Explaining both reported and 'true' condom use within marriage in rural Malawi: A couple-level analysis

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Abstract

In populations where extramarital sex is common and condoms are not generally used, married people, even when sexually faithful, are at high risk of becoming infected with HIV/AIDS. Some preventive practices, such as the use of condoms in marital sexual relations, may be in conflict with specific social norms that regulate marriage. In this paper we examine the influence that the fidelity norm and the traditional association between marriage and reproduction have on condom use within marriage. To do this we apply latent class analysis to estimate a 'true' or latent measure of condom use within marriage based on the individual, and sometimes discrepant, reports of husbands and wives. Moreover, we also explore the reasons why individuals tend to misreport their preventive sexual behavior. In order to test the robustness of our results, two different samples of monogamous couples are taken from the Malawi Diffusion and Ideational Change Project (MDICP), 2004 and 2006. The analysis supports the hypotheses that, on the one hand, the suspicion of unfaithfulness and the number of living children increase the 'true' use of condoms by married couples, and on the other hand, that having been informed by experts about AIDS prevention at home induces men and women to over-report condom use within marriage in a survey but does not necessarily increase the extent to which condoms are used.

Keywords: HIV/AIDS, Malawi, condom use, social norms, couple-level analysis, Latent Class Analysis, marriage, fidelity, prevention.

Introduction

Around 67 per cent of all people infected with the HIV virus live in sub-Saharan Africa (UNAIDS and WHO, 2009). Furthermore, HIV infection here is widespread among the heterosexual population, in contrast to the situation in other parts of the world where the phenomenon is concentrated on high-risk groups, such as drug consumers, homosexuals, or prostitutes. One of the most convincing explanations of why this is so argues that the spread of the epidemic in this region is not due to individuals having high numbers of sexual partners *per se* but to the common practice of simultaneous long-term relationships (Morris, 1995; 1997). Extramarital sexual relations are very common among both married men and women (Tawfik, 2003; Kohler et al., 2007; Tawfik and Watkins, 2007) in several parts of the region, despite the fact that the majority of survey respondents in several countries report that it is acceptable to divorce a spouse, especially a wife, who has been unfaithful (Chimbiri, 2006). As a result, even

faithful married individuals are at high risk of becoming infected because their partner may have short and long-term sexual relations outside marriage.

This risk would be considerably less if condom use were a normal practice. However, the level of reported condom use is still low in casual relations, and even lower in formal or marital relations. The lack of condom use in marital relations has important negative consequences for the population, since marriage is the context were most sexual intercourse takes place and so the likelihood that a non-infected member of a marital couple becomes infected is high. Besides, reproduction is embedded in marriage and children may become infected during pregnancy or delivery, so affecting their health, and they are more likely to become orphans, so affecting their socioeconomic condition.

For these reasons, it is of special interest to focus on preventive behavior within marital relations in sub-Saharan countries. Specifically, it is important to identify the reasons why married individuals have unprotected sexual relations within marriage in societies where extramarital sex is quite common, especially among men, and the perceived risk of becoming infected is very high, given that the great majority knows someone who has died of AIDS (Smith and Watkins, 2005). Moreover, several studies show that the sub-Saharan population has a good knowledge about the mechanisms by which HIV can be transmitted and of some of the ways it can be protected against (Lindan et al, 1991; Neequaye et al., 1991; Barden-O'Fallon et al., 2004; Nachega et al, 2005).

In this paper we have both a substantive and methodological goal. Substantively, we analyze the relationship between condom use in marital relations in rural Malawi and three factors which we believe will be an important predictor of it. We discuss these factors and our hypotheses about them in more detail in the ensuing section of the paper. Methodologically we seek to overcome the problem that arises when a question asked of both spouses – namely whether they have ever used condoms in their marital sexual relations – elicits conflicting responses. To this end we use latent class models to capture the true or latent response and we also investigate factors that may help to explain the discrepancy between the respondent's manifest and latent response.

Actual and reported use of condoms in marriage

We hypothesize that an important factor in determining whether or not a couple uses condoms in their marital sexual relations is whether the husband or wife believes that his or her spouse has been unfaithful and that there is thus a risk of contracting the virus from him or her. Nonetheless, some further facilitating conditions are required in order for condoms to be used, because condom use conflicts with established social norms about marriage. Despite

considerable levels of extra-marital sexual activity, marriage in Malawi is supposed to be based on trust, faithfulness and legitimate sex and reproduction (Watkins, 2004; Smith and Watkins, 2005; Chimbiri, 2007; Tavory and Swidler, 2009), and this militates against condom use within marriage as a preventive strategy. Attitudes towards the use of condoms are likely to depend, in part, on personal beliefs or expectations about the social acceptability of condom use that individuals update through social interactions. Those individuals who perceive that extramarital sexual relations are common among the people with whom they usually talk may believe that the norm of marital fidelity is not so important and this may increase their likelihood of using condoms in marriage. As regards reproduction, the clash between condom use and the social norm that makes wives and husbands understand the provision of offspring as one of their main duties should have less relevance the more children the couple already has. It is not only that spouses are likelier to agree upon using condoms when they do not need to renounce reproduction, but marital discussions about condom use may also come up more easily when the spouses agree on an alternative interpretation of this practice, that is to say, by understanding it as a contraceptive, rather than a disease-prevention, method. In our analyses we attempt to capture the elements of this argument using measures of suspicion of spousal unfaithfulness, the perceived extent of extramarital sex in one's social network, and relevance of parenthood within marriage.

On methodological grounds, the ideal research strategy to investigate condom use is to collect information from both husband and wife. Most studies about preventive sexual behavior[1], as about many other topics, conduct separate analyses for women and men. This approach has severe limitations, since the outcome to be explained is not a strictly individual behavior. Moreover, the same person may use condoms with one particular sexual partner but not with another. Couple-based analyses, on the contrary, offer more comprehensive and realistic models, since they take into consideration information about both parties involved in the act of using, or not using, condoms. Nevertheless, this approach becomes problematic when the indicators referring to the couple behavior are constructed, since the researcher must take decisions about how to deal with the inevitable husband-wife discrepancies in the reporting of practices such as condom use within marriage.

