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Research Article

When the group encourages extramarital sex: Difficulties in HIV/AIDS prevention in rural Malawi

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When the group encourages extramarital sex: Difficulties in HIV/AIDS prevention in rural Malawi

Julia Cordero Coma¹

Abstract

BACKGROUND

Recent research on the HIV epidemic in sub-Saharan Africa has highlighted the relevance of married individuals' extramarital sexual behavior for the spread of the disease. At the same time, there is social disapproval of sexual infidelity.

OBJECTIVE

This article examines the extent to which Malawian married men's likelihood of having extramarital sex is influenced by their expectations about the prevalence of extramarital relationships in their social network. It also explores whether this effect depends on the network density, and whether it is also observed when the extramarital behavior of a particularly influential actor is controlled for.

METHODS

Data from the last two waves, 2004 and 2006, of the longitudinal survey provided by the Malawi Diffusion and Ideational Change Project are analyzed both cross-sectionally and through a panel analysis with fixed effects. The longitudinal approach enables the researcher to deal with the potential non-random distribution of social interactions among respondents, which bias the estimation in the cross-sectional analysis.

RESULTS

Married men's expectations about the prevalence of extramarital sexual relationships in the network were shown to have a substantial influence on their extramarital behavior, and the impact was found to be bigger in dense networks. In addition, there was some evidence that the perceived dominant behavior in the peer group is relevant, independent of the extramarital behavior of the respondents' best friends.

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1. Introduction

Extramarital sexual relationships are a powerful factor in the diffusion of the HIV epidemic in sub-Saharan Africa. They account for a relevant share of concurrent long-term sexual relationships, a phenomenon that has received considerable attention in the last decade and is believed to be the basis of the disproportionate levels of HIV in sub-Saharan Africa (Shelton 2007; Mishra and Bignami-Van Assche 2009; Mah and Halperin 2010). Theoretical models have shown that the dynamics of sexual networks in which concurrent long-term sexual relationships are frequent facilitate the spread of the disease much more than those in which sequential monogamy is the common pattern (Watts and May 1992; Morris and Kretzschmar 1995, 1997). Moreover, concurrent sexual relations may increase the risk of HIV transmission because the capacity to infect a person is much higher over a short period (about three weeks) immediately after the individual becomes infected (Pilcher et al. 2004; Wawer et al. 2005). Thus, regarding extramarital sex in particular, married people with sexual partners outside of marriage may facilitate the spread of the disease, especially when the extramarital relationships are stable and the use of condoms is not generalized.

In relation to the empirical evidence on the relevance of married individuals' sexual behavior, several studies have claimed that this is a key aspect for understanding the current stage of the epidemic, given that most new HIV infections take place in serodiscordant couples. The work by Dunkle et al. (2008) illustrated the magnitude of the problem. They found that in urban areas of Rwanda and Zambia, between 55% and 93% of the new infections via heterosexual intercourse have taken place in serodiscordant married or cohabiting couples. The relatively important role of marital sexual relations has also been observed in other countries, such as Uganda, Swaziland, and Lesotho (Khobotlo et al. 2009; Mngadi et al. 2009; Wabwire-Mangen et al. 2009). Contrary to popular belief, getting married does not work as a preventive strategy against HIV infection, as the percentage of women who are HIV positive has been shown to be much higher among those who are married than among those of the same age who are single (Glynn et al. 2001b; Kelly et al. 2003).

Men are more likely to bring HIV infection into a concordant-negative partnership (Hugonnet et al. 2002). Surveys have shown that extramarital sex is more frequent among men than among women.² It is not easy to determine whether these differences are real or whether they stem from a female tendency to under-report—or a male propensity to over-report—extramarital sexual behavior. But some studies that looked at data on biomarkers for HIV have concluded that in a couple, the man is twice as likely as the woman to be the first to become infected (Carpenter et al. 1999; Lurie et al. 2003). However, de Walque (2007) showed in his research on nationally representative

² See the Demographic and Health Surveys (DHS) by country.

samples of five African countries that in a significant percentage of infected cohabiting couples, only the woman is infected. The author argued that such a finding is difficult to explain in the absence of extramarital sex by married women.

Given the potential effects of extramarital relations on the HIV epidemic, it is crucial that we explore the factors that induce married individuals either to engage in these extramarital activities, or to stop doing so. In particular, understanding the mechanism through which social factors influence sexual behavior in a population with a high HIV prevalence is clearly an important task for social scientists. Numerous qualitative studies have emphasized that certain social and institutional factors, such as work-related migration, the social meaning of masculinity and sexuality, and peer pressure (Parikh 2007; Smith 2007; Hunter 2010), must be taken into account when examining the question of why men engage in extramarital relationships. On the other hand, the presence of contradictory moralities, the social norm of fidelity, and the AIDS threat are believed to discourage people from having extramarital sexual partners (Hunter 2005; Smith, 2007). Some quantitative studies have, in turn, measured the effect of interpersonal communication and social networks on issues related to HIV preventive behavior, such as risk perception and spousal communication about AIDS (Helleringer and Kohler 2005; Smith and Watkins 2005; Kohler, Behrman, and Watkins 2007). However, apart from a study by Clark (2010), which will be discussed in the next section, the extent to which extramarital sexual behavior is influenced by the opinions and actions of others in the individual's social context is an issue that has yet to be addressed.

Measuring the influence of the social group is always a challenge because individuals are likely to self-select into social networks. It is difficult to disentangle the effect of the network from the mere association between the individual's behaviors and that of his/her peers, given the systematic selection of interlocutors. In this piece of research, I use panel analysis with fixed effects to analyze the extent to which men's extramarital behavior is affected by whether they perceive that having extramarital relationships is common in their social network, a perception that is shaped by the information received through interpersonal communication. I also explore the conditions under which such an influence might be more pronounced. The analysis focuses on men's extramarital sex because, as noted above, male behavior seems to be more relevant for the transmission of HIV, and because the quantitative examination of women's extramarital activity is less reliable given the lack of variance. The study analyzes a male population in rural Malawi, a country in southeastern Africa that has many of the socioeconomic and demographic features common to other countries in the region (World Bank 2006).

