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Understanding intra-vaginal and labia minora elongation practices among women heads-of-households in Zambézia Province, Mozambique

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Abstract

Background—Intra-vaginal drying and tightening and labia minora elongation are commonly practiced in some parts of southern Africa. We sought to capture data on these practices among women living in Zambézia province, Mozambique.

Methods—We gathered information from 3,543 female heads of household on >500 variables, including vaginal practices in 2014. Weighted percentages of survey responses are reported.

Results—Women who planned to use intra-vaginal tightening substances had 1.84 times higher odds of ever receiving an HIV test ($p<0.001$) and 1.40 times higher odds of at least one ANC visit attended during last pregnancy ($p=0.015$). Women who had or planned to undergo labia minora elongation had 2.61 times higher odds of receiving an HIV test in the past ($p<0.001$) and 1.60 times higher odds of attending at least one ANC visit during their last pregnancy ($p<0.001$). There was little evidence for a relationship between self-reported HIV status and anticipated use of intra-vaginal tightening substances ($p=0.21$). Current or anticipated participation in labia elongation showed a protective effect on HIV infection ($p=0.028$).

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Conclusion—Given documented associations between intra-vaginal substance use, vaginal infections, and HIV acquisition, understanding the prevalence of vaginal practices may be an essential component to addressing the epidemic.

Keywords

Intravaginal drying; Mozambique; HIV/AIDS; labia minora elongation

Introduction

Understanding the transmission of HIV and sexually transmitted infections (STI) in specific populations and geographic locations is critical for targeting effective strategies for disease prevention and control. The magnitude of risk for HIV and STI acquisition among women in sub-Saharan Africa (SSA) is unparalleled (World Health Organization 2011, Magadi 2013). In some parts of SSA, young women have an HIV prevalence eight times higher than men, and the gap in infection prevalence continues to widen (Rodrigo and Rajapakse 2010, Rodrigo and Rajapakse 2010, Stöckl, Kalra et al. 2013). Researchers postulate several hypotheses for this gender discrepancy including: early sexual debut among girls (Pettifor, Measham et al. 2004, Hallett, Lewis et al. 2007), genital inflammation due to untreated STIs (Freeman, Weiss et al. 2006, Boily, Baggaley et al. 2009, Masson, Passmore et al. 2015), bacterial vaginosis (BV) (Myer, Kuhn et al. 2005, Chersich and Rees 2008, Hilber, Francis et al. 2010, Low, Chersich et al. 2011, Cohen, Lingappa et al. 2012), intra-vaginal cleaning and tightening practices (Myer, Kuhn et al. 2005, Bagnol and Mariano 2008, Hilber, Francis et al. 2010, Turner, Morrison et al. 2010); and/or high incidence of sexual assault (Abrahams and Jewkes 2010). While all may be contributing factors, genital inflammation appears to be of primary significance (Masson, Passmore et al. 2015).

Intra-vaginal cleaning and tightening practices, has been a topic of discussion among scholars since the 1950s, if not earlier (Tobias 1957, Bagnol and Mariano 2008, Martin Hilber, Hull et al. 2009, Hilber, Francis et al. 2010, Larsen 2010, Hull, Hilber et al. 2011, Low, Chersich et al. 2011, Martinez Perez and Namulondo 2011, Francis, Lees et al. 2012, Hugo 2012, Francis, Baisley et al. 2013, Masese, McClelland et al. 2013). Common intra-vaginal practices include the insertion of herbs and other agents to tighten the vagina precoitally (Kun 1998, Martin Hilber, Hull et al. 2009, Turner, Morrison et al. 2010, Hull, Hilber et al. 2011) as well as soap and water to clean the vagina (McClelland, Lavreys et al. 2006, van de Wijgert, Morrison et al. 2006, Francis, Lees et al. 2012, Francis, Baisley et al. 2013, Masese, McClelland et al. 2013), both associated with increasing STI risk and delaying care for vaginal infections (Myer, Denny et al. 2004, Hilber, Chersich et al. 2007, Hilber, Francis et al. 2010, Low, Chersich et al. 2011, Francis, Baisley et al. 2013). There is evidence of the negative effect of intra-vaginal practices on reproductive tract health, specifically increased risk of bacterial vaginosis (van de Wijgert, Chirenje et al. 2000, van De Wijgert, Mason et al. 2000, Bradshaw, Morton et al. 2005, Demba, Morison et al. 2005, Myer, Kuhn et al. 2005, Hilber, Francis et al. 2010, Low, Chersich et al. 2011). Evidence regarding the influence that intra-vaginal drying or tightening practices have on HIV acquisition is mixed (Mann, Nzilambi et al. 1988, Dallabetta, Miotti et al. 1995, Kun 1998, Myer, Denny et al. 2004, McClelland, Lavreys et al. 2006, van de Wijgert, Morrison et al.