Almost no effort has been made in the literature to identify important causes of discrepancies or biased responses (Miller et al., 2001; Harvey et al., 2004)[2]. In this paper we develop a couple-based explanatory model of condom use within marriage that identifies and takes into consideration the factors that bias individuals' reports of condom use. To this end we use latent class analysis (LCA) (McCutcheon, 1987: Hagenaars and McCutcheon, 2002), which

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[1] An exception is Zulu and Chepngeno (2003).
[2] Some other studies have examined differences in reporting contraceptive use and intentions between partners (Ezeh et al., 1996; Becker, 1999; Ezeh, 2000).

"models the relationships between sets of categorical or ordinal variables as arising from the common influence of an unobserved, latent variable, having two or more categories or classes" (Breen, 2000: 375). In our case the latent, unobserved variable is the "true" use of condoms by the couple, and the manifest variables are the husband and wife's responses to the question of whether they use condoms within marriage, plus the other selected variables that explain preventive sexual behavior and/or bias the report of condom use. In other words, we estimate a measurement model and a structural model simultaneously. The former attempts to uncover the "true" degree of condom use in marriage, while the latter attempts to assess the effect of a set of explanatory variables on this "true" response.

This methodological strategy has two main advantages for our study. On the one hand, we can carry out a couple-level analysis of preventive sexual behavior, and, on the other hand, we can explore the biasing effect of certain factors on the report of condom use. This is because the manifest response to the question of condom use given by a man or woman may be a function not only of what the couple truly does but also of other factors which may induce individual respondents not to tell the truth to the interviewer. It is easy to imagine how useful a understanding of these factors would be in improving our knowledge about effective policies to encourage preventive behavior against AIDS.

In this study we hypothesize that those individuals who have been informed by health assistants or other experts about AIDS and the ways to prevent infection are more likely to over-report condom use during an interview even though they may not be more likely to use condoms. If this proves to be so then some of what appear to be a positive influence of expert information on individual preventive behavior may derive, at least in part, from the fact that having received such information induces people to give exaggerated reports of their preventive practices.

In sum, the aim of this research is to understand the levels of condom use within marital relations in Malawi (and by extension some other sub-Saharan countries) from a micro perspective, taking into consideration the effect of factors that may bias individuals' responses about preventive sexual behavior. In the next section of the paper we present the data and review the characteristics of the Malawian context on which the research focuses. We detail the research problem in section three and the statistical method in section four. The empirical analysis is summarized and explained in section five, while the last section consists of the concluding remarks.

Data and context

Our empirical analysis uses data from the Malawi Diffusion and Ideational Change Project (MDICP). The aim of this project is to examine the effect of social interactions on

individuals' behavior and attitudes towards the use of modern contraceptive methods and HIV/AIDS in rural Malawi. The MDICP provides both qualitative and quantitative data. In this study, we make use of the latter, which consist of a longitudinal household survey conducted in 1998, 2001, 2004, and 2006 in three rural districts, one in each of the three regions of the country –Rumphi (North), Mchinji (Centre), and Balaka (South). The sampling frame was ever-married women aged 15-49 and their husbands (if currently married). Sample size has changed during the period 1998-2006. The first wave included about 1,500 ever-married women and 1,100 spouses of these women, which constitutes a sample that is reasonably representative of the married rural population. In 2001 new spouses were added, and respondents who could not be located in 1998 were interviewed. In 2004, the sample increased with a random sample of adolescents in order to correct for the underrepresentation of young females due to aging and it also included non-married individuals. In 2006 the spouses of married adolescents were also interviewed.

In this analysis we use the data from the last two waves (2004 and 2006), since these are the only ones that provide specific information about condom use inside marriage. We first analyze the data of one of the years and then replicate our analyses using the other wave to test the robustness of our results. There is considerable overlap between the 2004 and 2006 samples but they are not identical because some of the couples are not present in both waves.

Since one aim of this research is to show the importance of taking couples as units of analysis in the study of preventive sexual behavior we limit the sample to those individuals whose spouse has also been interviewed.[3] We analyze monogamous couples only because we cannot know, in the case of polygamous families, to which of the current wives the man's responses about condom use inside marriage refer.[4] Furthermore, women's evaluation of the HIV risk that unprotected marital sex involves would be more complex in polygamous couples, possibly requiring a differently specified model.

Malawi has a mature epidemic with an HIV prevalence among adults that exceeds 14% (UNAIDS/WHO, 2009), and an estimated rural prevalence of 10.8% (Malawi DHS 2004). Malawi exemplifies the problems in the region, since it is similar to other sub-Saharan countries and to countries classed in the World Bank low income group in terms of life expectancy, educational enrollment, infant mortality, and other indicators (World Bank, 2006). Subsistence agriculture characterizes all three regions of Malawi - north, center and south - but there are differences among them in terms of marriage system, ethnic composition, and socioeconomic conditions. The north has higher levels of education and wealth, and follows a patrilineal system of inheritance in which residence after marriage is patrilocal. In the center and south the

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[3] The datasets allow one to link each individual to his or her current spouse. Other possible sexual partners were not interviewed. In the majority of the analyzed couples, husband and wife were interviewed the same day, although separately.

[4] Men in polygamous marriages are less than 20% in both samples.

marriage system is matrilineal and matrilocal although this is less strict in the central district, where residence may be either matrilocal or patrilocal.[5] The differences between these two types of kinship ties have been considered as determinants of women's autonomy and social integration (Helleringer and Kohler, 2005; Takyi and Broughton, 2006; Takyi and Gyimah, 2007; Reniers, 2008), and, indirectly, of HIV preventive behavior.

