Prevalence of and Factors Associated with Oral Sex among Rural and Urban Malawian Men

Jason Kerwin*
Department of Economics, University of Michigan

Rebecca Thornton
Department of Economics, University of Michigan

Sallie Foley
Graduate School of Social Work, University of Michigan

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ABSTRACT
Despite medical evidence that female-to-male oral sex carries a much lower risk of HIV transmission than unprotected vaginal intercourse, there has been little research on the practice of fellatio in Africa. We use a sample of 1216 men in rural Malawi and 1537 uncircumcised men in urban Malawi to examine the prevalence of oral sex. While 97 percent of the rural sample and 87 percent of the urban sample reported having had *vaginal* sex just 2 percent and 12 percent respectively said they had ever received *oral* sex. Only half of the rural sample, and less than three quarters of the urban sample, reported having heard of oral sex. We find that education and condom use predict oral sex knowledge; in contrast, media exposure and beliefs about HIV do not significantly predict knowledge about oral sex after controlling for other confounding factors. The large gap between sexual activity and oral sex prevalence implies substantial scope for fellatio as another safer sex strategy in Malawi and potentially in other African countries as well.

* Corresponding author: Thornton, Department of Economics, 611 Tappan St., Ann Arbor, MI, 48109. Phone: 734-763-9238. Email: rebeccal@umich.edu. Kerwin: Department of Economics, 611 Tappan St., Ann Arbor, MI, 48109. Email: jtkerwin@umich.edu Foley: School of Social Work 1080 S. University Ann Arbor, MI 48109. Phone: 734-764-4074. Email: smfoley@umich.edu.

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INTRODUCTION

Quantitative medical and epidemiological studies have suggested that fellatio (female-to-male oral sex) carries a very low risk of HIV transmission. The most cited study estimates the rate of transmission to be 4 of 10,000 acts of oral sex between men in the United States (Vitinghoff et al., 1999). As a point of reference, studies of American couples estimate rates of transmission of 9 of 10000 acts of unprotected vaginal intercourse (Padian et al., 1997) while rates of transmission in Uganda for individuals more than 6 months after seroconversion were estimated to be 15 of 10,000 acts of unprotected vaginal intercourse (Wawer et al., 2005). Transmission is highest near the time of seroconversion: Wawer et al. (2005) found that rates climbed to 82 of 10,000 acts. Some researchers believe the risk of HIV transmission through oral sex to be vanishingly small. One Spanish study followed 135 HIV-negative individuals in monogamous relationships with an HIV-positive partner; all 135 reported only unprotected oral sex for several years. After over 19,000 reported incidents of oral sex between an HIV-positive and HIV-negative partner, not one HIV-negative individual seroconverted (del Romero et al., 2002). The most recent review of the literature concludes that "the risk of transmission of HIV via oral sexual practices is very low" (Campo et al., 2006). See also Kerwin et al. (2011) for a review.

Despite the effectiveness of oral sex in preventing HIV transmission and extensive research on other safer sex strategies in sub-Saharan Africa, there is very little evidence on the prevalence of oral sex in the region. We are aware of only three previous published studies on the topic, mainly among adolescents or youth. A survey of 273 Zambian adolescents found that while 77 percent had engaged in vaginal intercourse only 25 percent had given or received fellatio (Feldman et al. 1997). A similar study of 521 students in Nigeria found that while 78 percent reported practicing vaginal sex, only 13 percent said they had had oral sex (Bamidele et al. 2009). Peltzer and Pengpid (2006) find that among 16 and 17 year olds in South Africa, 26 percent of males and 24 percent of females had received oral sex, while 20 percent of males and 19 percent of females had performed oral sex. Unpublished work in Rwanda finds that 28 percent of male and 25 percent of female college students report having oral sex (Umuhoza and Basinga, 2011). By means of comparison, a study of 3,321 American men age 20-39 found that 79

percent of had ever received fellatio and 75 percent had ever performed cunnilingus, while 95.4 percent had ever had sex (Billy et al., 1993). Among younger individuals in developed countries, oral sex is even more common relative to other sexual practices: a survey of 580 ninth-grade adolescents in the US, including both males and females, found that 19.6% had engaged in oral sex versus just 13.5% having had vaginal intercourse (Halpern-Fisher et al. 2005).