2. Social interactions and the behavior of others

An explanation of extramarital sexual relationships that does not examine the social context would be inadequate and unrealistic. Sexuality is influenced by socially shared understandings and meanings, which might in turn be shaped by sexual motives and notions of sex (Thornton 2008). In Malawi, as in other sub-Saharan countries, social disapproval of male extramarital affairs is prevalent. Only 7% of married men agree that it is acceptable for a married man to have sexual relations outside marriage, according to the data used in this empirical analysis of the rural population of Malawi (MDICP 2004).³ Sexual infidelity is even viewed by the Malawians as the most frequent trigger for the dissolution of a marriage (Kaler 2001). Moreover, public condemnation of male and female infidelity in the church congregations that have spread through southeastern Africa (Chimbiri 2006), together with personal experiences and observations of the devastating consequences of the HIV/AIDS epidemic in the region, may have forced people to reconsider certain norms and beliefs. Evidence from other countries in the region, such as Nigeria, has also shown that men tend to hide their extramarital relationships, not only from their wives but also from people in the community (Smith 2007). Therefore, it appears that sexual fidelity in marriage is normatively supported.

On the other hand, masculinity is understood in sub-Saharan Africa to be closely linked to signs of skill in the sexual domain, which may include having a large number of sexual partners (Varga 1997; Kaler 2003; Smith 2007), and having the capacity to provide economic support and protection. Indeed, the number of partners a man is sexually active with can be interpreted as an expression of masculinity, because it is seen as indicative of the man's economic status. As men are expected to offer monetary and non-monetary transfers to their female sexual partners in informal relationships (Luke 2006, 2007; Tawfik and Watkins 2007), economic exchanges related to sex take place not only in the context of commercial sexual relations. Research has shown that informal conversations in which men boast about their sexual exploits and about how many sexual partners they have are common in male-dominated social settings in sub-Saharan countries (Kaler 2003; Smith 2007). Thus, in addition to providing him with sexual pleasure and affection, having an active extramarital sexual life may enhance a man's social reputation, particularly among his peers.

Therefore, despite the general norm that married men should be sexually faithful to their wives, a range of factors, both individual and social, appear to motivate and even encourage some men to have extramarital sex. Scholars who have looked at the mechanisms of influence have found that informal conversations are a key channel through which married men are likely to become aware of the extramarital experiences

³ The abbreviation stands for Malawi Diffusion and Ideational Change Project.

of other men, and of their opinions on extramarital relationships. Through these conversations, men may gain practical knowledge about how to meet potential sexual partners and maintain a relationship outside of marriage. They may also learn more about the range of positive and negative consequences of having extramarital affairs, and about the likelihood that they will experience these consequences in the community in which they live. A thorough examination of this exchange of information and the content of the messages received would be very revealing. However, a simpler but nonetheless crucial question could also be analyzed: namely, what impact does his belief about the prevalence of extramarital sex in the social network or reference group have on the behavior of a married man? Men who perceive that a substantial proportion of the married people with whom they interact have extramarital sex may feel pressured to behave as the others do. Complying with the expectations of others helps individuals to integrate into the group and maintain enduring relationships. Some studies have found a notable effect of peer pressure, especially among adolescents, on sexual behaviors, such as premarital sex or unprotected sex (DiClemente 1991; Bearman and Brükner 2001; Fletcher 2007). Recent research on the operational definitions of social norms has revealed that, in addition to believing that certain behavior is socially interpreted as the *right* way to act in a particular situation (*normative expectations*), individuals need to perceive that there is a substantial level of compliance with the norm (*empirical expectations*) in order to be motivated to obey it (Bicchieri 2006). Moreover, some experimental work has shown that individuals are more prone to violate the norm in situations in which they believe that only a small proportion of their social group actually comply with it, even if they also believe that most of the people in the group think that the rule should be followed (Bicchieri and Xiao 2008). In sum, the behavior of others is expected to play an important role in explaining individual actions.

As I noted above, although Malawians tend to agree that spouses should be sexually faithful, men who think that most people disobey this rule may interpret the norm to be weak, and believe that infidelity is, at the very least, tolerated. Therefore, these men are expected to be more likely to have extramarital sex. The opposite would be the case for men who were immersed in a social group in which extramarital sex is a rare phenomenon. Such a low prevalence might be a sign of the rigidity of the norm of fidelity, the existence of strong social controls, or a lack of pressure among male peers to prove their masculinity through having a large number of sexual partners. Thus, my first hypothesis is that the proportion of married network partners who, according to the respondent, have engaged in extramarital relations will positively affect the respondent's likelihood of having sex outside marriage. As I will explain in the following section, network partners are identified as those people with whom the interviewee reports having had some interpersonal communication.

The power of social sanctions and peer pressure depends on the characteristics of the social group. Theories of social interaction, such as those that explain the diffusion of innovations, collective action, and social influence, highlight the relevance of the network structure for understanding individual behavior and demographic and social changes (Schelling 1971, 1978; Granovetter 1973, 1978; Moscovici 1985; Rogers 1995; Montgomery and Casterline 1996; Scherer and Cho 2003). Dense networks, in which ego's network partners are connected to each other through strong ties, are more likely to enforce norms and conventions (Granovetter 1973). The desire of individuals to please others by behaving as others expect them to tends to be particularly strong in dense networks, as is the power of the group to effectively punish norm violators (Bott 1957). Moreover, because the actors in such networks are likely to think that the information they have about the opinions and behaviors of others is also shared by everyone else—i.e., that this information is common knowledge (Chwe 1999)—they can be more confident that their behavior is based on common expectations.

For these reasons, my second hypothesis is that the impact of the perceived level of prevalence of extramarital relationships in the group on men's sexual behavior varies with the network density.