2006, Hilber, Francis et al. 2010, Alcaide, Mumbi et al. 2013, Francis, Baisley et al. 2013, Masson, Passmore et al. 2015), in part due to variable definitions used in defining when, where, and what substance a woman inserts into her vagina. A meta-analysis of 13 prospective cohort studies found women who insert products to dry or tighten the vagina had a 31% increased hazard of contracting HIV (Low, Chersich et al. 2011).

In contrast, labia minora elongation is typically practiced among girls at puberty initiation, under the supervision of older family members and generally completed before sexual initiation (François, Bagnol et al. 2012, Martínez Pérez, Mubanga et al. 2015). Labia minora elongation has commonly been practiced in central and northern Mozambique, but has experienced a recent resurgence of popularity in southern provinces (Arnfred 2011). The reproductive health risks of labia minora elongation are considered minor, limited to itching and irritation at the time of active stretching (Martinez Perez, Bagnol et al. 2012, Martínez Pérez, Tomás Aznar et al. 2014, Martínez Pérez, Mubanga et al. 2015). There is no evidence linking labia minora elongation to increased risk of STIs or HIV acquisition.

In some provinces in Mozambique, vaginal tightening and labia elongation are common. A 2012 study suggests that insertion of substances for drying and tightening as well as labia elongation were reported as 'currently practiced' by 60% and 65% of women in Tete Province, respectively (72% and 99%, respectively, reported having 'ever practiced') (Bagnol and Mariano 2008, Martin Hilber, Hull et al. 2009, Hull, Hilber et al. 2011). Mozambican women in Tete described vaginal drying and tightening as well as labia minora elongation practices as empowering, increasing perceived vaginal cleanliness and sexual pleasure for both her and her partner (Bagnol and Mariano 2008). Given local attitudes in Tete province and anecdotal evidence of vaginal drying and tightening practices in several districts in Zambézia province, we believed it important to investigate these practices further, including their association with individual characteristics, beliefs, HIV testing, antenatal care, and self-reported HIV status. If the act of engaging in vaginal drying, tightening or cleaning is empowering or a reflection of a women's ability to independently, it is possible that women who observe these practices have higher self-efficacy in other health behaviors. Currently, Friends in Global Health (FGH), a Vanderbilt University non-governmental organization providing health system support to the Ministry of Health, does not address the topic of vaginal drying or labia minora elongation in their education outreach programs as there is little empirical data describing the practices in the area or how these practices are associated with health behaviors (ANC and HIV testing) or health outcomes (self-reported HIV status). We sought to capture this information through a province-wide population-based household survey of adult women living in Zambézia Province.