The reasons for the low prevalence of oral sex in sub-Saharan Africa are currently unknown; further exploration of which factors are associated with the knowledge and practice of oral sex is important to evaluate its potential as a safer sex strategy in the region. In this paper we use the results of two surveys conducted in Malawi, to study the extent of, and factors determining, the knowledge and practice of oral sex . To the best of our knowledge, this paper presents the first data on oral sex in Malawi, and the first exploration of factors correlated with oral sex anywhere in Africa.

METHODS

Our analysis of the prevalence and correlates of oral sex is based on two studies conducted among two distinct samples of men in Malawi. The first study comprises of 1228 circumcised and uncircumcised men who were randomly sampled from 70 villages in Traditional Authority Kuntumanji in rural Zomba district, located in the Southern Region of Malawi. To sample men into the study, 70 villages were randomly selected, stratified by the distance of each village to the nearest mosque. Within each village a full household enumeration was conducted and men ages 25 to 40 were randomly selected from the household enumeration – allowing for only one man per household. Men were asked questions about their knowledge and experience with oral sex. We focus on 1216 who responded to questions about oral sex. For more information on the study, see Godlonton et al. (2012).

The second set of data includes a representative sample of uncircumcised men living in urban Lilongwe. This survey was conducted within the catchment area of a family planning clinic in which neighborhoods were randomly selected; a household census was conducted in selected neighborhoods in which uncircumcised men between the ages of 18 and 30 were selected. See Chinkhumba et al. (2012) for

further information. In this paper our data comprise 1537 men who answered questions about oral sex and have a complete set of covariates including age, whether they had ever used a condom, and the number of sex partners they had ever had in their lifetime.

Prior to commencing each survey, subjects granted their informed written consent to participate in the study. The research was overseen and approved by the Health Sciences and Behavioral Sciences Institutional Review Boards at the University of Michigan, the College of Medicine Research Ethics Committee at the University of Malawi, and the National Health Science and Research Council.

The respondents in the rural sample answered questions on four sexual practices: anal sex, fellatio, cunnilingus, and masturbation. For each practice, they were asked "Have you ever heard of [practice]?" If they answered yes, they were asked: "Do you know of any friends who have done this?", and "Have you ever done this?" The urban sample was only asked about fellatio. They were asked "Have you ever heard of receiving oral sex from a woman?" A yes answer led to two follow-up questions: "Do you know of any of your friends who have received oral sex from a woman?", and "Have you ever received oral sex from a woman?" We tabulate the responses to these questions in order to examine the overall extent of these practices and how the knowledge and practice of oral sex varies across rural and urban areas.

Respondents in the rural sample were asked additional questions about ways in which they believed HIV could be transmitted. For example, the first of these questions asks "Do you think that people contract HIV by having vaginal sex?" Ten other similar questions were also asked for other activities, replacing "vaginal sex" with the activity in question. This means that the questions are not mutually exclusive: a respondent could (correctly) believe that people contract HIV through both vaginal sex and mother's milk. These questions allow us to measure the extent of knowledge about HIV transmission and in particular, whether they understand the risk benefits of oral sex.

All surveys were conducted in Chichewa using translated versions of the survey instruments. These translations were cross-checked during enumerator training.

We analyze the data using Stata (Version SE 11; StataCorp LP, College Station, TX).

The two samples have different covariates with more detailed information in the rural sample. In particular, the urban sample lacks information on respondents' income, beliefs about HIV transmission, marital status, and how often the respondent watches TV, reads the newspaper, and listens to the radio. In addition, the urban sample includes only uncircumcised men. We therefore rely on the rural sample to measure which factors are significantly associated with the knowledge and practice of oral sex. We begin by running a probit regression using an expanded model that includes a wide range of potentially important factors with knowledge of oral sex as the dependent variable. In all our analyses, we include indicators of areas/neighborhoods in order to control for regional heterogeneity in knowledge and practices. Based on this model, we then choose some of the most-important determinants of knowledge of oral sex and run probit regressions with knowledge of oral sex as the dependent variable for both the rural and the urban sample. Oral sex is so rarely practiced in rural Malawi that studying factors associated with its practice is infeasible for the rural sample. However, because oral sex is more prevalent in urban Malawi, we are able to run probit regressions of whether a respondent has tried oral sex himself for the urban sample. We compare the results of these four probit regression models to determine how the factors associated with knowledge of oral sex vary across rural and urban Malawi, and how they differ from the factors associated with the practice of oral sex.