Although the number of studies on the quantitative measurement of the effect of social interactions on issues related to HIV prevention has been growing over the past decade (Helleringer and Kohler 2005; Smith and Watkins 2005; Kohler, Behrman, and Watkins 2007), the issue of the influence of social interactions on extramarital sexual behavior has yet to be explored. It should be noted, however, that Clark (2010) has addressed a related question using data from previous waves (1998 and 2001) of the longitudinal survey also used here: the Malawi Diffusion and Ideational Change Project. Clark studied the extent to which the perceptions among married men in rural Malawi of the extramarital behaviors of particular network partners influenced them to have sexual relationships outside of marriage. More specifically, she focused on the best married male friend and another male friend or acquaintance reported by the respondent. The two main goals of Clark's research (2010) were, first, to test whether the respondent's behavior both correlated with and was affected by his friends' sexual behavior; and, second, to explore whether a best friend exerted more influence than a more distant actor, as the theory of social influence predicts. Her fixed-effects panel analysis of married men showed that the best male friend's behavior had a significant effect, whereas a more distant friend's behavior did not. In an alternative multivariate logistic model that Clark also proposed, respondents who indicated in the first wave that they believed their best friend's extramarital behavior differed from their own were more likely to have reported different extramarital behavior in the following wave. Analogously, the effect of having a more distant friend who behaved differently in 1998 was slightly lower, but was still significant.

In the present study, rather than investigating the behavior of specific actors, I examine the relevance of the perceived prevailing conduct in the entire network, and look at the conditions of the network structure that facilitate the influence of the group. In addition, given that best friends have been found to exert a strong influence, either because of their capacity to impose sanctions or through deeper cognitive and emotional mechanisms (Montgomery and Casterline 1996), our final task in this study is to test whether the group exerts an influence when the perceived behavior of the best friend is controlled for. The dominant behavior in the network is expected to have an effect that is independent of the behavior of a particularly influential actor.

3. Data and measures

I used data from the most recent waves (2004 and 2006) of the longitudinal survey included in the *Malawi Diffusion and Ideational Change Project* (MDICP). The data were collected in rural sites located in each of the country's three regions: north, center, and south. The sample frame consisted of ever-married women of childbearing age and their current husbands. Although the sample was not designed to be nationally representative, the distributions of the responses were quite similar to those of comparable questions among the rural population in the nationally representative Malawi Demographic and Health Survey (for more details about the quality of the survey, see Watkins et al. 2003; Anglewicz et al. 2009). Only the married men's reports were analyzed with the goal of exploring the factors that explain men's extramarital sexual behavior.

The dependent variable in the analysis measured whether the respondent had engaged in extramarital sexual relations in the last year. In the questionnaires of both waves, a list of questions about the last three sexual partners during the previous 12 months was included. Those men who mentioned having a sexual partner other than their wife or wives were classified as having engaged in extramarital sex.⁴ In 2006, men were specifically asked whether the partner was a previous wife. For each man who reported having such a partner, I checked whether he reported a marriage that ended in 2005 or 2006⁵, in order to ensure that I was not counting a relationship with a former

⁴ I am aware that a measure of sexual behavior outside marriage might be affected by misreporting, as this is a sensitive topic. Evidence of married individuals misreporting their sexual behavior in this same survey has been provided. Cordero-Coma and Breen (2012) have observed important discrepancies in the reports that husbands and wives provide about their use of condoms within marriage. Unfortunately, sophisticated methods for dealing with this problem cannot be used in this case, given that the man's report is the only available source of information about his extramarital relations.

⁵ I have decided to include the years 2005 and 2006 in the criterion because there is no information available about the month when the marriage ended, and most interviews were carried out in mid-2006.

wife as an extramarital affair. Those married men who reported having other sexual partners, but who did not marry until the year when the survey was conducted, also were not counted as having engaged in extramarital sex.⁶ A steady girlfriend was the type of extramarital sexual partner most frequently reported in both survey waves, followed by an infrequent partner. Nevertheless, although some very limited information about the characteristics of the extramarital relationship was provided, the small sample sizes forced me to analyze these relationships as a homogenous category, which could be considered a constraint. Table 1, which displays the distribution of the variables in the empirical analysis, shows that about 10% of the married men in both waves reported having had extramarital sexual partners over the previous year. The missing cases in this variable, about 1% in each wave, were dropped. The same procedure was applied to all of the variables in the analysis. The total number of missing cases was 204 in 2004 and 192 in 2006.

Given the aim of this research study, one of the main explanatory variables was the respondent's report about the extramarital sexual behavior of the people with whom he interacted. More specifically, the measure referred to the perceived percentage of married network partners who had engaged in sex in the last 12 months with partners outside of marriage. Respondents were asked about the number of people with whom they have ever chatted about AIDS, and then to provide further details about a maximum of four of these people, such as information about their marital status and extramarital sexual behavior. Only those conversational partners who were married were taken into account. The expectations about the dominant behavior in the social context were then measured with a three-category variable: the first category consisted of those married men who said that 50% or more of their married network partners were unfaithful, the second category was made up of men with networks in which extramarital sex was perceived to be less prevalent, and the third category consisted of those husbands who reported having no unfaithful network partner. Models with an alternative categorization of this variable were also tested and are commented on in the empirical section below.

⁶ This correction has been made in order to improve the measure, which is somewhat imperfect, since we cannot know the exact dates when the weddings and sexual intercourse took place. It should be noted that the interviews for the two survey waves were carried out in mid-2004 and mid-2006, respectively.

