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Corresponding Author:
Dr. Devon D Brewer,
Director, Interdisciplinary Scientific Research, P.O. Box 15110, 98115 - United States of America

Submitting Author:
Dr. Devon D Brewer,
Director, Interdisciplinary Scientific Research, P.O. Box 15110, 98115 - United States of America

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Abstract

Background: In sub-Saharan Africa, significant numbers of children with seronegative mothers are HIV infected. Similarly, substantial proportions of African youth who have not had sex are infected with HIV. These findings imply that some African children and youth acquire HIV through blood exposures in unhygienic healthcare, cosmetic care, and rituals. In prior research, male and female Kenyan, Lesothoan, and Tanzanian adolescents and virgins who were circumcised were more likely to be infected with HIV than their uncircumcised counterparts.

Methods: I examined the association between male circumcision, scarification, and HIV infection in Mozambican children and youth with data from the 2009 Mozambique AIDS Indicator Survey. I excluded from analysis children under age 12 who had HIV seropositive biological mothers. I coded children and youth as exposed to circumcision or scarification only if it had occurred within the prior 10 years.

Results: Circumcised and scarified children and youth were two to three times more likely to be infected with HIV than children and youth who had not been circumcised or scarified, respectively. Circumcision and scarification were each associated with HIV infection for both virgins and sexually experienced youth. Males circumcised by medical doctors were almost as likely to be infected as those circumcised by traditional circumcisers. Circumcision and scarification were also independently associated with HIV infection in males.

Conclusions: To determine modes of HIV transmission with confidence, researchers must employ more rigorous research designs than have been used to date in sub-Saharan Africa. In the meantime, Mozambicans and other Africans should be warned about all risks of blood-borne HIV transmission, including scarification and medical and traditional circumcision, and informed about how these risks can be avoided.

Introduction

Since HIV was first recognized, researchers and clinicians have regularly reported significant numbers of children in sub-Saharan Africa with horizontally acquired HIV infection [1-5]. In recent national probability sample household serosurveys in Swaziland (2006-2007) and Uganda (2004-2005), 16-20% of HIV infected children had seronegative mothers [3,6-8]. Similarly, a substantial proportion as high as 5.5% in some countries of adolescent and young adult virgins in sub-Saharan Africa are infected with HIV [9-11].

Some African children and youth may be exposed to HIV and other blood-borne pathogens through circumcision and scarification [12]. In sub-Saharan Africa, traditional and medical circumcision are often conducted unhygienically, and serious complications, including death, are not uncommon [9,13-17]. In fact, male and female virgins and adolescents in Kenya, Lesotho, and Tanzania who had been circumcised (generally in puberty or later) were several times more likely to be HIV infected than their uncircumcised counterparts. Other diverse blood exposures are associated with incident and prevalent HIV infection in children and adults in sub-Saharan Africa, independent of sexual behaviors [3,11,18-22].

Data from the 2009 Mozambique AIDS Indicator Survey (AIS) [23] allow a detailed examination of the links between male circumcision, scarification, and HIV infection in children and youth. To my knowledge, scarification has not been previously studied in relation to HIV infection in children. The 2009 Mozambique AIS also has a unique combination of data on age at exposure, circumciser type, and biological mother's serostatus.

The group nature of male circumcision and scarification has been noted for several ethnic groups in Mozambique [24-26]. Just as with circumcision, scarification in Mozambique may often be done in unhygienic circumstances and involve reused and unsterilized cutting instruments [27]. Unhygienic circumcision and scarification may lead to HIV transmission if a cutting instrument, provider's fingers or hands, other sharps, or materials applied to wounds

are contaminated with HIV infected blood. Traditional male circumcision in Mozambique is done as part of initiation rites, while scarification reportedly is done to express ethnic identity, signify passage into adulthood, or beautify the scarified person [28]. Thus, in Mozambique, children and youth are not circumcised or scarified in response to illness symptoms.