RESULTS

Table 1 presents summary statistics for the two samples. The rural men are predominantly married (89 percent) with 97 percent reporting having had sex at least once. Just slightly more than a third have ever used a condom during intercourse. Among the urban men 87 percent have ever had sex and with 76 percent ever having used a condom. By sample design, the urban sample is younger than the rural one, with an average age of 26 as compared to 32, and while sexual debut occurs in the mid- to late-teens for both groups, it happens slightly later for the urban men. The average urban man has had more sex partners (6.8) than the average rural man (4.3) but the median man in both groups reports three. The average rural respondent has completed 6 years of education (up through Standard 6, which is roughly equivalent to the

fifth grade in the American educational system), whereas the median urban respondent has finished all of primary and secondary education. The literacy rate is 78 percent for the rural men and 98 percent for the urban men.[1]

Ethnically, the rural respondents consist primarily of the Nyanja and Yao tribes, representing 41 percent and 36 percent of the sample respectively. Five percent are Chewa. Roughly half of the men in the rural sample are Muslim. The urban sample differs sharply from the rural one both ethnically and religiously. It contains virtually no Nyanjas (1 percent) and decidedly fewer Yaos than the rural sample (4 percent), while nearly a third of the sample self-identifies as Chewa. A much larger share of the sample is Ngoni (24 percent vs 1 percent), while the proportion that is Lomwe is roughly the same, 14 percent as opposed to 17 percent of the rural men. In terms of religion, the most notable difference is that there are nearly no Muslims. The share of respondents that are Catholic (23 percent) and from the Church of Central Africa, Presbyterian (33 percent) is notably higher than in the rural sample.

[1] Men who reached secondary school or college (Form 1 or above) were not asked about literacy. Everyone in that group is assumed to be literate.

Table 1: Demographic Characteristics

	Rural Sample			Urban Sample		
	Mean (1)	Median (2)	Std. Dev. (3)	Mean (4)	Median (5)	Std. Dev. (6)
Marital Status						
Married	0.90			--		
Separated/Divorced/Widowed	0.05			--		
Never Married	0.06			--		
Ethnicity						
Chewa	0.05			0.33		
Yao	0.36			0.04		
Tumbuka	0.00			0.13		
Lomwe	0.17			0.14		
Ngoni	0.01			0.24		
Nyanja	0.41			0.01		
Other†	0.00			0.11††		
Religion						
Muslim	0.52			0.01		
Catholic	0.08			0.23		
Pentecostal	0.19			0.14		
Church of Cent. Africa, Presb.	0.04			0.33		
Seventh-Day Adventist	0.00			0.09		
African-Initiated Church	0.06			0.05		
Other Christian	0.09			0.12		
Other/No Religion	0.00			0.02		
Age	31.87	31.00	6.65	26.46	26.00	6.63
Ever Had Sex	0.97		0.17	0.87		0.34
Years Sexually Active	15.41	15.00	7.54	8.66	8.00	7.00
Total Lifetime Sex Partners	4.27	3.00	4.55	6.80	3.00	29.55
Ever Used a Condom	0.36		0.48	0.76		0.43
Used a Condom at Last Sex	0.14		0.34	0.45		0.50
Total Sex Partners in Last Month	0.85	1.00	1.22	0.66	1.00	0.94
Sexual Encounters in Last Month	9.24	6.00	10.03	4.10	1.00	7.15
Circumcised	0.73		0.44	0.00		0.00
Years of Education	5.88	6.00	3.63	11.14	12.00	2.39
Literate in English, Chichewa, or Both	0.78		0.41	0.98		0.13
Last 3 Months Spending (1000s of MK)	13.03	10.15	11.03	21.45	15.04	23.76
Last 3 Months Income (1000s of MK)	15.03	9.05	18.13	--		

Rural sample is from Godlonton et al. (2012) and comprises 1216 men from rural Malawi who answered questions about oral sex. Urban sample is from Chinkhumba et al. (2012) and comprises 1537 uncircumcised men from urban Malawi who answered questions about oral sex and covariates. †For the Urban Sample "Other" ethnicities include Tonga (3.34%), Mang'anja (2.54%), Sena (1.63%), Ngonde (1.69%) and other smaller tribes (1.69%).