The Malawian rural population is quite aware of the HIV/AIDS epidemic and how HIV is transmitted: more than 70% and 85% of sexually active women and men, respectively, identify abstaining from sex as a way to avoid HIV infection and almost 60% and 68% of these women and men report that AIDS can be avoided by using condoms during sex (DHS, 2004) Low levels of condom use outside and inside marriage do not, therefore, seem to be related to a lack of knowledge about the disease. Moreover, if anything, rural Malawians tend to overestimate the probability of becoming infected through a single act of sexual intercourse with a person who has the virus (Smith and Watkins, 2005). Even in marital relations, the perception of lower risk does not seem to be the main factor that explains the absence of condom use, given that around 70% and 65% of married women and men are worried about becoming infected (MDICP 2004).

Multiple studies have highlighted the relevance of the social environment for the adoption of preventive practices in sub-Saharan Africa, as in other regions (Rushing, 1995; Caldwell, 1999; Gausset at al., 2001; Rutenberg et al. 2001; Dolcini, et al., 2004). Experimental and empirical analyses have emphasized both the negative and positive influence of peers on risk assessments and risky behavior (Campbell and MacPheil, 2002; Hughes-D'Aeth 2002; Scherer and Cho, 2003). Numerous authors have treated the spread of modern contraceptive methods as a diffusion process (Montgomery and Casterline, 1996; Kohler, 2001), and some recent studies investigate the role of social networks on HIV preventive attitudes and behavior (Helleringer and Kohler, 2005; Kohler et al, 2007).

The social acceptance of condom use is far from being widespread. Although the dramatic levels of HIV prevalence have forced Government agencies and NGOs to promote condom use, public programs and policies tend to associate condom use with risky sex outside marriage, and especially commercial sex (Chimbiri, 2007). However, a significant part of the population reports having had some informal conversations about AIDS in which condom use has been considered by some of the interlocutors to be a good strategy against AIDS (Bühler and Kohler, 2003). The percentage of people who say that condom use within marriage is acceptable to protect against HIV infection has increased from 1998 to 2004, especially among women (from 15% in 1998 to 42% in 2004) (Tavory and Swidler, 2009).

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[5] In a patrilineal/patrilocal system offspring are part of the man's kinship group. Polygyny is a common practice in this system. In a matrilineal/matrilocal system, inheritance of offspring, property, and family resources is through the mother's brother.

As some authors have pointed out, the spread of condom use inside marriage may be hindered by established social norms that regulate marital relations (Caldwell, 2000; Watkins, 2004). One of the main norms in marriage is fidelity. To propose the use of condoms thus amounts to breaking this norm since it is either an admission that one has not been faithful or that one believes that the other has not been faithful (Smith, 2006; Tavory and Swidler, 2009). However, since extramarital sexual relations are quite frequent among married men in Malawi, it could be that the fidelity norm does not exert a strong pressure on certain individuals or groups, in the sense that these people do not expect a relevant proportion of the population to follow the rule and do not believe that this is the way an individual should behave (Bicchieri, 2006). Extramarital sex among married women is not infrequent, but it is far from being socially accepted or even socially tolerated, so we do not expect that this rule has normatively weakened. This leads us to the hypothesis that the spread of unfaithfulness in the husband's social network has some effect on the married couple's preventive behavior. We expect that condom use within marriage is more likely when the man's married friends are perceived as unfaithful.[6]

The other fundamental social norm that regulates marital relations is the intimate link between marriage and parenthood. Wives and husbands in Malawi and other sub-Saharan countries are expected to provide their spouses with children. Marriage is understood as the institutional frame in which legitimate sex and children are embedded (Caldwell 2000; Watkins, 2004; Chimbiri, 2007). Some Malawians even believed that marriage is motivated by the intention to have children (Sultana et al., 1990[7]). Therefore, the use of condoms as a preventive strategy against HIV/AIDS in marital relations can only make sense when the couple already has children. The twofold function of condoms, as contraceptive and as protection against infection, is expected to hinder their use when the couple has no children, but may facilitate it once they have, since the contraceptive characteristic allows couples to reinterpret condom use in a way that does not conflict with faithfulness and trust. Condom use should therefore be more common when both husband and wife agree on stopping or spacing births: conversely childlessness should have a negative influence on condom use inside marriage.

The methodological problem

Research studies about sexual behavior and contraceptive use have conventionally focused on individuals, attempting to observe the effect that personal characteristics, and,

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[6] We focus on reports of male infidelity in networks because we are unlikely to find as much variance in reports for women.
[7] Cited in Chimbiri, 2007.

sometimes interpersonal interactions, have on individual actions. Women's responses have been considered the most useful in the analysis of contraceptive use in developing countries, although demographers have long noticed spousal discrepancies in surveys (Koenig et al., 1984). Even when the responses of both men and women are taken into consideration, analyses are usually carried out separately by sex. This approach implicitly assumes that the phenomena of interest are individual actions that may be influenced by one's own and other people's actions and attitudes. However, sexual behavior and even contraceptive use are difficult to conceive of as purely individual actions. There have been few attempts to explain the relevance of the kind of sexual relationship and the interaction between the sexual partners to preventive sexual behavior: the 'interactional framework' (Van Campenhoudt et al., 1997) is one such attempt. In more general terms, theoretical developments in the study of social norms (such as those that regulate condom use in marriage) emphasize their contingent character, since they are understood as behavioral rules that are believed to apply in specific contexts (Tversky and Kahneman 1981; Bicchieri 2006). Nevertheless, it is difficult to find empirical couple-based analyses of preventive sexual behavior (Zulu and Chepngeno, 2003) and there are very few studies that compare wife's and husband's responses to issues related to HIV prevention (Anglewicz and Clark, 2008; Miller et al, 2001).