Methods

Study Area

Zambézia Province (Figure 1) is home to 4.4 million people primarily from five ethnic groups (Chuabo, Macua-Lomwe, Manhaua, Merenge, and Senas) who speak 11 languages. It is one of Mozambique's poorest performing provinces in terms of health and development indicators—with low literacy rates, poor maternal and child health indices, high rates of tuberculosis, malnutrition, and the highest estimated total number of people living with HIV

in Mozambique (Ministério da Saúde and Instituto Nacional de Saude 2009, Audet, Burlison et al. 2010). Sexual and reproductive health indicators in Zambézia are also among the worst in the nation. Access to reproductive services is limited: only 5% of women use modern methods of contraception and the average fertility rate is 6.8 children per woman (Instituto Nacional de Estatística and Ministério da Saúde 2013). HIV is primarily transmitted via heterosexual vaginal sex in Mozambique (UNGASS 2010). HIV prevalence among pregnant women in the provincial capital of Quelimane was 28% in 2009, higher than most antenatal clinics nationwide (Grupo Técnico Multisectorial De Apoio À Luta Contra O Hiv/Sida Em Moçambique 2011). In addition, pregnant women had higher prevalence of syphilis (12%) than most clinical sites, often left undiagnosed and treated in rural areas (Grupo Técnico Multisectorial De Apoio À Luta Contra O Hiv/Sida Em Moçambique 2011).

Survey Data

Data was collected from 12 May to 15 June 2014. The design and implementation of the survey are detailed elsewhere (Victor, Blevins et al. 2014). A total of 255 enumeration areas (EA) were selected with probability proportional to size. Two samples were taken such that 3 districts (Namacurra, Morrumbala, and Alto Molócuè) were heavily sampled with 206 EA (Figure 1), with another 49 EAs being drawn from the remaining districts across Zambézia Province, for a total of 3,892 households. The ministry of health considers adults to be aged 16 or older, and this was an inclusion criterion for this study. Of the 3,892 households, only 3,543 (91%) of respondents reported her age and all were 16 or older. The entire sample is representative of Zambézia Province, and the concentrated sampling of three focal districts was done to increase precision of estimates for pre-post comparisons in that sample, while keeping survey costs lower by limiting the survey area. Fifteen household interviews were planned per EA. Interviews were conducted with female heads of household and covered various topics including socio-demographics; knowledge, attitudes, practices and access to health and HIV-related services and products; access to improved water and sanitation; nutrition; agricultural production; and vaginal drying/tightening and stretching practices (Victor, Blevins et al. 2014, Moon, Blevins et al. 2015).

Local authorities were notified prior to study initiation and none encountered any difficulty receiving approval. Fourteen teams consisting of a team leader and four interviewers (all female) collected the survey data with a mean survey completion time of 54 minutes (interquartile range, IQR: 39-88). All participants provided written informed consent (a fingerprint was sufficient for those who were unable to read and write). Consent forms were read aloud to each participant and a written copy was provided before the interview began. No one refused to participate. The protocol for data collection was approved by the Mozambican National Bioethics Committee for Health and the Institutional Review Board of Vanderbilt University.

Interviewer training

All interviewers were women. Interviewers were trained on ethical principles in research, interviewing techniques, and on the mobile phone technology used to capture data. Interviewers reviewed the questionnaire jointly to confirm understanding of each question and to discuss sensitive issues relating to the questions included about sex, gender-based

violence and other cultural norms. Training was conducted in Portuguese, with questionnaire testing and feedback in all local languages used in the survey (Elomwe, Echuabo, Cisená, Chinyanja, and Emakhuwa)

Statistical Methods

Vaginal drying/tightening and stretching practices were collected through a series of ten questions. Sociodemographic characteristics were summarized by practice, and p-values were calculated for the bivariate association using logistic regression with robust covariance to account for clustering. Categorical variables are reported as weighted percentages, with each observation being weighted by the inverse of the household sampling probability. Continuous variables are reported as weighted estimates of median (interquartile range).

To understand the potential association of vaginal drying/tightening and stretching practices with health, we considered three outcomes: 1) antenatal care during the last pregnancy, 2) HIV testing history, 3) self-reported HIV status. Two models were estimated for each outcome, including one for each vaginal practice as an exposure, and adjusting for: age, number of children under 5, education, HIV knowledge score, marital status, and ability to make decisions without husband. Multivariable logistic regression models were used with robust covariance to account for clustering of respondents within EA. The significance level for all testing was two-sided and set at 0.05. If there was evidence of non-linearity ($p < 0.10$) of continuous covariates, then that variable was modeled using a restricted cubic spline. Multiple imputation was used to account for missing survey responses in covariates. We used the Hmisc package in R which employed predictive mean matching to take random draws from imputation models; 10 imputation data sets were used in the analysis. We employed R-software 3.2 (www.r-project.org) for all data analyses.