Methods

2009 Mozambique AIDS Indicator Survey (AIS) data

In the 2009 Mozambique AIS, the household participation rate was 99%, and 95% of eligible women and 90% of eligible men participated [23]. Ninety-three percent of respondents age 12-19 and 87% of children between ages 0 and 11 years provided dried blood spot specimens for HIV testing. HIV serostatus was determined with an enzyme linked immunosorbent assay (ELISA) test and confirmed by a different ELISA test. Specimens with discrepant ELISA results were confirmed by a further ELISA test. The 2009 Mozambique AIS data and documentation are available at http://www.measuredhs.com.

A parent or caretaker responded on behalf of their children under age 12. Adolescents and youth age 12 to 19 responded for themselves. Male respondents were asked whether they were circumcised, and parents reporting for boys were asked whether the boys were circumcised. Follow-up questions focused on the type of circumciser (medical doctor or traditional circumciser) and age at circumcision. All adolescent and adult respondents were asked whether they had received scarification or tattoos (as scarification is sometimes called in Mozambique), and parents and caretakers were asked whether their children had received scarification or tattoos. One follow-up question focused on age at scarification. All respondents age 12 and older were asked whether they had ever had sex; parents and caretakers were not asked whether their children under age 12 had ever had sex.

The very large majority of HIV infected children do not survive even 5 years after seroconversion without treatment [4]. Most infected and untreated adults also do not survive 10 years after seroconversion [29]. The questions on age at circumcision and scarification therefore provide crucial data, because potential exposures to HIV are only meaningfully assessed for periods during which some infected persons can be expected to survive. Therefore, I coded individuals as exposed to circumcision only if it had occurred within the previous 10 years. I coded exposure to scarification similarly. For some individuals, age at circumcision/scarification was coded in the AIS as during infancy/before age 5. In such cases, I treated age at circumcision/scarification as age 4 years in my calculation of time since the exposure.

Statistical analysis

I included all adolescents and youth age 12 to 19 in analysis. I also included children age 0 to 11 in analysis if their biological mothers were HIV seronegative and reported on their behalf. The inclusion criteria for children ensure that vertically-infected children were excluded. I computed cross-classifications, odds ratios, and the associated 95% confidence intervals (CI) for the relationships between circumcision, scarification, sexual experience, and HIV status. For the relationship between circumcision and scarification, I also calculated the Pearson (phi) correlation. In addition, for males, I computed the adjusted odds ratios from the multiple logistic regression with HIV status as the dependent variable and circumcision and scarification as the independent variables. For analyses involving the sexual experience variable, I coded children under age 12 as virgins. I used SPSS 7.5 (SPSS Inc., Chicago, USA), VassarStats (http://faculty.vassar.edu/lowry/VassarStats.html), RLPlot 1.4 (rlplot.sourceforge.net), and programs I wrote in QuickBasic (Microsoft Corporation, Redmond, USA) to perform the analyses.

Results

One and one-half percent of 3,371 males age 0 to 19 were HIV positive, and 2.5% of 3,405 females age 0 to 19 were HIV positive. Eighteen (0.6%) children under age 12 who had HIV negative biological mothers were HIV infected. These horizontally-infected children comprised 31% (18/58) of all HIV infected children under age 12 whose biological mothers' serostatuses were known.

Circumcised boys and youth were circumcised at ages ranging from infancy to their late teens. Every region is represented among circumcised males.

Circumcised boys and youth were twice as likely to be infected with HIV as uncircumcised boys and youth (Table 1). This association was similar in strength for virgins and sexually experienced males, respectively. Males circumcised by medical doctors were almost as likely to be HIV infected (2.6%, 6/230) as males circumcised by traditional circumcisers (3.3%, 15/452; OR 1.28, 95% CI 0.49-3.35). There was no meaningful difference in age at circumcision by the type of

circumciser (medical doctor or traditional circumciser; data not shown).

Scarified children and youth of both sexes were scarified at ages ranging from infancy to their late teens. Every region is represented among scarified females, and every region except Manica province is represented among scarified males.