The use of couples as units of analysis may improve the explanation of condom use as an HIV preventive practice. It is not enough that we focus on specific sexual contexts (that is, that we take into consideration the reported condom use in each individual's particular relationship); we should also pay attention to the responses of both partners to questions concerning individual characteristics or actions and couple behavior. On the one hand, we may be interested in the attitudes, expectations, and perceptions of both actors involved, and the best source of information is, in principle, each person's report. On the other hand, we should take advantage of having two statements referring to the same outcome. Ideally, husband's and wife's reports about having ever used condoms with their spouse should be very similar, and the differences would be exclusively due to non-systematic errors. In that case, either response could be taken as a measure of the couple's practice. However, husband-wife discrepancies may be observed, even when the quality of the surveys is high. This is exactly the case in the Malawian data.

Table 1 shows that the percentage of husbands who report having ever used condoms[8] with their current spouse is higher than the same figure for wives in 2004 and 2006. These results could derive from a general tendency for men to give positive answers more often than women. Miller et al. (2001) also observed this pattern in the 1998 wave of the MDICP, although

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[8] Unfortunately, the MDICP surveys do not ask about condom use at the last sexual intercourse with a specific type of partner, which is usually considered the best indicator of condom use, because it is less susceptible to memory and other biases than are questions about the frequency with which condoms were ever used.

rather than condom use they analyzed several other issues including 'having ever talked with the spouse about the risk of getting AIDS'.

Table 1. Distribution of condom ever used inside marriage according to wives and husbands, and the distribution of discrepancies between the spouses, 2006 and 2004.

	2004						2006					
	N	Wives	N	Husbands	N	Couples	N	Wives	N	Husbands	N	Couples
Condom ever used with current spouse												
No	488	75.9	474	73.7			486	77.5	453	72.2		
Yes	91	14.2	123	19.1			136	21.7	168	26.8		
Missing	64	10.0	46	7.2			5	0.8	6	1.0		
Total	643	100.0	643	100.0			627	100.0	627	100.0		
Discrepancies on												
condom use inside marriage												
Both say yes					47	7.3					66	10.5
Wife says yes, husband says no					41	6.4					69	11.0
Husband says yes, wife says no					62	9.6					99	15.8
Both say no					394	61.3					382	60.9
Missing					99	15.4					11	1.8
Total					643	100.0					627	100.0

The number of missing cases in both wives and husbands' responses is quite high in 2004 because people who reported that they had not had sex with their spouse in the last 12 months were not asked about condom use with their spouse. Thus, the category of missing cases in the discrepancies variable involves couples in which at least one of the spouses is a missing case. Curiously, however, in most of these missing couples, the other spouse reported that they had had sex, so discrepancies are present even in these cases. In 2006, this problem does not occur because every individual had to answer the question about condom use, independently of whether the couple had sex in the last year or not[9]. We eliminated all the missing cases from our subsequent analyses.

In both years the percentage of monogamous couples whose members report opposite answers is more than double the percentage of couples in which husband and wife agree that they have ever used condoms. Thus we should be cautious when selecting our source of information about condom use inside marriage. In this study, we identify one characteristic that may induce people to misreport condom use inside marriage, and we use this information to obtain a more reliable measure.

Analyses of survey data frequently assume that the characteristics of the interviewer and the situation in which the interview takes place have no systematic impact on the likelihood that the respondent gives truthful answers. However, in reality the survey situation may play an important role on the quality of the information obtained (Fowler, 1993) and this is particularly likely when the topics that are discussed are sensitive, controversial, and private (Huygens et al., 1996). Miller et al. (2001: 170) argue that respondents give the answers that they think can benefit themselves or their community in the light of what they believe the interviewer's

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[9] It should be noticed, however, that the percentage of women and men who reported not having had sex in the last year was minuscule in 2006.

research aims to be. This explanation seems to assume an instrumental and conscious reaction by the respondent and we consider, instead, the possibility that a respondent's beliefs about what the interviewer and the people "like" her/him expect shapes the answer that is given. In other words, people provide a response about their behavior coherent with what they believe is a socially desirable behavior (Crowne and Marlowe, 1960; Phillips and Clancy, 1972; DeMaio, 1984; Kissinger et al. 1999; Gregson et al., 2002). The formation of these beliefs is mainly derived from the comparison that the respondent makes between the particular situation in which the interview takes place and previous experiences with similar characteristics that he/she remembers (Lamberts and Shanks, 1997). We therefore hypothesize that those individuals who report that someone like a Community-Based Distribution Agent, a Traditional Birth Attendant, or a Health Surveillance Assistant[10] ever came to their home to give them information about how people can protect themselves against AIDS will tend to overreport condom use. Huygens at al. (1996: 225) report that, in Uganda, "local farmers and teachers trained as interviewers in the programme were soon viewed as members of the pool of researchers known as 'doctor' or 'virus' in the community. […] This attitude may influence the respondent to hide his or her own beliefs and behaviors in assuming that the interviewer is more educated or sophisticated." Therefore, it makes sense to think that those respondents in the MDICP surveys who have been informed about HIV/AIDS preventive practices by these local "experts" are likely to associate that experience with the interview, where they are asked by mostly local interviewers about sexual behavior, AIDS, and condom use, among other things. Clearly AIDS information from experts may also affect actual condom use and in our analyses we seek to measure both the potential biasing effect on the report of condom use and the effect on condom use itself.

Our approach: Latent Class Analysis

We use latent class models to estimate a measurement model and a structural model for condom use. The measurement model links a latent unobserved true response concerning condom use in marriage to the manifest responses of the husband and wife to the question concerning condom use in marriage. We use the measurement model and structural models to examine how characteristics of couples are related to true condom use, and how the true response relates to their manifest responses (the results are in Tables 2 and 3). In addition, in the measurement model, the relationship between the manifest and latent responses of the husband and wife varies according to one factor that is expected to induce individuals to misreport condom use inside marriage. The estimation of the whole model enables us, then, to both understand the

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[10] These are all local workers who have been trained by the government or NGOs for various purposes related to family planning, health promotion, and reproduction assistance.

mechanism that explains the true condom use and identify some of the reasons behind husband-wife discrepancies in reporting their preventive behavior.