Table 1: Characteristics of married male respondents: percentages and descriptive statistics, 2004 and 2006

	2004	2006
Had extramarital sex in last year – No	89.1	90.8
Had extramarital sex in last year – Yes	10.9	9.2
Age (mean)	40.7	40.6
S.D.	12.5	13.1
Education – Never attended	14.3	17.0
Education – Primary	70.1	67.0
Education – Secondary or more	15.6	16.0
Spending on personal purchases – None	46.0	35.6
Spending – Some	29.5	39.0
Spending – In the highest quartile	24.5	25.4
Religion – Muslim	24.8	26.3
Religion – Catholic	16.9	16.4
Religion – Protestant	37.7	36.6
Religion – Others	20.6	20.7
Attended church – Last week	64.5	68.5
Attended church – Last month	22.1	24.7
Attended church – Prior to last month/Never	13.4	6.8
Known people dead from AIDS (mean)	7.7	9.3
S.D.	11.3	9.4
Marriage – Polygamous	16.7	15.1
Marriage – Monogamous	83.3	84.9
Duration of last current marriage (mean)	13.7	13.1
S.D.	10.1	10.5
Stayed outside the District – For less than a month	84.7	85.5
Stayed outside the District – For at least one month	15.3	14.5
Region – South	31.1	31.4
Region – Center	35.3	35.3
Region – North	33.6	33.3
Network – None had E.Sex	63.9	58.9
Network – Less than half had E.Sex	12.7	20.0
Network – Half or more had E.Sex	12.7	21.1
Without a network	10.7	0.0
Non-dense network	66.1	58.5
Dense network	16.8	40.0
Missing (with less than 2 network partners)	17.1	1.5
Observations	819	935

It should be noted that this network is a proxy of the social network, given that information was available only about those individuals with whom the husband had informal conversations about AIDS. It is therefore important to be aware of the characteristics of such a subgroup of the social network, which I call the AIDS network. Table 2 illustrates some aspects of the AIDS networks in two different ways. The characteristics of the respondents regarding their type of network are displayed at the top of the table, while the characteristics of the reported AIDS network partners are shown at the bottom.⁷ As the table clearly shows that the proportion of respondents who said they had not chatted with anyone was negligible in both waves, I was able to examine the social context of most of the sample units. Informal conversations on AIDS appeared to be more common in 2006, as a greater percentage of the married men interviewed (88%) reported having chatted with more than four people in this wave than in the previous one. Thus, for more respondents in 2004 than in 2006, the analyzed networks formed by a maximum of four married people about whom the interviewee offered information—called censored networks here—were the same as the complete AIDS networks. However, this finding did not clarify how similar the composition of the reference group was to that of the AIDS censored network. There was a trend toward larger AIDS networks, given that the average size of the uncensored networks—i.e., the total number of people with whom the respondents had chatted about AIDS—was much higher in 2006. This increase could have been due to the accumulation of conversations over time for those men interviewed in both ways.⁸ In addition, the average size of the censored networks was 3.34 married network partners in 2004 and 3.87 in 2006. In these censored networks, about 90% of the husbands in both waves only talked to men. The proportion of married men who only reported information about confidants or friends, as opposed to information about acquaintances or people they had met just once or twice, was higher in 2006 than in 2004 (0.84 versus 0.68). Therefore, AIDS conversations were more common in the community in 2006, and the analyzed censored networks in this wave referred more specifically to conversations with the closest network partners. Nonetheless, since most of the censored networks were mainly made up of confidants or friends in 2004 as well, it appears that the measure of the prevailing behavior in the network referred to the immediate social network or peer group made up of married friends⁹ who were mostly men. The similarities between each respondent and his network partners were not as evident in terms of levels of education. About 75% of the respondents in 2004 and 50% of the respondents in 2006 had a censored network in which half or more of the individuals

⁷ For this alternative description, I pooled all the reported married network partners and got a sample of 2,207 in 2004 and 2,817 in 2006. Some of them may refer to the same person, who was reported by more than one married man in the sample.

⁸ Unfortunately, there was no information about the time frame for these conversations.

⁹ Some of these friends or confidants may be relatives.

had the same level of education as the respondent. The percentage in 2004 might have been exaggerated by the fact that, in this wave, those married network partners who never attended school could not be distinguished from those with primary or lower education, and were thus classified as having completed the same level of education as those respondents who had completed primary or lower education. To provide a more complete picture of the educational composition of the network, Table 2 shows the distribution of two variables: the network partner's education level and the network partner's education level relative to the respondent's. The distribution was quite similar to that of the education variable in the sample of married men (Table 1), although the percentage with secondary education or higher was bigger in the sample of network partners (about 20% versus 16%). The fact that 40% (23% plus 17%) of the 2,817 reported married network partners in 2006 had a different level of education than the respondent might also indicate that the censored networks involved individuals from different cohorts. Unfortunately, there was no information about each network partner's age.

In addition to the information provided about the AIDS censored networks, respondents in all of the waves were asked whether they thought that their best married male friend had engaged in extramarital sex in the last year. The possible answers in the questionnaire were: "yes," "suspects," "no," and "don't know." The first two were recoded as a positive answer, and the last two as a negative response. According to this dichotomous variable, about 23% and 22% of husbands in 2004 and 2006, respectively, said they thought their best friend had engaged in extramarital sexual partners in the last year.

A variable describing the density of the network structure was also introduced in the analysis in order to estimate whether the perception of the behavior of others had a stronger effect in groups in which everyone knew each other. The variable differentiated between those men whose network partners were all connected by strong ties—i.e., they were confidants or friends instead of acquaintances or unknown—and the rest. The density indicator referred to the whole censored network, including both the married and the unmarried partners, in order to provide a more accurate measure of the kind of social network the respondent was immersed in. About 17% and 40% of those respondents who reported having had at least two network partners in 2004 and 2006, respectively, were involved in dense networks (see Table 1).

The rest of the indicators in the analysis measured the individual and marital union characteristics that were identified as relevant in previous studies, although the magnitude and direction of the effects of each of these had not yet been clarified. The respondent's age and level of education were two of these indicators. The evidence of previous research on the direction of the effect that education had on extramarital sexual behavior was ambiguous, as positive, negative, and even non-significant effects

were found in different studies (Isiugo-Abanihe 1994; Ahlburg, Jensen, and Perez 1997; O'Connor 2001; Clark 2010).