Scarified children and youth were about three times more likely to be HIV infected than children and youth who had not been scarified (Tables 2 and 3). This relationship was of similar strength for virgin and sexually experienced males, respectively. Scarified virgin females were as likely to be infected with HIV as sexually experienced females. However, sexually experienced females who had been scarified were more than twice as likely to be HIV infected as sexually experienced females who had not been scarified. In sexually experienced females aged 15 to 19, the odds ratio for the association between scarification and HIV infection, adjusted for number of sex partners in the last 12 months, was 2.42 (95% CI, 1.11-5.29)

Circumcision and scarification were negligibly associated in males (r = .01; OR 1.09, 95% CI 0.66-1.78). In a multiple logistic regression (n = 3,293), circumcision (AOR 2.88, 95% CI 1.62-5.11) and scarification (AOR 4.00, 95% CI 1.54-10.4) were independently associated with HIV infection. Only two HIV infected males had been both circumcised and scarified.

Discussion

In the 2009 Mozambique AIDS Indicator Survey, circumcised and scarified children and youth were two to three times more likely to be infected with HIV than children and youth who had not been circumcised or scarified, respectively. Circumcision and scarification were associated with HIV infection for both virgins and sexually experienced youth. Males circumcised by medical doctors were almost as likely to be infected as those circumcised by traditional circumcisers. Circumcision and scarification were also independently associated with HIV infection in males.

These results are consistent with prior research showing that circumcised youth and virgins in Kenya, Lesotho, and Tanzania were more likely to be infected than their uncircumcised counterparts [9] (Figure 1). In these countries, circumcision traditionally has been done in adolescence or young adulthood. Despite the consistency of these relationships across southern and eastern Africa, circumcision and scarification can account, at most, for a relatively small fraction of horizontally-acquired HIV infections in children and youth. This implies that other blood exposures, such as those in healthcare, likely account for the rest [3,22].

To my knowledge, evaluations of mass male circumcision initiatives in clinical settings in sub-Saharan Africa since 2007 have not documented the hygiene of the procedures or involved re-testing patients for HIV and other blood-borne pathogens in the months after circumcision as a check for potential nosocomial transmission [30-31]. Such monitoring would seem to be warranted given the generally high rate of complications for medical male circumcision in sub-Saharan Africa [13,15] and the very high HIV incidence among circumcised men in the month following their circumcisions (with most infections in men reporting no sexual exposures) in one randomized trial [32-33]. Circumcision initiatives involving traditional circumcision have received more scrutiny with respect to safety. For example, traditional circumcisers in Guateng province, South Africa, received a 5 day training that included an emphasis on safer procedures and infection control [16]. Despite this, 7% of directly observed circumcisions after training involved reuse of an unsterilized knife and 25% of circumcised youth experienced moderate to severe bleeding.

Even if hygienic standards tend to be higher in clinical than traditional settings, medical circumcision may involve as much overall risk for HIV transmission as traditional circumcision, because medical circumcision involves more invasive procedures (anaesthetic injections, suturing) not typically done in traditional circumcision. Medical facilities are also locations where many other invasive procedures are done on other patients, which may increase the chances that equipment, supplies, surfaces, and providers are blood-contaminated. The similar HIV prevalence in Mozambican children and youth circumcised in medical and traditional settings and the similar rates of adverse events in directly observed medical and traditional settings in Kenya [13] are consistent with roughly equal HIV acquisition risk from medical and traditional circumcision in sub-Saharan Africa.

As revealed in recent assessments, medical facilities throughout sub-Saharan Africa routinely lack the supplies,equipment, utilities, staff training, and staff supervision necessary for performing even basic invasive procedures, much less surgery, in a reliably safe and hygienic way [34-38]. In Uganda in 2007, 3% of observed injections in healthcare facilities were not done with a new sterile needle and syringe, despite providers knowing they were being observed for their compliance with injection safety [38]. These circumstances are consistent with the finding that most

of the dozens of Kenyan clinics assessed in 1999 and 2004 lacked the trained staff, supplies, and equipment (including sterilizers) for performing male circumcision safely [13,39]. Indeed, local health officials in Tanzania interviewed in 2008-9 emphasized that Tanzania lacked the medical infrastructure, including trained professionals, infection control practices, and supplies for ensuring safe and hygienic male circumcision [40].

To determine modes of HIV transmission with confidence, researchers must employ more rigorous research designs than have been used to date in sub-Saharan Africa. Such designs involve assessing blood and sexual exposures comprehensively in incident HIV cases and controls, tracing their contacts corresponding to these exposures, and sequencing infected person's HIV isolates [41-43]. In the meantime, Mozambicans and other Africans should be warned about all risks of blood-borne HIV transmission, including scarification and medical and traditional circumcision, and informed about how these risks can be avoided [44-46].