Our final analysis is a comparison of the results of the latent class analysis with models in which we take the reported condom use by each of the partners as the dependent variables. Our intention is to illustrate the advantages of using our approach, which removes the necessity of choosing one of the spouse's responses as the truthful one. The specification of the models is the same except as regards the dependent variables for comparison purpose.

The relatively small sizes at our disposable force us to make a number of simplifications to the analysis. We mainly use dichotomous variables, although we are aware of the resulting loss in explanatory power. Moreover, we are sometimes obliged to use the response of one or other spouse to construct the explanatory variable that measures a couple characteristic. This is the case, for example, with location of residence, which may be matrilocal or patrilocal. Both the husband and the wife were asked about this topic but we use the latter's response (though in this case there are few discrepancies).

Results

Figure 1 shows the structural and measurement models and Tables 2 and 3 report the maximum likelihood estimates of its parameters in the 2004 and 2006 data. On the one hand, models 1 and 2 in Table 2 and models 5 and 6 in Table 3 refer to the latent class analysis. In the measurement model, the latent true response generates the observed responses of husband and wife. In the structural model we focus on how couple level characteristics predict latent or true condom use. On the other hand, models 3, 4, 7, and 8 consist of a logistic regression analysis in which the dependent variable is derived from the wife and husband's reports of condom use, respectively. This allows us to see how the results of an analysis might be sensitive to which partner's response is analyzed and how they differ from the findings of our latent class model.

[FIGURE 1 and TABLES 2 and 3 HERE]

Latent Class Analysis

We fit two latent classes models to each year's data: these two models differ only in their specification of the measurement model. In the first, we estimate a model with a restricted measurement part where the husband and wife's manifest responses are exclusively generated by the true latent variable (models 1 and 5). In the second we allow the manifest responses of husband and wife to depend also on whether or not they have been informed about Aids by experts (models 2 and 6). Fitting these two different versions of the measurement model then

allows us to observe how the estimated effects of the explanatory variables on the true condom use shift when we take into account factors that may induce women and men to misreport protected sex inside marriage. In the structural model we include wife's age, the couple's education, and the residence norm as control variables and we also include three variables to test our hypotheses about the determinants of condom use in marriage. These are the perception of HIV risk derived from extramarital relations (a dichotomous indicator that distinguishes those couples in which at least one of the spouses suspects the other of infidelity); childlessness (measured by the number of living children distinguishing zero or one from more than one); and the proportion of the husband's network partners that are (or are suspected to be) unfaithful. We also include two variables indicating whether the husband and wife, respectively, have been informed by experts about AIDS and the ways to prevent it.

The measurement model may be written as a logit model:

$$\text{logit}\left[\frac{Y_i = yes}{Y_i = no}\right] = \beta_{0s}[\eta = yes] + \beta_{1s}[X_i = yes],$$

where i denotes individual observations and s denotes sex, Y is the manifest response to the condom use question and X is the variable measuring whether or not the individual has been informed by experts about AIDS. The latent response is denoted by η.

In the first version of the measurement model we set $\beta_{1s} = 0$ and thus focus only on the relationship between the latent and manifest responses. A chi-squared test of the hypothesis that β_0 does not differ by sex cannot be rejected in the 2004 data, and so Table 2, model 1 reports a single coefficient. This is not the case for the 2006 data and so in Table 3, model 5, we report the sex-specific coefficients which suggest that women's manifest response is more closely linked to the true response than is men's.

In the second version of the measurement model (models 2 and 6 in Tables 2 and 3) we estimate both coefficients, but now, in both years' data, we can constrain both coefficients to the same for men and women (chi-square of 0.133 in 2004 1.87 in 2006, both with 2 df). The β_1 coefficient is positive and statistically significant, indicating that having been informed by experts increases the odds of a positive latent response by a factor of two and a half times in 2004 (= exp(0.913)) and 2.3 times in 2006 (=exp(0.828)).

Turning to the structural model, which predicts the log odds of being in the 'yes' category of the latent response, we see that, as expected, the probability of having ever used condoms decreases with the wife's age, although in 2004 only the coefficient of the highest category is significantly different from that of the youngest females. As regards education, the indicator differentiates those couples in which both husband and wife have attended school from the rest. The influence of education is positive and substantial in both years.

The type of marriage and residence system has also a negative effect on condom use and this is the opposite of what we expected. The matrilineal marriage system is supposed to provide the wife with more autonomy from her husband (Takyi, 2006; 2007; Reniers, 2008), since it is her clan who owns the resources, such as land, and controls the offspring. Many studies, especially in social psychology, that interpret condom use as the result of a negotiation process, have emphasized the relevance of women's lack of autonomy in the failure of preventive behavior (Gage, 1998; Wingood and DiClemente, 2000; UNAIDS, 2004). The negative effect of matrilocal residence that we find suggests, on the contrary, that women's autonomy does not lead to more condom use. On the other hand, the result may arise from selection. Divorce is quite common in Malawi (Kaler, 2001), and some authors have observed that matrilineality/matrilocality has a positive effect on the likelihood of divorcing (Reniers, 2003; 2008; Takyi, 2006; 2007). Women in matrilineal systems are likely to find fewer obstacles to ending a marriage, given that they and their matrilineal families have custody of the children and control over the resources. Hence, the costs of divorcing are smaller for women in this situation. Since our samples consist of married couples, instead of individuals, it could be that our sample contains an over-representation of couples that are more prone to break up from patrilineal marriage and residence systems: in other words, couples in a patrilineal context who would have been divorced if the institution that regulates marriage were a matrilineal type. Given that those couples remain married, they are more likely to look for other preventive strategies, such as condom use. Thus, if the selection issue exists, then the negative effect of matrilineality/ matrilocality may be due to the fact that the spouses are less motivated to protect themselves from HIV/AIDS in this social context.

