Female Circumcision and HIV Infection in Tanzania: for Better or for Worse?

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Data Source

This analysis and its findings are derived from the 2003-04 Tanzania HIV/AIDS Indicator Survey (the THIS), which is currently available for public use. The first author received permission from the National Bureau of Statistics in Tanzania to conduct this work prior to the official release of the data set to the public.

Introduction

Female circumcision, also referred to as female genital cutting (FGC) and female genital mutilation (FGM), is most prevalent in Africa. The practice has been linked to obstetrical and gynecological problems in addition to mental and physical trauma that may result from the more severe forms of the procedure and has hence been widely condemned for both ethical and health reasons by the World Health Organization and other entities involved with Human Rights.

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WHO has defined 4 types of circumcision:

I. Clitoridectomy

II. Excision (cutting of both the clitoris and part or all of the labia minora)

III. Infibulation (cutting of all external genitalia with stitching of the vaginal opening)

IV. Other less radical forms including pricking and piercing

It has been estimated that 80-85% of female circumcision is either type I or II.

K.E.Kun proposed 4 hypothetical mechanisms by which female circumcision could result in an elevated risk of HIV infection

(ref. K.E.Kun, 1997, Intl J Gynecology and Obstetrics)

I.

Female circumcision

↓

Infection/scarring

↓

Partial/complete occlusion of the vagina

↓

Greater risk of inflammation/bleeding during intercourse

↓

Disruption of the genital epithelium/exposure to blood/penile abrasions which have been reported to enhance risk of HIV infection

II.

Female circumcision

↓

Painful/difficult vaginal penetration

↓

Increased practice of anal intercourse, which has been shown to enhance the efficiency of HIV transmission

III.

Female circumcision

↓

Higher incidence of obstructed labor and tearing

↓

Hemorrhage

↓

Higher risk of blood transfusion; blood supply may not be optimally screened for HIV

IV.

Use of unsterilized instruments to perform the female circumcision procedure

Exposure to blood contaminated by the virus

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While WHO and the International Federation of Gynecology and Obstetrics publicly postulated that female circumcision might be a risk factor for HIV infection as long ago as 1992, very little research has been published to date examining this relationship.

In light of the alarming spread of HIV among females in a number of African countries where female circumcision continues to be practiced, the dearth of work on this question is somewhat perplexing.

Prior Studies

3 published studies were identified which looked at the association between female circumcision and HIV infection;

All 3 studies were conducted in the Kilimanjaro region of Tanzania

- S.E.Msuya et al, 2002, Tropical Medicine and Intl Health

  0.64 [95% CI = 0.26<RR<1.57]; N=379

- S.H.Kapiga et al, 2002, JAIDS

  1.29 [95% CI =0.88<RR<1.90];N=312

- E.Klouman et al, 2005, Tropical Medicine and Intl Health

  1.19 [95% CI=0.45<RR<3.16];N=392

Tanzania HIV/AIDS Indicator Survey

- All protocols were reviewed and given ethical clearance by the National Institute for Medical Research (NIMR)
- A nationally representative probability sample of households was selected, excluding Zanzibar, which had recently been similarly surveyed
- Data collection took place from December 2003-March 2004 and was conducted by trained interviewers, all of whom were nurses from the Ministry of Health

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- Participants aged 15-49 were interviewed and asked to give informed consent for the collection of capillary blood by finger-prick for HIV testing
- All participants were offered free VCT at their closest center regardless of their consent
- For participants consenting to the procedure, a set of unique barcoded labels was used to provide an anonymous link

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- HIV testing was conducted at the national reference laboratory at Muhimbili University College of Health Sciences
- Cleaned questionnaire data was anonymously linked to results from the HIV testing using the barcodes after the destruction of the end pages of the questionnaires

Response Rates

Households selected:	6901
…interviewed	6499
…response rate	98.5%
Eligible women	7154
…interviewed	6863
…response rate	95.9%
…interview & HIV test result	6061
…response rate for both	84.7%