PREVALENCEOF SEXUAL PRACTICES

Our first set of results examines the knowledge and practice of oral sex in rural and urban Malawi. Table 2 presents the percentage of respondents who have heard of each sex practice, who has had a friend who tried each sex practice, and who had tried each practice themselves. 56.4 percent of rural men and 73.2 percent of urban men reported ever having heard of fellatio, while only 1.7 percent of the rural sample and 11.7 percent of the urban sample reported having personally tried oral sex.

Table 2: Sexual Practices

	Rural Sample[†]		Urban Sample[‡]	
	Mean (1)	Std. Dev. (2)	Mean (3)	Std. Dev. (4)
Fellatio				
Heard of it	0.56	0.50	0.73	0.44
Friend Tried it	0.09	0.29	0.29	0.46
Respondent Tried it	0.02	0.13	0.12	0.32
Cunnilingus				
Heard of it	0.51	0.50	--	--
Friend Tried it	0.06	0.24	--	--
Respondent Tried it	0.01	0.11	--	--
Anal Sex				
Heard of it	0.63	0.48	--	--
Friend Tried it	0.05	0.23	--	--
Respondent Tried it	0.00	0.05	--	--
Masturbation				
Heard of it	0.71	0.45	--	--
Friend Tried it	0.37	0.48	--	--
Respondent Tried it	0.22	0.42	--	--

Rural sample is from Godlonton et al. (2012) and comprises 1216 men from rural Malawi who answered questions about oral sex. Urban sample is from Chinkhumba et al. (2012) and comprises 1537 uncircumcised men from urban Malawi who answered questions about oral sex and covariates.

Among the rural sample, rates for cunnilingus are comparable to those for fellatio and slightly lower. In contrast, slightly more men had heard of anal sex but only two men out of the entire rural sample said they had tried it themselves.

BELIEFS ABOUT HIV TRANSMISSION RISKS

One issue of interest with respect to the prevalence of oral sex is people's beliefs about the level of risk it carries. Table 3 presents the percentage of respondents who believes that HIV can be spread through a variety of actions. Virtually all the men in the sample are aware that vaginal sex is a transmission risk, and many are aware of the risk of vertical transmission through breast milk. Over half believe that both oral sex and swallowing sperm are risks.

Table 3: Beliefs About HIV Transmission

	Rural Sample	
Believes that HIV can be spread through:	Mean (1)	Std. Dev. (2)
Vaginal Sex	0.99	0.09
Mother's Milk	0.82	0.38
Having a child	0.76	0.43
Oral Sex	**0.55**	**0.50**
Swallowing sperm	**0.59**	**0.49**
Needles in the hospital	0.74	0.44
Kissing	0.46	0.50
Mosquitoes	0.39	0.49
Getting circumcised	0.83	0.37
Touching an open wound on someone	0.63	0.48

ORAL SEX KNOWLEDGE AND MEDIA EXPOSURE

Future research on the possibility of oral sex as a safer sex strategy requires an understanding of how knowledge about oral sex is acquired and what factors predict this knowledge. One logical hypothesis is that more media exposure would be positively associated with more knowledge about oral sex. To explore this, Table 5 presents the shares of rural men with different levels of exposure to media who have heard of oral sex as well as whether the men believed that HIV could be transmitted through vaginal sex, oral sex, or swallowing sperm. Higher levels of exposure to television and newspapers are associated with higher rates of knowledge, and we can reject the hypothesis that the likelihood of having heard of oral sex is unrelated to levels of TV and newspaper use at the 0.01 level. The distribution of knowledge across levels

of radio use is significantly different from equal proportions at the 0.1 level. In contrast, beliefs about how HIV is transmitted are not statistically significantly related to knowledge of oral sex.