We then include the explanatory variables to test the hypotheses that we discussed earlier. As expected, the perception of HIV risk derived from extramarital relations has a positive and significant effect in 2004 and 2006. Childlessness (or having only one living child) reduces the likelihood that a couple has ever used condoms. We interpret this to mean that the use of condoms increases when couples are willing to use contraceptive methods – that is, once that they have children. This does not necessarily mean that the only reason why they use condoms is a contraceptive intention: couples may also be trying to avoid HIV/AIDS infection, but they are more likely to agree on condom use when it can be interpreted as a way of avoiding pregnancy.

A high proportion of the husband's network partners that are (or suspected to be) unfaithful positively influences the use of condoms by the couple in 2004, though the effect is only weakly significant. Indeed, the effect is not statistically significant when we use the more complex measurement model (model 2) and it does not appear to be relevant at all in 2006. The results do not seem to support the hypothesis that the weakness of the fidelity norm facilitates condom use inside marriage by reducing the conflict between protected sex and formal sexual

relations. It should be said, however, that this is a crude measure of the social norm of fidelity, since we are unable to include additional information.

According to models 1 and 5, having received expert information about AIDS prevention has a positive influence on condom use in the case of females, but not of males. This result could be seen as a piece of evidence that spreading AIDS information through the rural population by interpersonal communication between women and local experts on health is an effective preventive policy strategy. However, when we turn to models 2 and 6, these effects disappear. Being informed by experts seems not to make individuals more likely to use condoms with their spouse, but instead induces them to give a positive answer to the survey question. Moreover, the husband having been informed by an expert appears to have a negative influence on true condom by the couple once we allow for the effect of having been informed in the measurement model. It could be that formal AIDS prevention information induces men to protect themselves from AIDS through increasing their preventive practices outside marriage, since this is the sexual context where prevention campaigns addressed to men place greater emphasis (Heald, 2002; USAID, 2002; Sinding, 2005; Chimbiri, 2006; Green et al., 2006). Faithfulness and condom use in commercial and casual sexual interactions are two of the main recommended practices in prevention campaigns in sub-Saharan Africa. Hence, if men who receive expert information are more prone to reduce the number of extramarital sexual partners and/or to use condoms with such partners, then protected sex inside marriage might be considered a less appealing preventive strategy for the couple. This interpretation would be valid even when controlling for the suspicion of the spouse's unfaithful behavior, since men who have been informed would be less worried about infecting their spouse, and therefore, less willing to use condoms in marital sex.

Couple vs. individual measure of condom use

The introduction in the LCA of a factor that systematically biases the reports on condom use has shown one of the advantages of our approach. Now we turn to the advantage of using a measure of condom use at the couple level, as opposed to the traditional individual-based analyses. As Table 2, models 3 and 4, and Table 3, models 7 and 8, show, results from the analysis of condom use inside marriage vary depending on which spouse's response is considered. Some variables that seem to be crucial when studying condom use according to wife's report are not significant at all when the men's reports are analyzed. In model 3 in Table 2, which uses the wife's response, the level of education in the couple, the wife's age, the suspicion of infidelity by at least one partner, and whether the wife received expert information about AIDS all affect the likelihood of having ever used condoms. In contrast, the relevant variables in model 4, which uses the husband's response, are the educational level, the number

of living children, and the proportion of the husband's network partners that are unfaithful. Differences between models 7 and 8 in Table 3 are similarly large. A common finding in the analysis of both waves that should be highlighted is that the variable indicating whether the wife has received information from experts is always positively related with condom use reported by the wife, whereas it is never a relevant factor when the husband's response is taken as the dependent variable.

Conclusions

In this paper we have used latent class analysis to deal with husband-wife discrepancies in reports of condom use in marriage. This approach offers two advantages over more conventional ones: first it is possible to estimate a measure of condom use at the couple, rather than individual, level. Condom use is never a strictly individual outcome: sexual behavior is affected by the context in which it takes place and by the attitudes and characteristics of the individuals involved, and the social norms that regulate different types of sexual relations are diverse. The advantages of the latent class analysis in comparison with traditional approaches become evident when we see that conclusions about the factors affecting condom use depend on which spouse's responses are considered. Secondly, the LCA sheds light on why we observe discrepancies between the husband's and wife's responses about condom use. We are able to explore the factors that induce men and women to lie or tell the truth in response to survey questions about their preventive behavior.

One of the main objectives of this study was to test the hypothesis that condom use within marriage is in conflict with the most salient social norms that regulate marital relations in rural Malawi. Fidelity and reproduction are the fundamental elements that guide spouses' behavior, and are hardly compatible with the use of condoms, which, our analysis showed, is motivated by the suspicion of unfaithfulness. However, the pressure that such social norms exert on individuals and couples might depend on the expectations that they have about the extent to which others follow the norms. Besides, the compliance with the norm that links marriage with reproduction is more evident as the number of children increases. So, the use of condoms in marital relations should be less problematic as the family reaches an acceptable size. The empirical analysis in this research supports the part of the argument concerning reproduction. Nevertheless, we have not found evidence to support our proposition concerning the relevance of the social norm of fidelity.

On the other hand, we have identified a factor that partially explains the deviations of the responses that women and men give about condom ever use within marriage from the 'true' couple preventive behavior. Those individuals who report that a local expert has ever been to

their homes to inform them about AIDS preventive behavior are more prone to exaggerate, in their responses, their use of condoms within marriage. We consider that those people are to associate that experience and the interview, so they report a behavior they believe they are expected to have adopted. Our results show that failing to take account of this would lead to the erroneous conclusion that being informed by experts about AIDS prevention actually induces couples to use condoms (at least according to the wife's report).have protected sex. These results should not be interpreted as evidence of the failure of prevention programs that spread AIDS information through the rural population since they might have a positive effect on other preventive practices. However, we should be cautious when evaluating the success of policy interventions, and be sensitive to the bias that may be present when individuals report their own behavior.