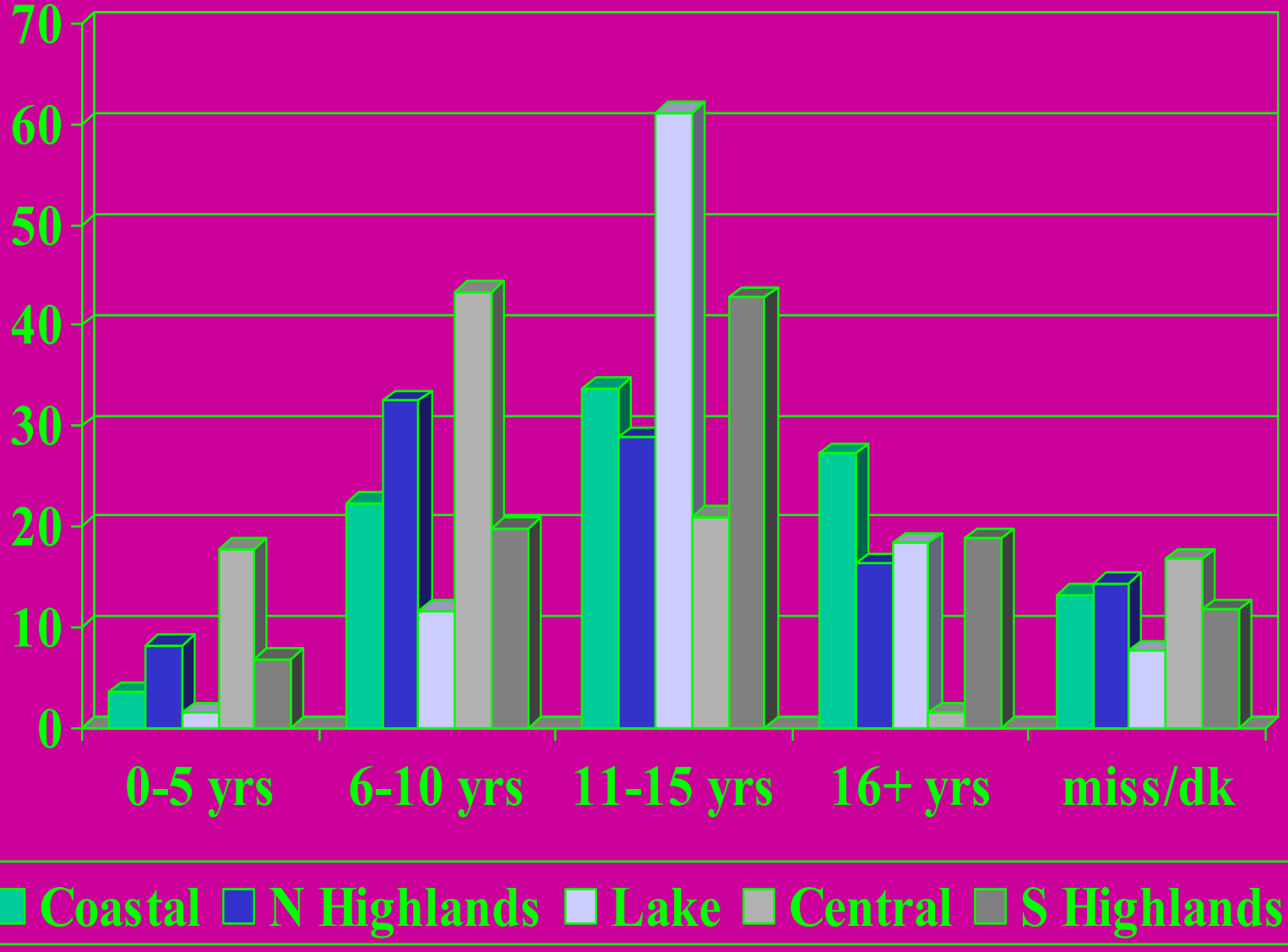
Distribution of reported female circumcision

- The highest reported rates of female circumcision were found in the Northern regions of Tanzania bordering Kenya, and in the regions directly south of those, ranging from 20% in Iringa to 73% in Manyara. These adjacent regions hence form a central belt from North to South.
- Other than in the capital city of Dar es Salaam (7%), the rate did not exceed 3% elsewhere in the country
- Ethnicity was not collected but may explain the regional clustering wrt female circumcision rates.