Results

Of survey respondents, the median age (interquartile range, IQR) was 27 (22-34), ranging from 16 to 62 years. Most (68%) were officially married or in a common law relationship. Formal education was low, with a median (IQR) 3 (0- 5) years of completed education and a range of 0 to 15 years. Forty-three percent of female heads of households reported fluency in Portuguese. The median (IQR) household size was 5 (4 - 6) members. Surveys were conducted in five languages (as demanded by participants): Elomwe, Echuabo, Cisená, and Chinyanja in order of volume, with a small proportion of Emakhuwa households (0.5%). Eighty-six percent of households had at least one child under the age of five. Most households self-identified their religion as Catholic (52.2%), although there were various other religions. Greater than 80% of respondents reported living in a rural location.

Intra-vaginal practices

Of women surveyed, 52.2% reported knowing about intravaginal practices, including placing herbs, stones, powder or other substance into their vagina to tighten, clean or otherwise modify the vagina (lubricate, dry, and/or eliminate odor) before sex. Of those who knew about this practice, women were asked to report the type of substance typically used in their district. The most common substance reported was herbs (61%), followed by stones/powder

(26%), soap (26%), and dry cloth/paper (6%). There was little consensus about when women would choose to begin this practice: 35% reported this would normally happen at sexual initiation, 36% reported the period between sexual debut and first child, 22% reported after their first delivery, and 21% reported it commonly began after having more than one child (multiple responses permitted) (Table 1). Women over 35 years of age were more likely to report the common use of herbs/bark/leaves as agents than younger women (under 25 years), 68% versus 58%.

Fifty-five percent of women who had heard of the practice reported they were planning to use intra-vaginal substances in the next year (representing 29% overall) (Table 1). Women planning on using intra-vaginal substances in the next year were more likely to be single ($p<0.001$), Muslim ($p<0.001$), and had higher food insecurity scores (Coates, Swindale et al. 2007) (2 vs 0; $p<0.001$) than women not planning on this behavior (Table 1). However, women planning on using these substances had similar monthly income levels ($p=0.10$), reported similar levels of autonomy (decision making without consulting their partners) ($p=0.38$), and believed that condom use was the responsibility of both partners (53.6% vs. 51.4%; $p=0.063$). Reasons for using these substances included: increasing personal pleasure (32%), increasing pleasure of the man (34%), it is tradition (23%), it is a sign of cleanliness (9%), and it returns the vagina to pre-childbirth state (8%) (multiple responses permitted).

After adjusting for age, education, number of children, marital status, HIV knowledge, and autonomy, women who planned to use intra-vaginal tightening substances had 1.84 times higher odds of HIV testing ($p<0.001$) and had 1.40 times higher odds of one or more ANC visits during their last pregnancy ($p=0.015$). There was a negative bivariate association between women who planned to use intra-vaginal substances and HIV infection ($p=0.049$), but this relationship was not detected in our multivariable model ($p=0.21$) (Table 3: Adjusted odds ratios for HIV status related to intra-vaginal substance use).

Labia Minora Elongation

In addition to intra-vaginal practices, we also assessed the knowledge and practice of labia minora elongation (known locally as *puxa-puxa*). Labia minora elongation is a well-known practice in Zambia, with 88% of women knowledgeable about the practice. Among those who knew about *labia minora elongation*, 87% reported they had already elongated their labia minora or planned to undergo labia minora elongation in the coming year (representing 77% overall). Given the ages of participants, it is highly likely that all had already undergone the process and were currently maintaining elongated labia minora. Two primary reasons for this practice were reported: 43% planned to elongate/maintain their labia to increase their own sexual pleasure, while 43% reported planning to elongate/maintain their labia to increase the sexual pleasure of their partner (multiple responses permitted). Twenty-two percent reported that either their partner or men in general prefer women with elongated labia. Women who had or were planning on elongating their labia in the next year were more likely to be single ($p=0.002$), had higher food insecurity scores (Coates, Swindale et al. 2007) (1 vs 0; $p<0.001$), and were more likely to live on less than 14 USD per month (85.2% vs. 82.8%; $p=0.035$) than women not planning on this behavior (Table 2). However, women planning on elongation of their labia minora reported similar levels of autonomy (decision