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References

1. Gisselquist D, Potterat JJ, Brody S. HIV transmission during paediatric health care in sub-Saharan Africa: risks and evidence. S Afr Med J 2004;94:109-116.

2. Mitha M, Parboosing R, Nzimela A. HIV-negative mother with an HIV-infected child: A diagnostic dilemma. S Afr Med J 2009;99:513-514.

3. Okinyi M, Brewer DD, Potterat JJ. Horizontally acquired HIV infection in Kenyan and Swazi children. Int J STD AIDS 2009;20:852-857.

4. Reid S.: Non-vertical HIV transmission to children in sub-Saharan Africa. Int J STD AIDS 2009;20:820-827.

5. Slogrove S, Rabie H, Cotton M. Non-vertical transmission of HIV in children: more evidence from the Western Cape, South Africa. Poster presented at the 6th International AIDS Society Conference on HIV Pathogenesis, Treatment, and Prevention, July, 2011, Rome. Available at: http://pag.ias2011.org/EPosterHandler.axd/aid=2125.

6. Central Statistical Office (CSO) (Swaziland), Macro International Inc. Swaziland Demographic and Health Survey 2006-07. Central Statistical Office and Macro International Inc., Mbane; 2008.

7. Ministry of Health (MOH) [Uganda], ORC Macro. Uganda HIV/AIDS Sero-behavioural Survey 2004-2005. MOH and ORC Macro, Calverton, Maryland, USA; 2006.

8. Brewer DD, Gisselquist D, Brody S, Potterat JJ. Investigating iatrogenic HIV transmission in Ugandan children. J Acquir Immune Defic Syndr 2007;45:253-254.

9. Brewer DD, Potterat JJ, Roberts JM, Brody S. Male and female circumcision associated with prevalent HIV infection in virgins and adolescents in Kenya, Lesotho, and Tanzania. Ann Epidemiol 2007;17:217-226.

10. Gavin L, Galavotti C, Dube H, McNaghten AD, Murwirwa M, Khan R, St Louis M. Factors associated with HIV infection in adolescent females in Zimbabwe. J Adolesc Health 2006;39:596.e11-8.

11. Gisselquist D. Points to consider: Responses to HIV/AIDS in Africa, Asia, and the Caribbean. Adonis and Abbey Publishers Ltd, London; 2007. Available at: http://sites.google.com/site/davidgisselquist/pointstoconsider.

12. Ayeni OA, Ayeni OO, Jackson R. Observations on the procedural aspects and health effects of scarification in sub-Saharan Africa. J Cutan Med Surg 2007;11:217-221.

13. Bailey RC, Egesah O, Rosenberg S. Male circumcision for HIV prevention: a prospective study of complications in clinical and traditional settings in Bungoma, Kenya. Bull World Health Organ 2008;86:669-677.

14. Meel BL. Traditional male circumcision-related fatalities in the Mthatha area of South Africa. Med Sci Law 2010;50:189-191.

15. Osifo OD, Oriaifo IA. Circumcision mishaps in Nigerian children. Ann Afr Med 2009;8:266-270.

16. Peltzer K, Kanta X, Banyini M. Evaluation of a safer male circumcision training programme for Ndebele traditional surgeons and nurses in Gauteng, South Africa: using direct observation of circumcision procedures. Afr J Tradit Complement Altern Med 2010;7:153-159.

17. Wilcken A, Keil T, Dick B. Traditional male circumcision in eastern and southern Africa: a systematic review of prevalence and complications. Bull World Health Organ 2010;88:907-914.

18. Deuchert E, Brody S. The role of health care in the spread of HIV/AIDS in sub-Saharan Africa: evidence from Kenya. Int J STD AIDS 2006;17:749-752.