Table 5: Knowledge of Oral Sex by Media Exposure and HIV Transmission Beliefs

	Rural Sample†	
	Share who have heard of Oral Sex (1)	Total Men in Category (2)
Overall	0.56	1216
Newspaper Reading Frequency		
Daily or Almost Daily	0.60	5
1-3 Times per Week	0.69	29
1-3 Times per Month	0.73	126
Less than Once per Month	0.60	187
Not at All	0.53	869
Chi-Square Statistic (p-value)	21.50	(<0.001)
Radio Listening Frequency[a]		
Daily or Almost Daily	0.58	645
1-3 Times per Week	0.59	217
1-3 Times per Month	0.56	177
Less than Once per Month	0.48	129
Not at All	0.36	47
Chi-Square Statistic (p-value)	7.93	(0.094)
TV Watching Frequency[a]		
Daily or Almost Daily	0.74	27
1-3 Times per Week	0.74	57
1-3 Times per Month	0.69	181
Less than Once per Month	0.59	308
Not at All	0.49	640
Chi-Square Statistic (p-value)	13.39	(0.010)
Believes HIV Can be Transmitted[b]		
Through Vaginal Sex	0.56	1206
Chi-Square Statistic (p-value)	2.28	(0.131)
Through Oral Sex	0.58	671
Chi-Square Statistic (p-value)	2.10	(0.147)
Through Swallowing Sperm	0.57	720
Chi-Square Statistic (p-value)	0.20	(0.653)

Data taken from the Circumcision, Information, and HIV Prevention Study Dataset: † Rural Sample is 1216 men from rural Malawi who answered questions about oral sex. [a] Men with missing data excluded (1 for radio use and 3 on TV use). [b] HIV Transmission Belief categories are not mutually exclusive.

MULTIVARIATE REGRESSIONS OF ORAL SEX KNOWLEDGE AND PRACTICE

This section presents the results of the probit regression models described in the Methods section above. The results of these models, which represent the *ceteris paribus* effects of each variable on the likelihood of knowing about oral sex, are given in Table 6. Our preliminary analysis tested a variety of models before settling on the reduced version we ran on both the rural and urban samples. One such expanded model is given in Column 1. Notably, virtually none of the media or belief variables have a significant effect once we control for other factors that predict both media exposure and oral sex knowledge in particular education and income. This implies that the apparent relationship between newspaper and TV exposure and knowledge of oral sex was due to confounding from other factors. Consistent with that theory, when we remove them from our model (moving from Column 1 to Column 2) there are negligible changes in the estimated effects of the remaining controls, implying that any apparent effects from media exposure are in fact due to those other demographic variables.

The reduced model, shown in Columns 2 and 3 for the rural and urban samples respectively, reveals a set of robust predictors of knowledge of oral sex. Ever having used a condom has a strong positive effect on the likelihood of knowing about oral sex (OR = 1.61, 95% CI 1.24 to 2.08). This indicates that those with greater exposure to risk and knowledge of safer sex in general are those who tend to learn about oral sex. Years of education, in comparison, has a smaller but still statistically significant impact (OR = 1.06, 95% CI 1.01 to 1.12). Years of sexual activity and lifetime sex partners have positive effects: at a 10% level of statistical significance, both are significant in the rural sample while lifetime sexual partners is significant in the urban sample. Furthermore, even controlling for variations in other factors several of the village/area dummy variables are also significant (not shown), implying substantial geographic variation in knowledge of oral sex. These correlations paint two broad pictures. The first is that education matters, as indicated by the positive and significant effects of years of education. The second, and less intuitive, is that knowledge of oral sex appears to diffuse through networks, a story supported by the clustering of oral sex knowledge by village and the importance of sexual experience.

Also lending credence to the diffusion story is the effect of years of education, which may proxy for exposure to sexual partners.