making without consulting their partners) ($p=0.067$) and believed that condom use was primarily the responsibility of both partners (53.5% vs. 47.1%; $p=0.19$) than women who have not or are not planning to elongate their labia minora.

After adjusting for age, education, number of children, marital status, HIV knowledge, and perceived ability to make decisions without the consent of their partner, women who had or planned to undergo labia minora elongation had 2.61 times higher odds of past HIV testing ($p<0.001$), 1.60 times higher odds of at least one ANC visit during their last pregnancy ($p<0.001$), and had 43% lower odds of a positive HIV test ($p=0.028$) (Table 4: Adjusted odds ratios for HIV status related to labia elongation).

Discussion

Vaginal drying and tightening

Intra-vaginal drying and tightening was well-known in urban and rural communities of Zambézia province. Despite wide-spread knowledge about the practice, there was little intra-province agreement as to the preferred method of drying or tightening, when a woman should initiate these practices, or why it should be done. The literature has noted international differences in these behaviors (van de Wijgert, Chirenje et al. 2000, van De Wijgert, Mason et al. 2000, Bradshaw, Morton et al. 2005, Demba, Morison et al. 2005, Myer, Kuhn et al. 2005, Hilber, Francis et al. 2010, Low, Chersich et al. 2011). Among female heads-of-house in Zambézia Province, Mozambique, knowledge and attitudes towards these practices were not associated with a specific ethnic, linguistic or religious group. Worldwide, women profess to use vaginal drying products for their own sexual pleasure (Brown, Brown et al. 1993, Bagnol and Mariano 2008, Martin Hilber, Hull et al. 2010, Hull, Hilber et al. 2011), the sexual pleasure of their partner (Runganga, Pitts et al. 1992, Brown, Brown et al. 1993, Pitts, Magunje et al. 1994, Baleta 1998, Bagnol and Mariano 2008, Martin Hilber, Hull et al. 2010, Hull, Hilber et al. 2011), to ensure the vagina is clean (Sharma, Bukusi et al. 2006, van Andel, de Korte et al. 2008), to keep their partners loyal (Runganga, Pitts et al. 1992), and to prevent disease acquisition during sex (Sharma, Bukusi et al. 2006). In Zambézia Province, Mozambique, an equal number of women are making the decision to use intra-vaginal substances to increase their own sexual pleasure as they are to improve the sexual experience for their partners. This is in contrast to traditional research that highlighted the subordination of female sexuality in Africa (Kambarami 2006, Baloyi 2010) but more in line with recent literature that paints women's sexuality as positive, assertive, and desirable (Shaefer and Forster 2001, Arnfred 2015). In Mozambique, at least, it seems women in rural and urban area are increasingly able to employ vaginal practices to increase control of their sexual pleasure (Bagnol and Mariano 2008). This may be due, at least in part, to their position as the female head-of-house, a relatively higher status (vs. those who live in the housing compounds of other women) within their community. Women who planned to use intra-vaginal substances reported similar levels of independence in their relationships as those who did not, indicating that this was not a practice forced on them by their partners.

