Couples Concordance in Reporting the Most Recent Protected Sexual Activity

ABSTRACT

This study examined interpartner concordance of self-reported time since last coitus and reports of condom and contraceptive use at last sexual intercourse, among 1672 monogamous couples in Liberia, 4138 in Madagascar, and 588 in Namibia. It also explored the characteristics associated with such sexual behaviors as occurred in the prior 28 days. Overall, there was less than 80% concordance in reporting of time since last coitus. Condom or contraceptive use behaviors yielded fair (0.23) to substantial (0.64) agreement on the Kappa index. Factors predicting a shorter time since last coitus included wealthiest socioeconomic conditions, husband being younger than wife, and couples where at least one partner wants another child. Couples where both wanted another child were less likely to report use of condom or contraceptive method. In summary, addressing the source of errors of the survey question can lead to more concordant interpartner estimates.

INTRODUCTION

Measures of sexual and reproductive health outcomes have long been based solely on women's self-report. Because of the sensitive nature of sexual behavior, concerns have been raised about potential biases in these self-reports (Catania et al., 1990; James et al.1991).

Since sexual behavior is largely unobservable and no "gold standard" for the validity of such self-reports exists, determining the validity of these measures is usually not possible. (Padian et al. 1995). Yet, previous research has sought to improve the validity and reliability of self-reported sexual behavior. One approach is to use biologic markers, such as sexually transmitted infection (STI) or pregnancy, to verify self-reports and thereby determine measurement validity (Catania et al., 1995; Peterman et al., 2002). Biologic markers, however, are not always practical as a result of the large numbers of subjects necessary to determine outcomes. In addition, since there is not a one-to-one correspondence between negative biologic outcomes and sexual behavior, a bias results even when biologic outcomes are used (Fishbein et al., 2000; Pequegnat et al., 2000; Seal, 1997).

Another approach to evaluate the accuracy of self-reported sexual behavior is to collect data from both members of a sexual dyad and examine differences and similarities in reports about joint knowledge or behaviors. Comparison of the reports from both partners cannot absolutely determine the validity of self-report data, but it does allow assessment of reliability, a precursor to validity. If partners do not concur in their reports of a joint sexual behavior (i.e., reliability is low), then the validity of the information is questionable. Several studies summarize the factors associated with lack of concordance in partner reports. For example, Weinhardt et al. (1998) summarize what is known about measurement errors in the literature on sexual self-reports in general, and how these may contribute to discordant reports between partners. Methodological and participant influences examined include respondent influences, instrument variables, mode effects, and interviewer variables. It has been suggested that self-presentation bias may be related to issues of individual demographic or relationship characteristics such as levels of sexual comfort and willingness to disclose sexual information, as well as potential ethnic differences, and may

help explain discordance between partners (Catania et al., 1990; Becker et al., 2006).

In addition to evaluating the accuracy of self-reported sexual behavior, couple-level data can be used to assess the extent of agreement between members of a sexual dyad about factors that influence safer sexual behavior. Nevertheless, there are considerable gaps in the literature on why concordance of responses regarding sexual behavior among monogamous couples occurs or what specific individual or relationship variables might predict concurrent reports of sexual behaviors. A few studies quantitatively explored individual characteristics associated with concordance of partner reporting of sexual behaviors, such as time since last coitus and use of condom or contraceptive (Becker & Costenbader 2001; Becker et al. 2006; Kulczcki A., 2008).

The purpose of this study is to explore the extent of differences in husband-wife responses for time since last coitus, condom use at last sex and current contraceptive use and to identify a set of individual, household and couples' joint characteristics in predicting the time since last sex, and the use of condom and contraceptive methods (at last sex) as reported by both spouses. The research questions addressed by the study are:

1. What is the level of concordance in reports of sexual behavior (time since last coitus, condom use at last coitus, and current contraceptive use) among monogamous couples?
2. What are the individual and joint characteristics that predict time since last coitus as reported by concordant couples for this variable? And among those who were discordant, what factors predict the wife's report of a shorter time since last coitus than the husband's report?
3. Finally, among concordant couples in reports of condom and contraceptive use at last coitus, what are the covariates of both partners that are associated with condom or contraceptive use?

Information on variation in coital frequency within marriage is useful for formulating recommendations on which contraceptive methods are most suitable for particular groups of women (for example, newly married women, older women, women who wish to delay a birth) and for training family planning service providers on how to guide women to appropriate methods (Blanc A.K. &

Ruterberg N., 1991). By looking at how sexual behaviors varies within married couples, a better understanding of couples' sexual and reproductive health (SRH) behaviors has the potential to enhance our understanding of gender dynamics in couple SRH behavior and to provide meaningful information to current initiatives in family planning programs. This study in thus of importance particularly in African contexts because of the AIDS pandemic in the region.