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Appendix

Indicators construction

Education:
In the 2006 datasets, both women and men's questionnaires include the question about the *respondent's highest level of schooling*, which distinguishes between No-school, Primary-level, Secondary-level, and Higher. In 2004, women are administered a household roster that includes the question about the highest level of schooling of any person at the household, which has the same categories as in 2006. Thus, the information about the husband's level of education is extracted from the wife's report. The couple-level indicator that we have constructed takes value two when both husband and wife have attended school and value one otherwise.

Wife's age:
Women in both waves, 2004 and 2006, have been asked about their age. We have used that information to construct a three-category variable.

Matrilocal residence:
Both the husband and the wife are asked: *After you and your spouse got married, where did you live? In your spouse's home or village, in your home or village, or somewhere else?* We have constructed a two-category indicator that distinguishes between those who live in the wife's home or village from the others. Since there are a small number of discrepancies between the husband and wife's responses on this topic, we have taken the woman's answer.

Suspicion of infidelity:
Regarding each of the three sexual partners at most that the respondent has had in the last 12 months, she/he answers to the question: *Do you think he/she had other sexual partners during the time you were with him/her?* Obviously, the datasets specify the type of relationship with each partner. The couple-level indicator takes value two when at least one of the spouses suspects, and value one when the two of them answer '*No*' or '*Don't know*' to that question.

Living children:

The datasets include information about the number of living children that each individual has. We have constructed a dichotomous indicator that measures the number of living children reported by the wife. Since very few women have no living children (and the same happens with women who have less than two in the 2004 database), the reference category includes cases with one child or less in the 2006 indicator and with two or less in the 2004 measure in order to ensure that no category is too small for the statistical inference. Anyway, it makes sense to consider that one or two children represent a very small family size in the rural Malawian context, where the total fertility rate is 6,4 children per woman (DHS, 2004).

We have taken the women's reports because this is the source of information that has conventionally been selected as the most reliable one in the fertility and family planning studies, and because the social pressure for avoiding childlessness may be stronger on women than on men. Female sterility has

traditionally been more socially condemned (Isiugo-Abanihe, 1998). In addition, we have focused on the children who are still alive since we consider that the decision about stopping having children is especially dependent on the actual number of descendants, instead of on the amount of births. This statement is particularly suitable in societies where the flow of wealth from the younger to the older generation exceeds the reverse flow (Caldwell, 1976 and 1982; Clay and Van der Haar, 1993).

Proportion of husband's unfaithful married network partners:

This indicator has been built from several items in the questionnaire. On the one hand, the man is asked: *How about your best male married friend. Has he had sex with anyone other than his wife in the last year?* On the other hand, the respondent also gives information about the sexual behaviour of four of the people with whom he has chatted about AIDS. He is asked: a) *How many people other than your spouse have you chatted with about AIDS?* b) *Can you give me the (faked) names of four of these?* c) *Is (each of the network partners) married? d) Is the best friend you talked to me about earlier? e) How many men/women other than her/his spouse do you think she/he has slept within the last year?* We have calculated a rate where the denominator includes all the married people in the communication network plus the best friend (if the latter is not one of the network partners), and where the numerator includes those who have been unfaithful, according to the respondent. A dichotomous variable has been constructed afterwards, which takes value two when 40% of the network partners or more has had extramarital sex, and value one otherwise.[11]

Since all men who have been interviewed give an answer to the question about the best married friend's extramarital relations, we have information about the spread of unfaithfulness even for those that have not talked to anybody about AIDS (who are just a few in both 2004 and 2006). Although the people with whom men have talked about AIDS could be men or women, more than 85% and 95% of ego's communication networks are formed only by males, in 2004 and 2006 respectively.

Informed by experts on AIDS:
The databases include responses to the question: *Has someone like a CBD Agent, TBA, or a Health Surveillance Assistant ever come to your home to give you information about how people can protect themselves against AIDS?* Our indictor separates those who answer 'Yes' from those who say 'No' or 'Don't know'.
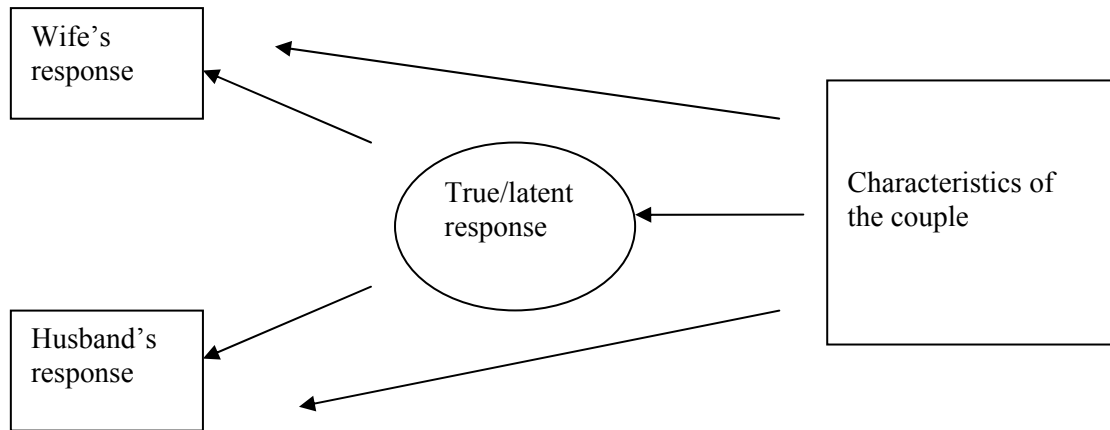
Condom ever used:
Men and women are asked whether they ever used condoms with their current spouse.

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[11] A higher threshold, such as 50%, would generate too high standard errors in the estimation of the parameters, especially in 2004 where the number of cases with a high percentage of unfaithful network partners is lower.

Figures

Figure 1: Measurement and structural model

Tables

Table 2. LCA of condom ever used within marriage and multivariate logit regression models of condom ever used according to wives and husbands, 2004.