Mozambican women who planned to use intravaginal substances were more likely to seek health services, including HIV testing and ANC services at last pregnancy. Most studies in

SSA have not collected data on health seeking behavior, but a study in the US found that women who practiced douching were more likely to receive regular Pap smears, as they perceived both practices to be part of their overall health and well-being.(Funkhouser, Pulley et al. 2002)

While the influence of intra-vaginal practices on HIV acquisition is mixed in the literature [8, 13, 21, 29-31, 33, 38-40], our study showed additional potential difficulties in measurement of this behavior: women plan to use different products, initiate and use them at different times, and profess various reasons for their use. There may be certain herbs or powders that result in greater vaginal irritation than others, and future studies will need to capture this variability(Brown, Brown et al. 1993). Our study lacked evidence of a link between self-reported HIV status and planned use of these substances, but the data were limited to women who recently experienced a pregnancy. If such a link was found, the variability in behavior and the link between increased sexual pleasure and substance use may make it difficult to implement any national health promotion program opposing this behavior.

Labia Minora Elongation

Much like our data on intra-vaginal practices, labia minora elongation is well-known and commonly practiced in Zambézia Province. Labia minora elongation is typically initiated during adolescence, before sexual debut, but needs to be maintained throughout adulthood (Martin Hilber, Hull et al. 2009, Hull, Hilber et al. 2011, François, Bagnol et al. 2012, Martin Hilber, Kenter et al. 2012). Thus by adulthood, the majority of women will have completed this initial process; women in Zambézia are no exception.

We found that women who have or plan to elongate their labia minora were more likely to have received ANC services during their last pregnancy and sought HIV testing than those who do not. As with health seeking behavior associated with intra-vaginal practices, women who choose to elongate their labia minora may be more inclined to participate in any behavior they deem to increase their health and well-being, but we do not have sufficient evidence to support this hypothesis. Among women who recently had a child, women who had or planned to elongate their labia minora had significantly lower odds of receiving a positive HIV result at their last ANC visit. The mechanism for this finding is unclear. Some Zambian women believed this practice helped to protect them from STIs, including HIV, although there was no association between labia stretching and protective health behaviors (Martínez Pérez, Mubanga et al. 2015). The process of stretching one's labia results in strong friendship networks and facilitates transmission of sexual and reproductive health education, which may explain our findings (Larsen 2010, Martinez Perez, Bagnol et al. 2012).

The strengths of our study include the large sample size of women in Zambézia Province and the quality sampling strategies in our three districts which allowed for us to determine local variability in behaviors. Despite these strengths there are limitations to our study related to the phrasing of questions about vaginal drying/tightening and labia minora elongation. These were originally set in the past tense '*Have you ever used vaginal drying/cleaning agents?*' and '*Have you ever participated in Puxa-Puxa* (local term for labia minora elongation)?' However, before the survey implementation, interviewers were concerned with

the acceptability of these questions and changed them to include both past and future behavior. This opens the results to include women who have not yet participated in drying and tightening behaviors or labia minora elongation. The potential for misclassification is greatest among those who reported drying and tightening of the vagina. Labia minora elongation typically occurs in adolescence, we find it unlikely that an adult woman would begin this process so late in life, but it is a possibility. In addition, the question about HIV status was only posed to women who recently experienced a pregnancy. In addition, we did not ask questions about women's experience with the practice, any physical irritation during the process, or if they had experienced any adverse health effects. .

Conclusion

Our study provides some groundwork in describing intra-vaginal and labia minora elongation practices among women in Zambézia Province, Mozambique. The findings from our study reflect similar practices and social norms as other areas of Mozambique. Given that women report using a variety of substances for drying their vagina, further research is required to better understand the potential association between specific intra-vaginal product use (timing and type of material used for drying) and STIs/HIV infection. Additionally, the mechanism behind the protective effect of labia stretching should be explored determine if group interventions can mimic its effect. Rigorous study in this area could yield important discoveries related to HIV prevention, public health education and the broader understanding of such cultural practices.