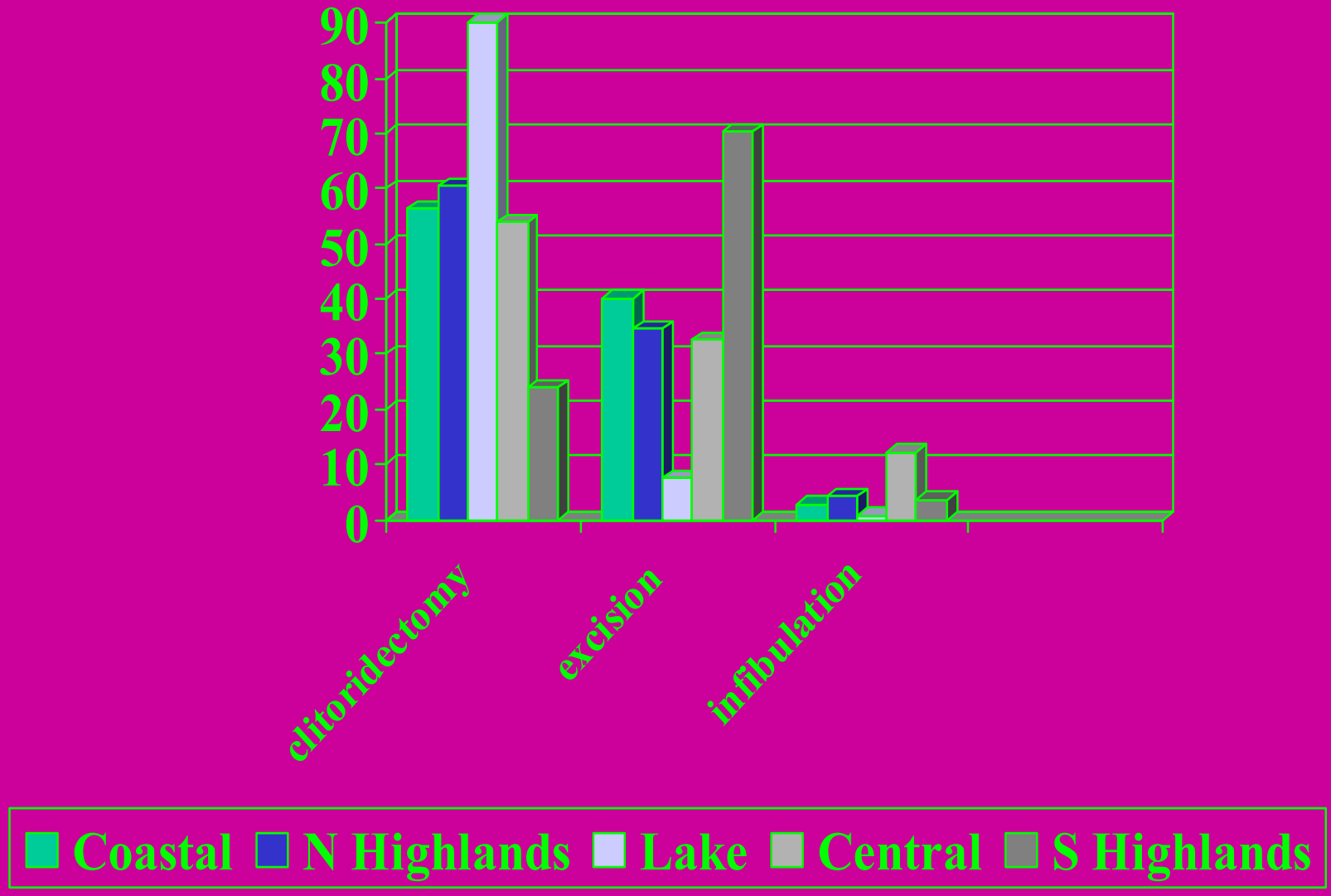
Age at time of circumcison, type of procedure, and practitioner

- Age at time of circumcision, type of procedure, and practitioner were not collected in the 2003-04 THIS, but were included in the 1996 DHS
- 74% of women in 1996 who self-reported having been circumcised said that the procedure was performed by a “circumcision practitioner” (91% in Lake zone)
- Doctors or trained nurses/midwives were most frequently reported by women in the Northern Highlands (6.9%)
- The next 2 slides show distributions of age and type by zone