19. Deuchert E: Maternal health care and the spread of AIDS in Burkina Faso and Cameroon. World Health

Pop 2007;9:55-72.
20. Peters EJ, Brewer DD, Udonwa NE, Jombo GT, Essien OE, Umoh VA, Otu AA, Eduwem DU, Potterat JJ. Diverse blood exposures associated with incident HIV infection in Calabar, Nigeria. Int J STD AIDS 2009;20:846-851.
21. St. Lawrence JS, Klaskala W, Kankasa C, West JT, Mitchell CD, Wood C. Factors associated with HIV prevalence in a pre-partum cohort of Zambian women. Int J STD AIDS 2006;17:607-613.
22. Vaz P, Pedro A, Le Bozec S, Macassa E, Salvador S, Biberfeld G, Blanche S, Andersson S. Nonvertical, nonsexual transmission of human immunodeficiency virus in children. Pediatr Infect Dis J 2010;29:271-274.
23. Instituto Nacional de Saúde (INS), Instituto Nacional de Estatística (INE), ICF Macro. Inquérito Nacional de Prevalência, Riscos Comportamentais e Informação sobre o HIV e SIDA em Moçambique 2009. INS, INE, and ICF Macro, Calverton, Maryland, USA; 2010.
24. Johnston T. Secret initiation songs of the Shangana-Tsonga circumcision rite: A textual and musical analysis. J Am Folklore 1974;87:328-339.
25. Schneider B. Body decoration in Mozambique. African Arts 1973;6 (2):26-31,92.
26. Stoner J. Makonde. Rosen Publishing Group, New York; 1995.
27. Arnfred S. Conceptualizing gender (paper 28). Feminist Research Centre in Aalborg, Aalborg University, Denmark; 1995.Available at: http://vbn.aau.dk/fbspretrieve/14136448/28.pdf.
28. Gengenbach H. Binding memories: women as makers and tellers of history in Magude, Mozambique. Available at: http://www.gutenberg-e.org/geh01/main.html.
29. Morgan D, Mahe C, Mayanja B, Okongo JM, Lubega R, Whitworth JA. HIV-1 infection in rural Africa: is there a difference in median time to AIDS and survival compared with that in industrialized countries AIDS 2002;16:597-603.
30. Lissouba P, Taljaard D, Rech D, Doyle S, Shabangu D, Nhlapo C, Otchere-Darko J, Mashigo T, Matson C, Lewis D, Billy S, Auvert B. A model for the roll-out of comprehensive adult male circumcision services in African low-income settings of high HIV incidence: the ANRS 12126 Bophelo Pele Project. PLoS Med 2010;7:e1000309.
31. Auvert B, Taljaard D, Rech D, Lissouba P, Singh B, Shabangu D, Nhlapo C, Otchere- Darko J, Mashigo T, Phatedi G, Taljaard R, Tsepe M, Chakela M, Mkhwanazi A, Ntshangase P, Billy S, Lewis D. Effect of the Orange Farm (South Africa) male circumcision roll-out (ANRS-12126) on the spread of HIV. Abstract WELBC02, 6th International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention, Rome, July, 2011. Available at: http://pag.ias2011.org/Abstracts.aspx/AID=4792.
32. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, Williams CFM, Campbell RT, Ndinya-Achola JO. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. Lancet 2007;369:643-656.
33. Gisselquist D. HIV infections as unanticipated problems during medical research in Africa. Account Res 2009;16:199-217.
34. National Coordinating Agency for Population and Development (NCAPD) [Kenya], Ministry of Medical Services (MOMS) [Kenya], Ministry of Public Health and Sanitation (MOPHS) [Kenya], Kenya National Bureau of Statistics (KNBS), ICF Macro. Kenya Service Provision Assessment Survey 2010. National Coordinating Agency for Population and Development, Ministry of Medical Services, Ministry of Public Health and Sanitation, Kenya National Bureau of Statistics, and ICF Macro, Nairobi; 2011.
35. Ministry of Health and Social Services (MoHSS) [Namibia], ICF Macro. Namibia Health Facility Census 2009. MoHSS and ICF Macro, Windhoek; 2010.
36. National Institute of Statistics (NIS) [Rwanda], Ministry of Health (MOH) [Rwanda], Macro International Inc. Rwanda Service Provision Assessment Survey 2007. NIS, MOH, and Macro International Inc., Calverton, Maryland, USA; 2008.
37. National Bureau of Statistics (NBS) [Tanzania], Macro International Inc. Tanzania Service Provision Assessment Survey 2006. National Bureau of Statistics and Macro International Inc., Dar es Salaam; 2007.
38. Ministry of Health [Uganda], Macro International Inc. Uganda Service Provision Assessment Survey 2007. Ministry of Health and Macro International Inc., Kampala; 2008.
39. Mattson CL, Muga R, Poulussen R, Onyango T, Bailey RC. Feasibility of medical male circumcision in Nyanza Province, Kenya. East Afr Med J 2004;81: 230-235.
40. Mwanga JR, Wambura M, Mosha JF, Mshana G, Mosha F, Changalucha J. Policy environment and male circumcision for HIV prevention: findings from a situation analysis study in Tanzania. BMC Public Health 2011;11:506.
41. Brewer DD, Rothenberg RB, Potterat JJ, Brody S, Gisselquist D. HIV epidemiology in sub-Saharan Africa: rich in conjecture, poor in data. Int J STD AIDS 2004;15:63-65.
42. Brody S, Potterat JJ. Establishing valid AIDS monitoring and research in countries with generalized epidemics. Int J STD AIDS 2004;15:1-6.