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Figure 1. Site map of Zambézia Province, Mozambique with three focus districts and EA's represented

Table 1
Distribution of vaginal/tightening intent

	No (n=2218)	Yes (n=659)	p-value
Marital Status			<0.001
Divorced	2.2%	1.3%	
Married/Common Law	69.1%	68.4%	
Single	26.7%	30.1%	
Widowed	2.0%	0.3%	
Number of Children	2 (1-4)	2 (1-3)	0.091
Responsibility of Use of Condoms			0.063
Both	51.4%	53.6%	
Man	32.9%	34.0%	
Woman	15.7%	12.4%	
Diagnosed with HIV at last pregnancy			0.100
Missing, n(%)	1677(75.6%)	438 (66.5%)	
No	84.4%	92.1%	
Yes	15.6%	7.9%	
Preferred Language			<0.001
Cinyanja	18.7%	11.0%	
Cisena	12.2%	13.1%	
Echuabo	18.9%	37.6%	
Elomwe	38.4%	26.8%	
Emakhuwa	0.0%	0.7%	
Other	7.2%	6.1%	
Portuguese	4.6%	4.8%	
Household Food Insecurity Access Score	0 (0-4)	2 (0-7)	<0.001
Monthly Income (categorized)			0.100
<1000 MZM per month	84.3%	84.8%	
1000+ MZM per month	15.7%	15.2%	
Religion			<0.001
Catholic	55.5%	44.9%	
Evangelical and Pentecostal	16.8%	13.5%	
Muslim	8.6%	18.5%	
Non-Christian Eastern	0.6%	0.4%	
Other Christian	6.2%	3.9%	
Other	2.7%	6.2%	
Protestant	9.6%	12.6%	

[a] Continuous variables are reported as weighted estimates of median (interquartile range), with each observation being weighted by the inverse of the household sampling probability.

[b] Categorical variables are reported as weighted percentages, with each observation being weighted by the inverse of the household sampling probability.

Table 2
Distribution of labia minora elongation

	No (n=2218)	Yes (n=659)	p-value
Marital Status			0.002
Divorced	2.9%	2.1%	
Married/Common Law	72.7%	65.9%	
Single	21.9%	30.9%	
Widowed	2.5%	1.1%	
Number of Children	2 (1-3)	2 (1-3)	0.032
Responsibility of Use of Condoms			0.19
Both	47.1%	53.5%	
Man	30.7%	33.4%	
Woman	22.2%	13.0%	
Diagnosed with HIV at last pregnancy			0.005
Missing, n(%)	681(85.1%)	1478 (68.6%)	
No	74.1%	90.0%	
Yes	25.9%	10.0%	
Preferred Language			<0.001
Cinyanja	10.9%	18.1%	
Cisena	18.4%	10.5%	
Echuabo	27.7%	23.1%	
Elomwe	31.8%	36.2%	
Emakhuwa	0%	0.3%	
Other	6.6%	7.2%	
Portuguese	4.7%	4.7%	
Household Food Insecurity Access Score	0 (0-4)	1 (0-5)	<0.001
Monthly Income (categorized)			0.035
<1000 MZM per month	82.8%	85.2%	
1000+ MZM per month	17.2%	14.8%	
Religion			<0.001
Catholic	51.1%	53.2%	
Evangelical and Pentecostal	14.0%	17.1%	
Muslim	15.8%	9.6%	
Non-Christian Eastern	0.2%	0.5%	
Other Christian	4.6%	5.6%	
Other	2.8%	4.0%	
Protestant	10.7%	9.9%	

[a] Continuous variables are reported as weighted estimates of median (interquartile range), with each observation being weighted by the inverse of the household sampling probability.

[b] Categorical variables are reported as weighted percentages, with each observation being weighted by the inverse of the household sampling probability.

Adjusted odds ratios for antenatal care, HIV testing, self-reported HIV status with anticipated vaginal drying and tightening practice as main exposure of interest