Age at circumcision by zone



Type of procedure by zone



Distribution of female HIV infection

- HIV infection among women aged 15-44 ranged from 2.0-15.2% by region
- Among the 10 (of 21) regions with the highest reported female circumcision rates (>=20%), only 4 were among the 10 regions with the highest female HIV infection rates
- The regions with female HIV infection rates >10% were Mbeya, Iringa, Dar es Salaam, and Pwani

Potential confounders available and examined

Demographic characteristics

- Region
- Household wealth index
- Age
- Educational attainment
- Occupation
- Time in current residence
- Religion

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Marriage and sexual activity

- Age at sexual debut
- Age when began cohabiting
- Currently married or living with partner
- Number of wives of husband/partner
- Lifetime sex partners
- Sex partners in last 12 months
- Use of alcohol during recent sexual liasons
- Ability to say “no” to having sex with recent partners

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Symptoms of sexually transmitted diseases

- Genital sore or ulcer in last 12 months
- Bad smelling abnormal discharge in last 12 months

Potential exposure to contaminated blood

- Any injection in last 12 months
- Any blood transfusion in last 12 months

Methods

- The χ^2 test of association was used to examine the bivariate relationships between potential HIV risk factors with both circumcision and HIV serostatus
- Logistic regression was used to reduce the model to those factors remaining statistically significantly associated with HIV serostatus and to adjust circumcision status for those factors
- All analyses were performed using the latest version of the Statistical Analysis System (SAS)

Results

The crude relative risk of HIV infection among women reporting to have been circumcised versus not circumcised was

0.51 [95% CI =0.38<RR<0.70]

The power (1 – ß) to detect this difference is 99%

Logistic Regression Models

- Each variable that was statistically significant in the simple bivariate analyses was added to a separate simple logistic regression model to predict HIV serostatus, together with circumcision status
- Additional logistic models were run which combined those variables which remained significant in their individual models, together with circumcision status
- Models were further restricted to include only those women who had ever been sexually active
- A final model was selected in which all variables remain statistically significant

Final Logistic Regression Model n=5284 ever sexually active women

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Effect	OR estimate	LL 95% CI	UL 95% CI
Circumsized	0.60	0.41	0.88
Genital ulcer in last 12 mos	2.20	1.28	3.77

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Effect	OR estimate	LL 95% CI	UL 95% CI
Regional zone			
Central (ref).	1.00		
Northern highlands	1.27	0.72	2.25
Coastal	1.19	0.69	2.07
Southern	0.87	0.48	1.59
Southern highlands	2.88	1.63	5.09
Lake	0.99	0.56	1.73

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Effect	OR estimate	LL 95% CI	UL 95% CI
HH wealth index quintile			
1st (lowest)	1.00		
2nd	1.33	0.86	2.05
3rd	1.83	1.21	2.76
4th	3.31	2.25	4.86
5th (highest)	4.13	2.78	6.15

(continued)

Effect	OR estimate	LL 95% CI	UL 95% CI
Age (years)			
15-19 (ref.)	1.00		
20-24	2.06	1.17	3.63
25-29	2.58	1.46	4.56
30-34	4.07	2.30	7.20
35-39	2.82	1.56	5.12
40-44	2.62	1.40	4.89
45-49	1.62	0.81	3.25

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Effect	OR estimate	LL 95% CI	UL 95% CI
Lifetime sex partners			
1 (ref.)	1.00		
2	2.25	1.64	3.08
3	2.54	1.80	3.59
4	3.43	2.23	5.28
5	3.26	2.17	4.89
6-10	3.47	1.76	6.87

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Effect	OR estimate	LL 95% CI	UL 95% CI
Union status			
In 1st union (ref.)	1.00		
Never in union	1.53	1.04	2.24
In 2+ union	1.82	1.33	2.50
In 1 prior union	3.57	2.65	4.81
In 2+ prior unions	3.23	2.00	5.21