METHODOLOGY

Data

Data came from the Demographic and Health Survey (DHS) which started to collect and produce data since 1987, on SRH from both men and women in households. They use the men's questionnaire which is shorter but similar in structure to the women's questionnaire, allowing subsequent comparison from both partners (Becker & Costenbader, 2001). DHS surveys have been conducted in over 85 countries. Initially, this analysis attempted to use matched couples' data from the most recent DHS (i.e., 2005 onwards) surveys in the four Sub-Saharan Africa regions with the highest percentage of monogamous couples. Fortunately, DHS questions and response categories in men and women questionnaires across countries are worded virtually identically to allow international comparisons.

We adopted the DHS definition of a couple: consisting of a man and a woman who are legally married or living together in a consensual union. Since questions about sexual activities for husbands are not specific to any particular wife, polygamous couples are excluded from the analyses, as male respondents may refer to other spouse(s) in answering the question. Countries for analysis were selected based on availability of data for women and men on the questions of interest: (1) time since last coitus, (2) condom use at last coitus, and (3) current contraceptive use. We retained Liberia, Madagascar, and Namibia from Western, Eastern and Southern Africa, respectively. We dropped central Africa region's countries, because in the most recent DHS data of countries of interest, the question "current contraceptive use" was missing for the men. In the

questionnaire, wives were asked, “Does your husband/partner have any other wives besides yourself?”; husbands were asked, “How many wives do you have?” As shown in Table 1, 85%-95% of the wives answered that there was no other wife, 89%-99% of the husbands answered that they had only one wife. The couples in which both spouses simultaneously answered “only one wife” are considered monogamous couples in the analysis; this resulted in 83%-94% of all couples, depending on the country (Table 1). Furthermore, to avoid recall bias in husband-wife reports, we considered only a short reference period of 28 days for time since last intercourse. To avoid the possibility of confusing the spouse with other sexual partners, monogamous couples were excluded from the analysis if one or both spouses answered that at last sex, they had sex with someone other than their spouse. In summary, the samples comprised all eligible men and women, engaged in a monogamous union, and who had sex within the last 28 days with their spouses, and consisted of 1672, 4138, 588 and couples respectively in Liberia, Madagascar and in Namibia (Table 1).

All of these surveys used a multistage, stratified sampling procedure with major strata based on regional and rural-urban divisions. Two challenges arise when dealing with these complex survey data: (1) obtaining correct point estimates (avoiding bias) and (2) computing correct variances and standard errors (Kreuter & Valliant, 2007). Hence, the analyses in this paper used design-based survey weights to make the sample representative of the population. The Taylor linearization method was also used to correct variance estimates. The DHS datasets contain household and individuals’ weight variables. The question then becomes which weight to use when analyzing couples’ data. A debate about whether a man's or woman's weight is more appropriate for use with couples has recently arisen. However, neither the man’s nor woman’s weight is appropriate for couple data analysis. One of the reasons why (among others) is simply because the couple non-response rate is different from that of either women or the men in partnerships and generally not a simple function of either. Therefore, a couple’s weight needs to be derived. The construction of couples’ weights used in this paper is given in the Appendix section.

Variables

One objective of this study is to measure the level of concordance among husbands and wives with respect to reporting about the last sexual intercourse, including time since last coitus, whether a condom was used, and whether contraception was used.

Our conceptual framework for concordance in reporting of SRH behaviors (Fig.1) posits that social and demographic characteristics of individuals are the starting point of the decision-making process among couples. Individual characteristics motivate individual desires which, when processed in conjunction with perceptions of partner's desires, result in a couple's communication and discussion (or not) about sexual and reproductive health, which then produces (or not) a couple's concordance in reporting recent SRH behaviors (Miller, 1992).

The dependent variables are:

1. Time since last coitus. This refers to the answer to the question, "When was the last time you had sexual intercourse?" Answers are recorded as *xx* days ago. Husband and wife responses were treated separately. Because men and women were very often interviewed on different days, we took into account the date of the interview and adjusted "the time since last coitus" accordingly. We considered the difference between the day of interview (herein D1) and the difference of time since last sex as reported by wife and husband (herein D2). Therefore, there is exact concordance if the difference between D2 and D1 equal zero. But for purposes of this study, we assumed that couples were concordant if this difference was equal to -1, 0, or 1. Otherwise, they were considered non-concordant.