We also run the reduced model with having tried oral sex as the dependent variable. We do this only for the urban sample, because the low numbers of rural men who report having tried oral sex (just 21 out of the 1216 rural men) makes statistical inferences difficult. Table 6 presents the results of this analysis. The urban regression for trying oral sex fits the same general story as above. The HIV education/sex education pattern is still there with a very strong, statistically significant relationship between the practice of oral sex and literacy (OR = 238.90, 95% CI 12.76 to 4471.21) and sexual experience is still important, through lifetime sex partners (OR = 1.04, 95% CI 1.02 to 1.06). Moreover, many of the area fixed-effects are statistically significant at the 0.01 level, with some indicating lower- and some higher-than-average levels of oral sex practice in the area. This is consistent with our above finding that knowledge of oral sex varies considerably based on location, and with the overall pattern of higher levels of oral sex practice in the urban versus the rural sample..

One pattern within the urban sample, for both "heard of" and "received" oral sex, is a positive and significant impact of expenditures. This is consistent with a model of sexual power dynamics in which money enables men to buy a wider variety of sex partners and sexual experiences. As discussed above, we tested a variety of models, finding that several covariates one might expect to be important had statistically insignificant effects. Perhaps most notable is age, which had no impact (entered either linearly or quadratically) once we control for years of sexual activity.

Table 5: Logistic Regression Results for Whether Respondent has Heard of Fellatio, Rural and Urban Samples

	(1) Rural Sample Expanded Model[a]		(2) Rural Sample Reduced Model		(3) Urban Sample Reduced Model	
Variables	Coeff.	SE	Coeff.	SE	Coeff.	SE
Age	0.960	[0.09]	0.950	[0.08]	0.970	[0.04]
(Age)^2	1.000	[0.00]	1.000	[0.00]	1.000	[0.00]
Years Sexually Active	1.06**	[0.02]	1.06**	[0.02]	1.010	[0.02]
Total Lifetime Sex Partners	1.050	[0.03]	1.05*	[0.03]	1.02*	[0.01]
Respondent Has Ever Used a Condom	1.57***	[0.21]	1.61***	[0.21]	2.48***	[0.41]
Respondent is Circumcised	1.260	[0.21]				
Respondent is Literate	0.970	[0.23]	0.990	[0.24]	0.980	[0.40]
Years of Education	1.040	[0.03]	1.06*	[0.03]	1.12***	[0.03]
Ln(Income in Last 3 Months)	1.020	[0.05]				
Ln(Spending in Last 3 Months)	1.010	[0.08]	1.090	[0.08]	1.17*	[0.08]
Believes HIV can be spread through:						
Vaginal Sex	0.290	[0.24]				
Oral Sex	1.170	[0.21]				
Swallowing Sperm	0.950	[0.17]				
Marital Status:						
Separated	0.960	[0.50]				
Divorced	1.370	[0.67]				
Widowed	0.330	[0.31]				
Never Married	1.020	[0.31]				
Reads the Newspaper:						
1-3 Times per Week	0.830	[1.09]				
1-3 Times per Month	1.280	[1.61]				
Less than Once per Month	0.690	[0.82]				
Not at All	0.740	[0.88]				
Listens to the Radio:						
1-3 Times per Week	1.250	[0.26]				
1-3 Times per Month	1.120	[0.23]				
Less than Once per Month	1.010	[0.30]				
Not at All	0.46*	[0.15]				
Watches TV:						
1-3 Times per Week	0.900	[0.60]				
1-3 Times per Month	0.770	[0.38]				
Less than Once per Month	0.520	[0.27]				
Not at All	0.420	[0.21]				
Observations	1213		1216		1537	
Mean of Dependent Variable	0.564		0.564		0.732	
Std Dev of Dependent Variable	0.496		0.496		0.443	

[a] 3 men with missing data on radio use and/or TV use excluded.
Reported coefficients are mean marginal effects. Regressors omitted from table: categorical dummy variables for 69 different villages (Rural Sample) and 30 different areas (Urban Sample). Heteroskedasticity-robust standard errors in brackets, clustered by village (Rural Sample) and area (Urban Sample). ***: p<0.01, **: p<0.05, *: p<0.1

Table 6: Probit Regression Results for Whether Respondent has Tried Fellatio Himself, Urban Sample