43. Brewer DD, Hagan H, Sullivan DG, Muth SQ, Hough ES, Feuerborn NA, Gretch DR. Social structural and behavioral underpinnings of hyperendemic Hepatitis C virus transmission in drug injectors. J Infect Dis 2006;194:764-772.
44. Gisselquist D, Friedman E, Potterat JJ, Minkin SF, Brody S. Four policies to reduce HIV transmission through unsterile health care. Int J STD AIDS 2003; 14:717-722.
45. Correa M, Gisselquist D, Gore DH. Blood-borne HIV: risks and prevention. Orient Longman Private Limited, Chennai; 2008.
46. Gisselquist D, Correa M: Don't get stuck with HIV: how to protect yourself during health care and cosmetic procedures. 2011. Available at: http://dontgetstuck.wordpress.com/downloads/.

Illustrations

Illustration 1

Table 1. Association between circumcision and HIV infection in males age 0-19, Mozambique, 2009

	HIV negative	HIV positive
All males		
Not circumcised	98.9 (2592)	1.1 (29)
Circumcised	97.0 (671)	3.0 (21)
OR (95% CI)	2.80 (1.59-4.94)	
Virgin males[1]		
Not circumcised	99.0 (2172)	1.0 (23)
Circumcised	97.8 (406)	2.2 (9)
OR (95% CI)	2.09 (0.96-4.56)	
Sexually experienced males[1]		
Not circumcised	98.6 (420)	1.4 (6)
Circumcised	95.7 (264)	4.3 (12)
OR (95% CI)	3.18 (1.18-8.58)	

Note: Cells show row percentages with frequencies in parentheses.

[1]One adolescent boy had missing data on sexual experience.

Illustration 2

Table 2. Association between scarification and HIV infection in males age 0-19, Mozambique, 2009

	HIV negative	HIV positive
All males		
Not scarified	98.6 (3203)	1.4 (44)
Scarified	94.8 (92)	5.2 (5)
OR (95% CI)	3.96 (1.53-10.2)	
Virgin males[1]		
Not scarified	98.9 (2560)	1.1 (29)
Scarified	95.8 (46)	4.2 (2)
OR (95% CI)	3.84 (0.89-16.6)	
Sexually experienced males[1]		
Not scarified	97.8 (642)	2.2 (15)
Scarified	93.9 (46)	6.1 (3)
OR (95% CI)	2.79 (0.78-9.99)	

Note: Cells show row percentages with frequencies in parentheses.

[1]One adolescent boy had missing data on sexual experience.

