.054
Mean of Dep. Var.	12.85	0.256	1.008	0.319	0.126

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Summary of Results and Next Steps

► Summary of results

- Easy access to male circumcision promotes its demand significantly (about 15% point, 300%)
- Peer effects for male circumcision take-up (about 4-7% point, 100%)
- Reinforcement effects (complementarities) between one's and friends' male circumcision
- No evidence on risk compensation

► Longer term follow-up survey (Oct. 2015 - Present)

- Alternative measure of sexual behaviors
 - Bio-markers (HIV and HSV2)
 - Item count technique (Coffman, Coffman, Ericson, 2013)

Correlation between Condom purchase and Sexual Behaviors

Dep. Var.	Prob (Take-up Condom) (1)	No. of condoms purchased (2)
Sex experience	0.165*** (0.022)	0.595*** (0.080)
Currently in Sex relation	0.166*** (0.031)	0.711*** (0.128)
HIV Knowledge	0.001 (0.004)	0.002 (0.014)
Condom Attitude	0.009*** (0.002)	0.029*** (0.007)
Multiple Sex Partners	0.028 (0.028)	0.140 (0.110)
MC take-up	-0.019 (0.020)	-0.041 (0.074)
Constant	0.047 (0.067)	0.203 (0.250)
Observations	3,970	3,969
R-squared	0.077	0.081

► Back

Impact of MC offer on Most Popular Kids

Dep. Var.	(1)
My MC offer	0.140*** (0.040)
Most popular kid got MC offer	-0.084 (0.073)
Most popular kid thinks that MC is painful	0.129 (0.137)
Most popular kid got MC offer x My MC offer	-0.017 (0.054)
Most popular kid thinks that MC is painful x My MC offer	-0.018 (0.062)
Most popular kid got MC offer x He thinks that MC is painful	-0.150 (0.158)
Most popular kid got MC offer x He thinks that MC is painful x My MC offer	0.105 (0.078)
Classroom F.E.	Yes
Observations	1,350
R-squared	0.155

► Back