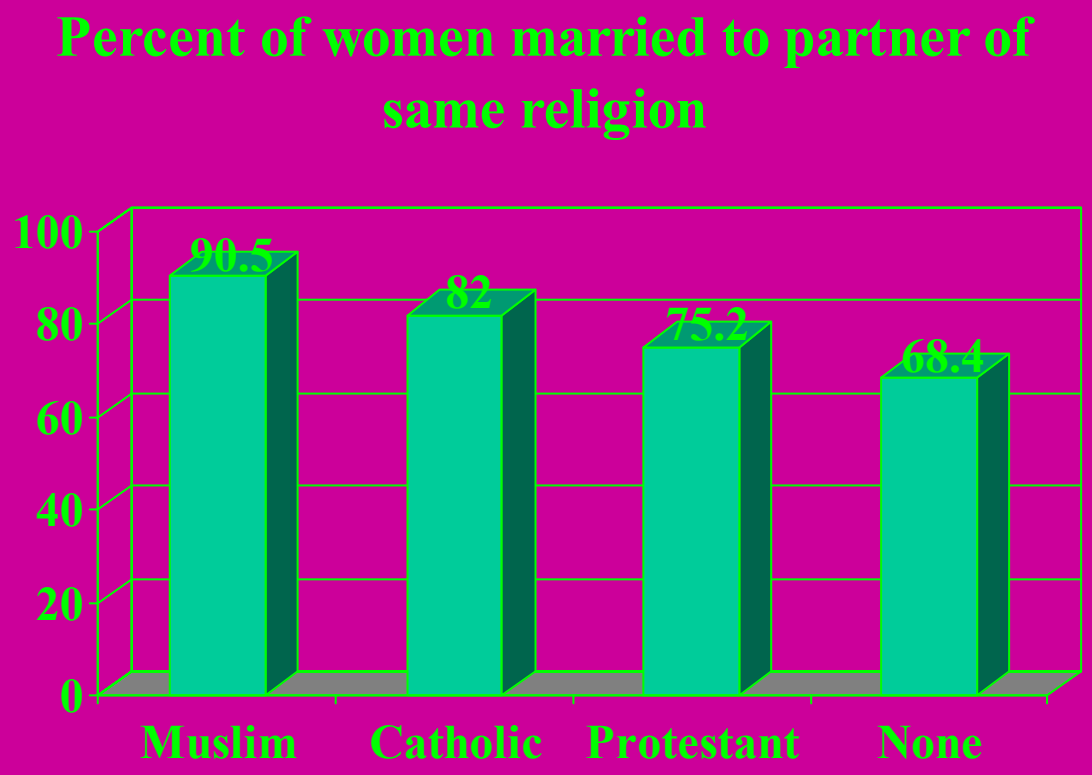
Discussion

- The surprising and perplexing significant inverse association between reported female circumcision and HIV seropositivity remained highly statistically significant in the final logistic regression model, despite the presence of other significant potential confounders, namely, geographic zone, household wealth index, woman´s age, lifetime sex partners, and current/past union status
- Some additional analyses were undertaken using those women for whom a male partner was interviewed and could be linked (n=2305)

Couples analysis (male x female)

Factor examined	RR estimate that both partners are + for the factor	LL 95% CI	UL 95% CI
HIV positive	11.6	8.5	15.8
Circum-cised	7.1	5.0	10.3
Abnormal discharge	5.4	3.3	9.0
Genital ulcer	11.7	6.9	19.9

Muslim women are more likely than other women to be married to a partner of the same religion



Relative Risk of HIV infection for the Female Partner by circumcision status

Comparison made	RR estimate	LL 95% CI	UL 95% CI
Both circ vs male only	0.56	0.33	0.97
Both circ vs neither	0.55	0.31	0.96
Male circ vs neither	0.97	0.66	1.42

Discussion continued

- The couples analysis also suggests a protective effect, real or not, of female circumcision
- There are several important risk factors which were not collected in the 2003-04 THIS which might be explanatory confounders of this perplexing conundrum, including ethnic group, age at time of circumcision and type of circumcision
- In 6 of the 10 regions with the highest female circumcision rates, the HIV seroprevalence among males is <5%, and is <3% in 3 of them. In such cases, a lower transmission risk may be an explanatory confounder.

Conclusions

- The surprising and perplexing significant inverse association between reported female circumcision and HIV seropositivity has not been explained by other variables available and examined in these analyses
- As no biological mechanism seems plausible, we conclude that it is due to irreducible confounding
- Anthropological insights on female circumcision as practiced in Tanzania may shed light on this conundrum

Recommendations

- Similar analyses are needed from other countries to determine if this association holds elsewhere.
- It is an understatement to say that further research is warranted.

Thank you for your attention !