Illustration 3

Table 3. Association between scarification and HIV infection in females age 0-19, Mozambique, 2009

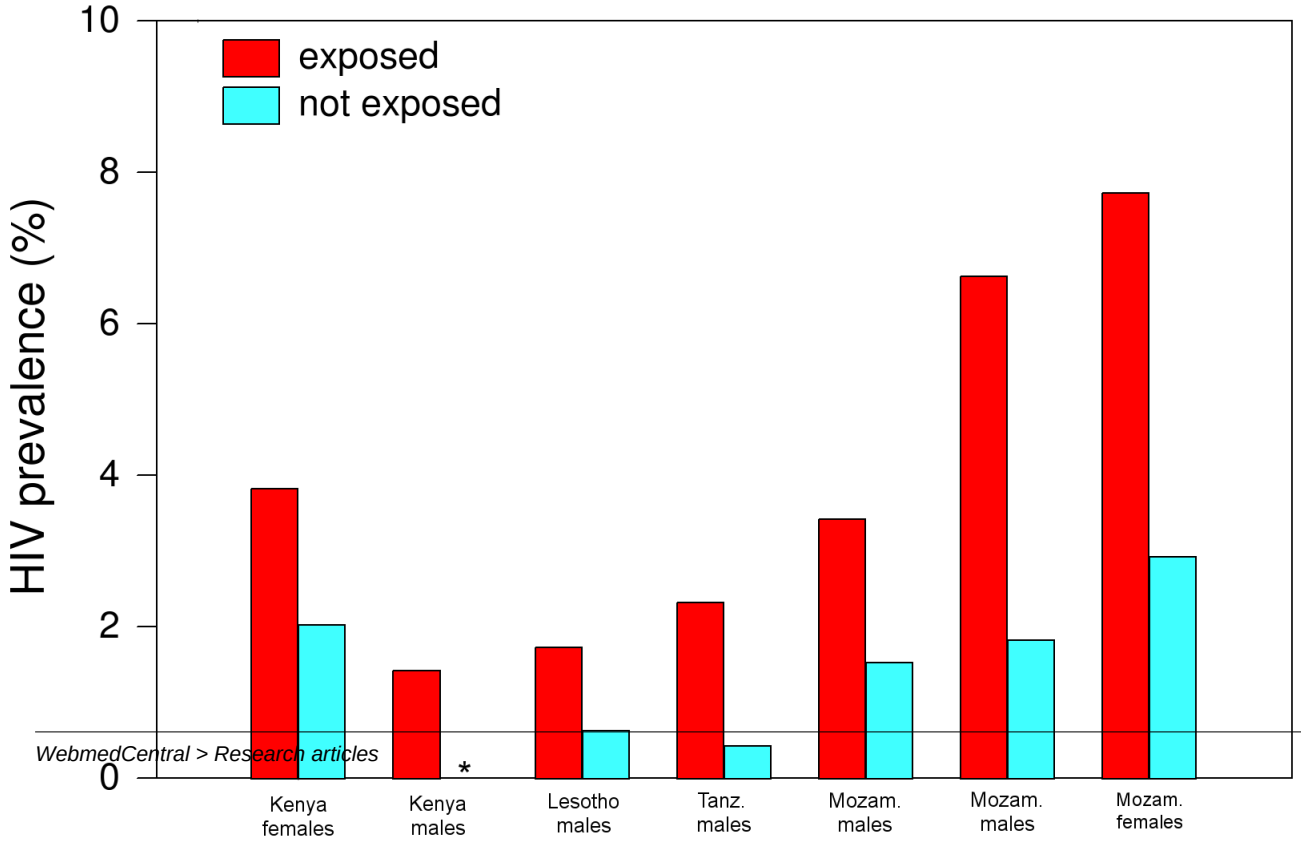
	HIV negative	HIV positive
All females		
Not scarified	97.7 (3135)	2.3 (74)
Scarified	93.0 (147)	7.0 (11)
OR (95% CI)	3.17 (1.65-6.10)	
Virgin females[1]		
Not scarified	98.9 (2466)	1.1 (27)
Scarified	98.9 (93)	1.1 (1)
OR (95% CI)	0.98 (0.13-7.31)	
Sexually experienced females[1]		
Not scarified	93.5 (658)	6.5 (46)
Scarified	84.4 (54)	15.6 (10)
OR (95% CI)	2.65 (1.27-5.54)	

Note: Cells show row percentages with frequencies in parentheses.

[1]Twelve adolescent girls had missing data on sexual experience.

Illustration 4

Figure 1. Higher prevalence of HIV in children and youth who have been circumcised or scarified, in four African countries (ages 15-17 for Kenya, Lesotho, and Tanzania; ages 0-19 for Mozambique)



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