Table 2: Description of the networks

	2004	2006
Characteristics of the respondents		
Proportion who chatted with one person at least	0.91	0.99
Proportion who chatted with more than 4	0.38	0.88
Uncensored size of the network (mean)	5.27	16.63
S.D.	(11.99)	(26.06)
Censored size of the network (mean)	3.34	3.87
S.D.	(0.98)	(0.50)
Proportion with a censored network in which ¹ :		
all married network partners are men	0.91	0.92
all married network partners are respondent's confidants or friends	0.68	0.84
More than half of the married network partners have the same level of education as the respondent	0.75	0.50
Characteristics of the sample of married network partners		
Never attended school		0.16
Primary educational level or lower	0.80	0.65
Secondary or higher level	0.20	0.19
N	2207	2817
Same educational level as the respondent	0.80	0.60
The partner has a lower level	0.07	0.17
The partner has a higher level	0.13	0.23
N	2111	2817

Note: The missing cases in each variable have been eliminated from the sample to compute the proportions. The percentages of husbands with missing values in 2004 and 2006, respectively, are: 2.5% and 1.2% in "all network partners are men," 2.6% and 5.9% in "all network partners are married," 1.2% and 2.6% in "all network partners are confidants or friends," and 3.5% and 4.6% in "more than half of the network partners have the same education as the respondent."

The respondent's economic status was measured with an indicator for the amount of spending on clothes, fabric for clothes, and shoes for himself over the past three months. The original variable was continuous and the unit of measure was *kwacha*, the official currency in Malawi. Given that a very substantial percentage of the married men reported no spending on these products (45% in 2004 and 35% in 2006), a variable with three categories was constructed: no spending, some spending but less than in the top quartile, and spending in the top quartile. This measure referred to the possession of cash instead of the ownership of goods or properties. Such an indicator is interesting, as

several studies have highlighted the role of monetary and nonmonetary transfers, such as gifts in informal sexual relationships in sub-Saharan societies (Hunter 2005; Mishra et al. 2007; Bingenheimer 2010). Those married men who spent more on personal purchases were assumed to have had greater spending capacity, and to have been better able to afford to having extramarital sexual partners.

The influence of religion appears to differ depending on the country (Isiugo-Abanihe 1994; Kimuna and Djamba 2005; Clark 2010). The indicator used in this study synthesized the different faiths into four categories: Muslim, Catholic, Protestant, and others. In addition to including members of the independent African churches, the last category consisted of men who answered “no religion;”. 1.8% of the sample in 2004 and 0.9% in 2006 were in this category. The respondent’s religiosity was also measured using an indicator for the last time he went to church. It distinguished between three types of churchgoers: those who had attended church services in the past week, those who had gone to church over the past month, and those who had last attended church more than two months ago. The latter category also included those who never went to church.

The perception of the risk of getting infected with HIV also had to be taken into consideration. I expected to find that the epidemic had increased the costs of having extramarital sex, especially given that the use of condoms is not widespread in sub-Saharan countries such as Malawi (Cleland and Ali 2006; Bankole et al. 2007; Chimbiri 2007). I therefore assumed that those men who were more aware of the disease—which was measured here with a continuous variable of the number of people known to the respondent who had died from AIDS—would avoid putting themselves at risk.¹⁰

In terms of the type of marriage, polygamous and monogamous marriages were differentiated, and the duration of the last marriage that was still continuing was also included. The research into the influence of polygamous unions on extramarital sex has been inconclusive (Isiugo-Abanihe 1994; Carael, Ali, and Cleland 2001; Reniers and Tfaily 2008). Some authors have claimed that the traditional institution of polygyny, which was weakened considerably by the spread of Christianity in Malawi and in other countries in the region (Kaler 2001), might have generated or reinforced the common belief that men need many sexual partners in order to be sexually satisfied (Caldwell et al. 1993). However, this convention might have also restricted the multiplicity of partners to the marriage domain (Mitsunaga et al. 2005). Concerning the duration of marriage, I expected to find that the men who had lived with their wives for longer periods of time were more interested in seeking out other sexual partners.

¹⁰ In 2004, 3.2% of married men answered “don’t know” to this question. I imputed the average value of the distribution to these cases. The magnitude of the coefficients and the significance level in the analysis, however, barely changed.

Migrant laborers have generally been considered a crucial vector in the spread of HIV among the heterosexual population, because they act as bridges between different sexual networks (Hirsch et al. 2002; Wolffers et al. 2002; Lurie et al. 2003; Yang 2006). In the case of sub-Saharan Africa, most of these migrants are rural men who stay in cities temporarily, far from the companionship and social control of their families and friends. The only indicator which could identify migrant status in these databases was rather poor, as it only measured whether the man stayed outside of his district for at least one month out of the last 12 months. As migrant men might be underrepresented in the sample, the conclusions that can be drawn on this issue on the basis of this analysis are very limited.

The region of the country—north, center, or south—was also introduced in the model to account for the substantial regional differences in cultural patterns (Helleringer and Kohler 2005; Chimbiri 2006) and in the prevalence of extramarital sexual relations; with the south being the region where more married men and women reported having had other sexual partners.

The practice of postpartum abstinence has also been identified as an important reason for seeking extramarital sexual partners (Glynn et al. 2001a). Similarly, the practice of having sex with prospective brides might explain extramarital sex in polygamous marriages (Clark 2010). Unfortunately, the information available about marriages and children's birth dates in these waves of the MDCIP was not detailed enough to allow me to construct reliable measures.

4. Methods

The analysis was based on multivariate logistic regression models, as the goal was to explain a dichotomous dependent variable: i.e., having had sexual partners outside of marriage in the last 12 months. First, the data from the two waves of the MDICP (2004 and 2006) were analyzed cross-sectionally. Thus, the model is:

$$Y_i = X_i\beta_1 + N_i\beta_2 + u_i \quad (1)$$

where Y_i is the dependent variable by married man i , X_i refers to the individual and marital union observed characteristics, N_i involves the social network characteristics, and u_i is the error term.

The data from the two waves, 2004 and 2006, were pooled in the cross-sectional analysis, with a multivariate logistic model applied to a larger sample. This method was considered suitable because it improved the statistical efficiency given the greater

number of cases, and because there was no indication that the influence of each variable changed substantially from 2004 to 2006.