Table 3

	ANC uptake (last pregnancy) ¹		HIV testing uptake (ever) ²		Self-reported HIV status ³	
	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value
Age 35 vs. 22 years	1.03 (0.88, 1.19)	0.72	1.12 (0.97, 1.30)	0.12	0.80 (0.54, 1.18)	0.26
2 vs. 1 child under 5	1.12 (0.98, 1.28)	0.10	1.06 (0.94, 1.20)	0.32	0.63 (0.42, 0.93)	<0.001
Education 4 vs. 0 years	1.72 (1.35, 2.20)	<0.001	1.75 (1.35, 2.28)	<0.001	0.85 (0.61, 1.19)	0.02
HIV knowledge 4 vs. 0	1.87 (1.48, 2.38)	<0.001	2.49 (1.88, 3.28)	<0.001	1.24 (0.87, 1.76)	0.34
Marital status		0.038		0.87		0.23
Married/Common Law (ref)	1		1		1	
Divorced/Separated	1.36 (0.78, 2.38)		0.87 (0.49, 1.56)		3.87 (1.20, 12.45)	
Single	1.26 (0.98, 1.63)		1.04 (0.83, 1.31)		1.54 (0.87, 2.71)	
Widowed	1.86 (1.04, 3.34)		0.85 (0.46, 1.58)		5.82 (2.14, 15.86)	
Ability to make decisions without husband		0.15		0.57		0.017
Little (ref)	1		1		1	
More or less	0.81 (0.64, 1.04)		1.06 (0.83, 1.35)		0.42 (0.23, 0.76)	
A lot	0.79 (0.62, 1.02)		0.93 (0.73, 1.19)		0.75 (0.45, 1.25)	
Planning to use vaginal drying/tightening substances in next year	1.40 (1.07, 1.82)	0.015	1.84 (1.46, 2.33)	<0.001	0.68 (0.38, 1.24)	0.21

¹There are 2415 women in this model. There is a bivariate association between use of vaginal drying/tightening substances and ANC uptake (p=0.015).

²There are 3085 women in this model. There is a bivariate association between use of vaginal drying/tightening substances and HIV testing (p<0.001).

³There are 810 women in this model. There is a bivariate association between use of vaginal drying/tightening substances and HIV status (p=0.049).

Adjusted odds ratios for antenatal care, HIV testing, self-reported HIV status with labia minora elongation practice/intention as main exposure of interest

Table 4

	ANC uptake (last pregnancy) ¹		HIV testing uptake (ever) ²		Self-reported HIV status ³	
	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value
Age 35 vs. 22 years	1.01 (0.87, 1.18)	0.87	1.09 (0.93, 1.27)	0.27	0.85 (0.63, 1.16)	0.31
2 vs. 1 child under 5	1.12 (0.98, 1.28)	0.11	1.07 (0.95, 1.20)	0.29	0.63 (0.43, 0.95)	0.025
Education 4 vs. 0 years	1.68 (1.31, 2.14)	<0.001	1.64 (1.26, 2.14)	<0.001	0.84 (0.56, 1.25)	0.39
HIV knowledge 4 vs. 0	1.85 (1.46, 2.35)	<0.001	2.38 (1.81, 3.14)	<0.001	1.31 (0.92, 1.85)	0.13
Marital status		0.032		0.91		0.001
Married/Common Law (ref)	1		1		1	
Divorced/Separated	1.40 (0.79, 2.49)		0.90 (0.51, 1.59)		3.47 (1.12, 10.74)	
Single	1.28 (0.99, 1.65)		1.04 (0.82, 1.31)		1.50 (0.86, 2.61)	
Widowed	1.84 (1.01, 3.38)		0.86 (0.45, 1.63)		5.92 (2.08, 16.88)	
Ability to make decisions without husband		0.19		0.76		0.009
Little (ref)	1		1		1	
More or less	0.82 (0.64, 1.04)		1.06 (0.84, 1.34)		0.39 (0.22, 0.71)	
A lot	0.81 (0.63, 1.05)		0.97 (0.76, 1.24)		0.72 (0.44, 1.19)	
Has or will undergo puxa-puxa	1.60 (1.22, 2.11)	<0.001	2.61 (2.03, 3.35)	<0.001	0.57 (0.34, 0.94)	0.028

¹There are 2415 women in this model. There is a bivariate association between labia minora elongation practice and ANC uptake ($p<0.001$).

²There are 3085 women in this model. There is a bivariate association between labia minora elongation practice and HIV testing ($p<0.001$).

³There are 810 women in this model. There is a bivariate association between labia minora elongation practice and HIV status ($p=0.011$).