	(1) Urban Sample Reduced Model	
Variables	Coeff.	SE
Age	0.950	[0.03]
(Age)^2	1.000	[0.00]
Years Sexually Active	1.030	[0.02]
Total Lifetime Sex Partners	1.04***	[0.01]
Respondent Has Ever Used a Condom	3.56**	[1.42]
Respondent is Literate	238.90***	[357.06]
Years of Education	1.050	[0.05]
Ln(Spending in Last 3 Months)	1.96***	[0.23]
Observations	1537	
Mean of Dependent Variable	0.117	
Std Dev of Dependent Variable	0.322	

Reported coefficients are mean marginal effects. Regressors omitted from table: categorical dummy variables for 69 different villages (Rural Sample) and 30 different areas (Urban Sample). Heteroskedasticity-robust standard errors in brackets, clustered by area. ***: p<0.01, **: p<0.05, *: p<0.1

POTENTIAL LIMITATIONS

The most important limitations of this analysis are related to potential biases and reporting errors in the data collection process. One limitation facing any in-person survey on sexual practices is social acceptability bias, which is the tendency of respondents to report, instead of the truth, either what they are socially expected to do or what they think the interviewer wants to hear.

Similarly, there may have been limitations in the translation of questions on oral sex. In particular, it is possible that the phrases used to ask about oral sex in Chichewa were not understood, either due to issues with translation or because respondents know the practice by slang terms rather than a more technical name. Because no previous quantitative research had addressed the prevalence of oral sex in Malawi, no pre-existing validated questions were available and so we were obliged to develop our own Chichewa-language questions on the topic. The set of questions we used was extensively field-tested

against other alternatives, including ones that used slang, and broadly understood by test participants who were familiar with oral sex. However, we cannot rule out that the possibility that to some extent the low knowledge and practice of oral sex are the result of poor understanding of our survey questions. Mitigating against this possibility somewhat is the positive correlation between knowledge of oral sex and sexual experience, which is consistent with what we would expect in a setting where knowledge of the practice is limited.

DISCUSSION

Oral sex compares favorably with other potential safer sex strategies. Condom use has a comparable risk benefit but is seven to 30 times as common, while male circumcision reduces risk by just 60 percent and only benefits men. Our analysis has some implications for the potential promotion of oral sex. Foremost, oral sex is very rare in our sample, and many people overestimate the HIV risk of oral sex. This implies that education or information campaigns may be useful tools in educating about oral sex as a safer sex strategy. Lending credence to this view is the fact that education and condom use predict oral sex knowledge; these variables may be proxies for exposure to HIV prevention and sexual education programs. We also observe an important role for sexual experience and village of origin, implying that knowledge of oral sex may diffuse through sex networks. Researchers analyzing the impact of a promotion campaign need to be aware of this potential diffusion.

A crucial issue for any potential oral sex education effort is the extent to which it serves as a substitute for, rather than a complement to, risky sexual behaviors. While there is no evidence on this issue for Malawi, there does exist a literature on oral sex among American teens that implies that oral sex does substitute for vaginal sex to a significant degree. In a survey of research on American adolescents, Remez (2000) reports that one study showed college-aged virgins were just as likely as non-virgins to have had oral sex. She also references a group that used data on teens in abstinence programs to study oral sex, quoting a researcher from the Institute for Research and Evaluation as saying that as many as a quarter of virgin teens in that sample use oral sex as a substitute for vaginal intercourse. Lindberg et al.

(2008) report that oral sex correlates strongly with vaginal sex among a sample of 15-19 year olds but also find that over 25 percent of virgins have had oral sex. Beyond considering the role of oral sex as a means of postponing sexual debut, we can also consider the physiological substitution between acts; fellatio to completion necessarily leads to a refractory period and a longer-term decline in sexual desire on the part of the male. Additional research is needed to establish the extent to which oral sex can serve as a substitute for riskier activities among high risk populations.

Future studies of oral sex and policy decisions should consider the impact of the network effects and account for the fact that uptake may depend on income, potentially because men are able to pay for less-common sexual activities. It is possible that this effect will have the opposite sign for women, as increased income may lead to financial capacity to choose not to have sex (Kohler and Thornton, forthcoming). Any educational campaign should emphasize the risks and potential benefits of oral sex, which are deeply underestimated in this population. The evidence suggests a large potential for oral sex as a safer sex strategy, but also the need for further research on this topic.

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