The cross-sectional analysis used here may be inadequate to estimate the influence of social interactions on individual attitudes and behavior. The results from this analysis would be correct if all of the individuals had had the same opportunity to interact with any kind of person or network, and thus did not select their communication partners according to particular characteristics related to the behavior that we have been seeking to explain. In the case of extramarital sex, it makes sense to assume that those married men who were more prone to being unfaithful were also more likely to have had unfaithful friends. A very clear example would be those men who usually go to brothels or similar places, since they are likely to meet new friends there who have extramarital sex with sex workers. Thus, a significant correlation between the respondent's behavior and his network partners' activities could simply have been a consequence of the active selection of the interlocutors, rather than evidence of the effect of the network.

A solution to this problem is the use of longitudinal analysis with fixed effects, which takes advantage of having information about the same individual at more than one point in time; in our case, in 2004 and 2006 (Kohler, Behrman, and Watkins 2001; Helleringer and Kohler 2005). This methodological strategy did not involve the assumption that the unobserved individual-specific factors were not correlated with the regressors. The model would be:

$$Y_{it} = X_{it}\beta_1 + N_{it}\beta_2 + \alpha_i + u_{it} \quad (2)$$

where α_i refers to the unobserved time-invariant characteristics that are supposed to affect the dependent variable.

In the analysis with fixed effects, these unobserved characteristics could correlate with the other variables on the right-hand side of the equation because it allowed us to control for the unobserved (and observed) heterogeneity among the sample units that did not change over time. More specifically, this model conditioned out the fixed part from the residual, and from all explanatory and control variables in the model. This implies that the features that induce social interactions and the selection of certain network partners, such as personality or household location, did not change between waves. This was a reasonable assumption in this analysis, given the shortness of the time interval; i.e., just two years. In linear panel-data models, the estimation of the coefficients was obtained by appropriate differencing transformations. In order to illustrate this process, I focus here on the analysis with fixed effects of a longitudinal dataset with two waves. The differenced version of model (2) would be:

$$\Delta Y_{it} = \beta_1 \Delta X_{it} + \beta_2 \Delta N_{it} + \Delta u_{it} \quad (3)$$

where Δ denotes the differences in variables between the two waves at time $t + 1$ and t ; or between 2006 and 2004 in our case. The term α_i and all of the time-invariant control variables were canceled out.

In the case of logit analyses, this estimation process was not possible. However, the fixed component could be eliminated through the conditional maximum likelihood estimation, which conditioned on the total number of outcomes equal to one for a given individual over time, with one and zero being the two possible values in the dependent variable. This estimation procedure eliminated those observations where Y_{it} was zero for all t or Y_{it} was one for all t (see Cameron and Trivedi 2009, for further details). In other words, it restricted the analysis to those individuals who changed their behavior (the outcome) between waves. A limitation of this method is that the sample size might decrease notably, which could lead to wrong conclusions, especially if the distribution of the explanatory variables in the subsample changes substantially. For this reason, I also used linear probability models. As I noted above, the estimation of linear models with fixed effects does not imply a reduction in the number of analyzed cases. I adjusted for the violations of the classical OLS model assumptions (normality and homoscedasticity of the disturbance term) by using robust standard errors (Behrman, Kohler, and Watkins 2001). Both the linear probability and the logit models with fixed effects are presented for comparison. As we will see, the significance level of the coefficients barely changed.

5. Empirical analysis

As I explained at the outset of this paper, the main objective of this research was to estimate the influence of the perceived occurrence of extramarital sex in the social network on married men's behavior in a context in which fidelity is normatively supported, but having multiple sexual partners is usually interpreted as a sign of masculinity in peer male groups. Table 3 shows the results of the multivariate analysis. In Model 1, it was assumed that the association between the respondent's perception about the network partners' sexual behavior outside of marriage and his unfaithful activity was linear, while the question of whether the effect is especially strong when the two extremes of this variable are contrasted was tested in Model 2.

The continuous measure of the percentage of network partners who had engaged in extramarital sex in the last year had a marked effect on the dependent variable (Model 1). Model 2 showed that the association with the husband's behavior was not linear, given that small percentages (less than 50%) of unfaithful network partners did not make any significant difference in individual behavior. Meanwhile, men with a network in which 50% or more of the individuals had engaged in extramarital sex were

statistically more likely to have reported having engaged in extramarital sex in the last 12 months.¹¹ In other words, as expected, the likelihood of having had extramarital sexual relations strongly depended on whether that sexual behavior was perceived as being common or rare in the peer group. It was not possible to distinguish the specific mechanism that explains the results of the analysis: e.g., the desire to please others, the lack of effective social sanctions against unfaithful husbands, or the importance of peer sanctions against monogamous men. In any case, the analysis showed that the perception of the dominant behavior in the network matters.

Concerning the relevance of the other variables in the model, Models 1 and 2 showed that five variables had a significant impact on the likelihood of having extramarital partners: economic status, religion, religiosity, type of marriage, and region. The signs of the coefficients were as expected given the arguments and findings of previous studies outlined in Section 3; however, it is important to note that no regular patterns related to the role of religious affiliation and the type of marriage were observed in the literature (Isiugo-Abanihe 1994; Carael, Ali, and Cleland 2001; Kimuna and Djamba 2005; Reniers and Tfamily 2008; Clark 2010). According to Models 1 and 2, age, education, risk perception, duration of marriage, and having spent at least one month outside of the district did not have a statistically significant influence on men's extramarital behavior.

A characteristic of the network structure was added in Model 3: namely, the density. Introducing an interaction of this factor with the proportion of network partners who were thought to have had extramarital sex in the last year enabled us to examine whether there was a multiplicative effect.¹² Model 3 showed that the influence of having a social network in which half or more of the partners were perceived to be engaged in extramarital affairs increased when everyone in the network was connected to each other through friendship links. The result is in line with the argument that individuals are more prone to coordinate or adjust their behavior to the dominant behavior when beliefs and expectations are perceived to be socially shared. People who are embedded in a dense network—i.e., a group in which everyone knows each other reasonably well—may feel especially motivated to behave as the others do.