		2004					
		Model 1	**Model 2**		**Model 3**		**Model 4**
		(X) Condom Use (latent variable)	**(X) Condom Use (latent variable)**		**(W) Condom Use (wife)**		**(H) Condom Use (husband)**
	N	**(W&H) Condom Use (wife/husband)**	**(W&H) Condom Use (wife/husband)**	**N**		**N**	
Measurement model							
Tables X|W and X|H							
(X) Condom Use (latent variable)		3.450 ***	3.309 ***				
		(0.645)	(0.313)				
Tables W|G and H|I							
(G & I) Informed by Experts about AIDS			0.913 ***				
			(0.331)				
Structural model							
Table X|ABCDEF							
(A) Education							
Never attended	166	--	--	176	--	181	--
Both spouses attended school	289	0.875 **	1.445 **	309	0.518 *	315	0.558 **
		(0.442)	(0.460)		(0.306)		(0.264)
(B) Wife's Age							
15-26	175	--	--	130	--	129	--
26-35	147	-0.481	-0.559	160	-0.382	166	-0.390
		(0.416)	(0.464)		(0.320)		(0.304)
36+	133	-0.858 **	-0.996 **	195	-0.807 **	201	-0.501
		(0.429)	(0.472)		(0.338)		(0.305)
(C) Matrilocal Residence							
No	294	--	--	315	--	323	--
Yes	161	-0.678 *	-0.976 **	170	-0.477	173	-0.313
		(0.381)	(0.473)		(0.309)		(0.263)
(D) Suspicion of Infidelity							
None suspects	297	--		318	--	323	--
At least one of the spouses suspects	158	0.753 **	0.735 **	167	0.664 **	173	0.217
		(0.326)	(0.362)		(0.260)		(0.236)
(E) Number of Living Children							
0-2	102	--	--	107	--	109	--
More than 2	353	1.005 **	1.138 **	378	0.247	387	0.974 **
		(0.440)	(0.511)		(0.326)		(0.338)
(F) Infidelity in the Husband's Network							
Less than 40% of the network partners	317	--	--	339	--	349	--
40% or more	138	0.562 *	0.571	146	0.419	147	0.576 **
		(0.334)	(0.366)		(0.265)		(0.241)
(G) Informed by Experts about AIDS (women)							
No	340	--	--	361	--	371	--
Yes	115	0.778 **	0.489	124	0.807 **	125	0.393
		(0.366)	(0.421)		(0.272)		(0.251)
(I) Informed by Experts about AIDS (men)							
No	310	--	--	330	--	334	--
Yes	145	0.081	-0.920 *	155	-0.061	162	0.193
		(0.443)	(0.533)		(0.280)		(0.241)
L²		389.02	382.64				
BIC		-6582.00	-6582.26				
df		1139	1138				

β coefficients. Standard errors in parenthesis
*** pvalue<0.01   ** pvalue< 0.05 * pvalue<0.10

Table 3. LCA of condom ever used within marriage and multivariate logit regression models of condom ever used according to wives and husbands, 2006.

		2006						
		Model 5			**Model 6**	**Model 7**		**Model 8**
		(X) Condom Use (latent variable)			(X) Condom Use (latent variable)	(W) Condom Use (wife)		(H) Condom Use (husband)
	N	(W) Condom Use (wife)	(H) Condom Use (husband)		(W&H) Condom Use (wife/husband)	**N**		**N**
Measurement model								
Tables X|W and X|H								
(X) Condom Use (latent variable)		3.481 ***	2.014 ***		2.681 ***			
		(0.614)	(0.315)		(0.275)			
Tables W|G and H|I								
(G & I) Informed by Experts about AIDS					0.828 ***			
					(0.223)			
Structural Model								
Table X|ABCDEF								
(A) Education								
Never attended	220	--			--	222	--	223	--
Both spouses attended school	310	1.132 **			1.315 **	312	0.638 **	312	0.568 **
		(0.460)			(0.507)		(0.259)		(0.226)
(B) Wife's Age								
15-26	113	--			--	113	--	113	--
26-35	182	-2.181 ***			-2.474 ***	184	-0.799 **	184	-0.676 **
		(0.717)			(0.867)		(0.306)		(0.286)
36+	235	-3.709 ***			-4.161 ***	237	-1.616 ***	238	-1.154 ***
		(0.878)			(1.014)		(0.326)		(0.289)
(C) Matrilocal Residence								
No	342	--			--	345	--	345	--
Yes	188	-1.536 **			-1.499 **	189	-0.671 **	190	-0.261
		(0.594)			(0.703)		(0.274)		(0.233)
(D) Suspicion of Infidelity								
None suspects	402	--			--	404	--	406	--
At least one of the spouses suspects	128	1.786 ***			1.827 ***	130	0.661 **	129	0.457 **
		(0.555)			(0.612)		(0.251)		(0.228)
(E) Number of Living Children								
0-1	67	--			--	67	--	67	--
More than 1	463	1.285 *			1.765 **	467	0.140	468	0.522
		(0.751)			(0.836)		(0.353)		(0.337)
(F) Infidelity in the Husband's Network								
Less than 40% of the network partners	428	--			--	432	--	433	--
40% or more	102	0.540			0.576	102	0.209	102	-0.042
		(0.540)			(0.559)		(0.285)		(0.264)
(G) Informed by Experts about AIDS (women)								
No	270	--			--	270	--	272	--
Yes	260	0.807 **			0.011	264	0.727 **	263	-0.072
		(0.393)			(0.415)		(0.234)		(0.203)
(I) Informed by Experts about AIDS (men)								
No	274	--			--	278	--	277	--
Yes	256	-0.403			-0.812 *	256	-0.351	258	0.258
		(0.398)			(0.467)		(0.231)		(0.203)
L²		411.10			401.61				
BIC		-6727.43			-6736.9				
df		1138			1138				

β coefficients. Standard errors in parenthesis
*** pvalue<0.01   ** pvalue< 0.05   * pvalue<0.10