¹¹ A good alternative categorization of the proportion of unfaithful network partners distinguishes between those men with networks in which more than half of the partners, instead of half or more, have had extramarital sex. The results hardly changed. In the longitudinal model with fixed effects (Model 5 in Table 5), this alternative categorization was significant at the 0.1 level.

¹² It should be noted that, in Model 3, the sample was limited to those respondents who had talked about AIDS with at least two people, since the calculus of the density had this requirement. The coefficients of all the variables in a model that added the density but not the interaction (not shown here) were similar to those in Model 3.

Table 3: Multivariate logit regression of husbands having extramarital sex in the last 12 months, pooled data from 2004 and 2006

	Model 1	Model 2	Model 3
Age (yrs)	-0.011 (0.010)	-0.011 (0.010)	-0.020 (0.011)
Education – Never attended (ref)			
Education – Primary	0.312 (0.245)	0.345 (0.243)	0.309 (0.257)
Education – Secondary or more	0.376 (0.333)	0.456 (0.330)	0.469 (0.345)
Spending on personal purchases – None (ref)			
Spending – Some	0.342 (0.206)	0.345 (0.205)	0.252 (0.217)
Spending – In the quartile that spent the most	0.498* (0.220)	0.515* (0.217)	0.401 (0.229)
Religion – Muslim (ref)			
Religion – Catholic	-0.309 (0.363)	-0.360 (0.359)	-0.235 (0.342)
Religion – Protestant	-0.630* (0.298)	-0.612* (0.298)	-0.431 (0.304)
Religion – Others	-0.439 (0.344)	-0.421 (0.342)	-0.250 (0.342)
Attended church – Last week (ref)			
Attended church – Last month	0.176 (0.205)	0.155 (0.203)	0.058 (0.223)
Attended church – Prior to last month/Never	0.646* (0.293)	0.618* (0.297)	0.646* (0.300)
Known people dead from AIDS	-0.021 (0.011)	-0.022 (0.012)	-0.022 (0.011)
Monogamous marriage	0.797*** (0.223)	-0.780*** (0.222)	-0.942*** (0.237)

Table 3: (Continued)

	Model 1	Model 2	Model 3
Duration of last current marriage (yrs)	0.002 (0.011)	0.002 (0.012)	0.011 (0.012)
Stayed outside the district for at least one month	0.315 (0.209)	0.333 (0.208)	0.322 (0.215)
Region – South (ref)			
Region – Center	-0.457 (0.295)	-0.463 (0.296)	-0.598* (0.290)
Region – North	-0.620* (0.300)	-0.631* (0.300)	-0.730* (0.299)
Proportion of net partners that had E.Sex ¹ (cont.)	1.839*** (0.245)		
Network – None had E.Sex (ref)			
Network – Less than half had E.Sex		0.434 (0.230)	0.553* (0.261)
Network – Half or more had E.Sex		1.316*** (0.194)	0.911*** (0.255)
Without a network	-0.509 (0.530)	-0.526 (0.530)	
Dense network			-0.154 (0.291)
Dense network * Less than half...			-0.334 (0.564)
Dense network * Half or more...			1.100** (0.414)
Constant	-1.472** (0.500)	-1.503** (0.510)	-1.063* (0.539)
Observations	1771	1771	1593

Notes: Clustered standard errors in parentheses.

¹ E.Sex stands for "extramarital sex".

* pvalue<0.05; ** pvalue<0.01; *** pvalue<0.001

The next question I addressed was whether the dominant behavior in the group was relevant even after controlling for the behavior of a particular actor who was strongly connected to the husband, and who was considered to be especially influential. As I explained in Section 2, Clark (2010) found that the perceived extramarital behavior of the best male friend was much more important than the behavior of people who were just casual friends or acquaintances. The following analysis included the perceived extramarital behavior of the best friend, which allowed me to estimate the influence of

this particular actor and the influence exerted by the group, which in this case was made up of all of the network partners except the best friend. According to Model 4 in Table 4, the two variables were crucial for explaining the respondent's behavior. The best friend's behavior was found to have had a significant effect; and, if half or more of the network had engaged in extramarital sex, *ceteris paribus*, the man's likelihood of having had extramarital sex was also shown to have increased substantially. Thus, the perceived prevalence of compliance with the norm of fidelity was relevant, independent of the behavior of a person closely linked to the respondent.

Table 4: Multivariate logistic regression of husbands having extramarital sex in the last 12 months, pooled data from 2004 and 2006

	Model 4
Best friend had E.Sex – No (ref)	
Best friend had E.Sex – Yes	1.109*** (0.186)
Network – None had E.Sex (ref)	
Network – Less than half had E.Sex	0.140 (0.249)
Network – Half or more had E.Sex	0.723*** (0.200)
Without a network	0.025 (0.373)
Constant	-1.641** (0.514)
Observations	1760

Notes: The model includes controls for age, education, spending on personal purchases, religion, religiosity, number of known people that have died from AIDS, type of marriage, duration of last current marriage, having stayed outside the district, and region. Clustered standard errors in parentheses.

* pvalue<0.05; ** pvalue<0.01; *** pvalue<0.001

The strong association between the respondent's behavior and the actions of his friends and other network partners could have been a consequence of the non-random selection of interlocutors, instead of reflecting an influential effect of social interactions. There might have been some unobserved factors correlated with both the individual's extramarital behavior and the characteristics of his network partners that biased the estimation, such as the respondent's personality traits and preferences (Behrman, Kohler, and Watkins 2001; Kohler, Behrman, and Watkins 2007; Clark 2010). Based on the assumption that such unobserved heterogeneity did not change between the two waves, a panel analysis with fixed effects enabled us to deal with the

potential selection of husbands into social networks. Since the estimation process conditioned out the time-invariant part of the model, the effects of the level of education, religion, and region were not estimated in the logit model in Table 5.¹³ Both a linear probability model (LPM) and a logit model were estimated for the purposes of comparison. The sample size in the longitudinal analysis was reduced to those married men who were interviewed in both waves. Moreover, those men whose extramarital sexual behavior did not change from one point to the other were eliminated from the logit model.

Table 5: Fixed-effects panel analysis (linear probability models and logit models) of husbands having extramarital sex in the last 12 months, waves 2004 and 2006

	Model 5	
	LPM ¹	Logit M
Network – None had E.Sex (ref)		
Network – Less than half had E.Sex	-0.015 (0.037)	-0.432 (0.664)
Network – Half or more had E.Sex	0.089* (0.045)	1.449† (0.746)
Without a network	-0.010 (0.043)	-1.421 (1.334)
Year	-0.022* (0.010)	-0.665* (0.315)
Observations	1083	128

Notes: The model includes controls for the time-variant variables: spending on personal purchases, religiosity, number of known people that have died from AIDS, type of marriage, duration of last current marriage, and having stayed outside the district. Standard errors in parentheses (robust standard errors in linear probability models).

¹ LPM stands for Linear Probability Model.

† pvalue<0.1; * pvalue<0.05; ** pvalue<0.01; *** pvalue<0.001

In both the linear probability model and the logit model, those individuals who had a network in which 50% or more of the partners were perceived to have been engaged in extramarital sex were significantly more likely to end up with extramarital partners than those who reported that no married person in their networks had engaged in sex outside marriage.¹⁴ It should be noted that the coefficients in the panel analysis refer to

¹³ I introduced a dummy of the wave, so the man's age was not included since both variables measure the same thing. This is so because the fixed-effects model estimated the within-individual variation.

¹⁴ The coefficient was significant at the 0.1 level in the logit model, which was considered a relevant threshold given the small sample size.

the influence over the likelihood of change in the dependent variable. The longitudinal analysis, which allowed us to deal with the self-selection problem, corroborated the result from the cross-sectional test. It provided convincing evidence of the influence that the perceived dominant behavior in the network exerted on the individual's actions.

6. Discussion

The study of the factors that promote or discourage extramarital sex is crucial for understanding the spread of the HIV epidemic in sub-Saharan Africa. This research has examined the influence of the peer group on married men's extramarital behavior in rural Malawi, a country with a high rate of HIV prevalence that shares many social and economic characteristics with the rest of the countries in southeastern Africa, the region of the world most devastated by the epidemic (World Bank 2006). The analysis focused on the role of individual expectations about the extramarital sexual behavior adopted by married individuals in the peer group, but it did not explore the question of whether the sexual behavior of single network partners had an impact on the husbands' extramarital activities. If, for example, single men had large numbers of sexual partners, this may have encouraged the general belief—which has been observed in sub-Saharan communities (Caldwell et al. 1993)—that men need many women for sexual satisfaction.

A special effort was made in this study to avoid the biasing effect on the estimation that the non-random distribution of interlocutors among the respondents might produce. It should be noted, however, that the selection problem could not be completely overcome because the panel analysis with fixed effects did not enable me to control for potentially biasing unobserved characteristics that changed between waves.

This paper, like several other empirical studies that examined the influence of social networks on individual attitudes and behavior (Bühler and Kohler 2003; Helleringer and Kohler 2005; Smith and Watkins 2005; Kohler, Behrman, and Watkins 2007), has an important limitation. The analysis focused on a small subset of network partners with whom the respondent chatted about AIDS, but the reasons why these interlocutors were selected were not provided. These relationships might have been associated with the most recent, frequent, or salient conversations, but I was unable to check whether this was the case. The description of the married network partners' characteristics, commented on in Section 3, suggests that a large share of these network partners were closely linked to the respondents. Therefore, it seems reasonable to think that the study worked with proxy measures of the prevailing behavior in the immediate network or peer group.

The analysis showed that the proportion of married people in a husband's network who he believed had sexual partners other than their spouses in the last 12 months positively influenced his likelihood of having extramarital sex. Thus, the results support the hypothesis that the perceived prevailing behavior in the social network—or at least in the group of married people with whom the individual talks about intimate and health issues—is relevant for understanding the behavior of married men in Malawi.

Even though marital infidelity was socially disapproved of, individuals' decisions were affected by their expectations about how others *really* behave. Married men update their beliefs about how they were expected to behave through social interactions, and this has an impact on their actions. A high prevalence of extramarital affairs in the network might indicate that sexual relations outside of marriage were tolerated in the group, or were even encouraged by peers.

Research on the influence of the social group would improve if surveys included some information on the respondent's beliefs about how each network partner thinks people should behave, and their likely reactions to different actions. We would be able to explore the existence of social norms and attempt to test the hypothesis put forward by Bicchieri and Xiao (2008) that individuals tend to disobey a norm, such as sexual fidelity, when their empirical expectations about the actual behavior of the people in their social group do not match their normative expectations of how others think one should behave. In addition, we could try to measure the effect of the anticipated positive and negative social sanctions on individual decisions in order to better understand the mechanisms of social pressure and the role of different motives for compliance with norms.

The analysis presented in this paper also supports the hypothesis that the density of the network intensifies the effect of empirical expectations. Several theoretical and empirical studies have shown that the influence of the group depends on the type of social network, and that denser networks, which are typical of small and homogenous groups that foster intense relationships, tend to facilitate social pressure and control (Granovetter 1973; Moscovici 1985; Helleringer and Kohler 2005). Moreover, network density not only informs us about the capacity to effectively watch and punish; it also makes coordination possible. The degree to which network partners are connected to each other allows individuals to know the extent to which certain information, beliefs, and expectations are socially shared. The database analyzed did not enable us to observe whether the respondent was aware that the information he had about the prevalence of this practice in the group was shared by all of the members, but it could be assumed that he believed that this was common knowledge when all of his network partners were friends with each other.

Finally, the study explored whether the influence of the group was relevant independent of the behavior of a certain actor who had been previously identified as

particularly influential (Clark 2010). The analysis here showed that the social group had a significant influence, even when the best friend's behavior was controlled for.

To conclude, the extent to which extramarital sex was commonly practiced in the peer group affected husbands' decisions to have this kind of sexual relationship, particularly when these groups were dense networks. In addition, there was some evidence that the perceived frequency of this practice in the network was important, independent of the specific behavior adopted by the married men's closest friends.

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