2. Use of a contraceptive method at last coitus. In the section about contraception, women were asked, "Are you currently doing something or using any method to delay or avoid getting pregnant?" If the woman says "yes," the interviewer asked "which method are you using?" The interviewer can only code one method. In the men's questionnaire, men

were typically asked, “The last time you had sex did you or your partner use any method (other than a condom) to avoid or prevent a pregnancy?” If the answer is “yes,” the interviewer also asked “What method did you or your partner use?” The interviewer can only code one method. These responses had been recorded in the dataset as “Current use of contraceptive methods.” “Current contraceptive use” and “use of contraceptive methods at last sex” are used interchangeably throughout this paper. This variable was treated as a dichotomous (yes or no) variable. Wives’ and husbands’ reports were treated as separate responses to measure concordance in their reports. They were concordant when both said either *yes* or *no;* otherwise, they were treated as disconcordant.

There are some problems in recording current contraceptive use (Becker et al., 2001). First, there are contraceptive methods which can be used simultaneously with other methods. For example, if a husband reported condom use for family planning and his wife reported IUD use, both of them may be correct since it is possible that they were using both methods. A condom can be used simultaneously with other methods. The way of coding in the DHS questionnaire which allows interviewers to code only one method is, therefore, problematic. Second, for coital methods such as condoms, the meaning of “currently doing” is ambiguous. For example, it is unclear if a couple that often uses a condom, but did not do so at the last coitus, are current users or not.

3. Condom use at last coitus. The wording of the questions in the men’s questionnaire is similar to wording in the women’s questionnaire in all three countries. The variable reflects the response to the question, “The last time you had sexual intercourse, was a condom used?” The coding categories included *yes* or *no* responses. Wives’ and husbands’ reports were treated as concordant when both said either *yes* or *no*; otherwise, they were non-concordant. Note that the purpose of condom use was not asked. Therefore, condom use for a purpose other than contraception

was included. It is possible that a couple used a condom to avoid STD/AIDS.

We consider the influence of partner's and own characteristics on reporting of most recent protected coitus. In reporting sexual and reproductive health behaviors, we assume that both effects were captured when we estimated the effects of individual characteristics on concordance, because individual characteristics operate directly on intentions and, also, indirectly through desires (DeRose L.F. & Ezeh A.C., 2005). Thus, we report the age, number of years of schooling, and duration of marriage reported by wives and husbands as numerical measures. The number of surviving children for both wife and husband was also included as a continuous variable to adjust for parity, because higher parity individuals are more likely to use and thus to report contraception (Bankole, 1995). The individual attribute that was of greatest interest with respect to relative spousal power, as reported in the literature, is schooling. Schooling was expected to increase awareness and use of family planning (DeRose L.F. & Ezeh A.C., 2005).

We also adjusted for household and couple (joint) characteristics: place of residence (rural vs. urban); the household economic status was captured through the five wealth quintiles, i.e., poorest quintile; lower middle (or poorer) quintile, middle quintile, upper middle (or richer) quintile, and wealthiest (or richest) quintile. Age differences consisted of three categories: (1) wife and husband have the same age (we considered a difference of up to two years between wife and husband ages as the same age); (2) wives who were three or more years older than their husband and (3) husbands who were three or more years older than their spouse. The spousal schooling difference was categorized into five groups: (1) both without schooling, (2) either the wife or (3) husband has some primary schooling but the other has no schooling, (3) either has secondary schooling, (4) both have secondary schooling. The difference in marital duration was combined into four categories variables: (1) both said 0-4 years of marriage, (2) both said 5-14 years, (3) both said 15+ years, or (4) other couples where husband’s and wife’s reports differ for this variable. In the questionnaire, fertility preferences were ascribed to respondents (who gave

numerical responses) into 4 classes from which we derived four categories describing couples' fertility preferences: (1) whether both want no more children, (2) whether both want another child, (3) whether only the wife wants another child but the husband does not, or (4) whether only the husband wants another child but the wife does not.

Analytic Methods

In each country we first calculated the reported mean time since last coitus and the proportions of condom use and use of contraceptive methods at last sexual intercourse, along with other individual variables; we tested the equality of these estimates between wives and husbands using the McNemar's test and the *t*-test for paired data, respectively.

We calculated both the percentage of couples whose responses were in concordance and the kappa statistic for outcomes and individual variables to assess whether the concurrence in reports was due to chance alone.

We assume that the reports of partners are more likely to be correct when they are concordant than when they aren't. We thus run successive multivariate regression models to identify a set of factors associated with reports of time since last sex, condom use at last sex, and current contraceptive use. These analyses were restricted to couples concordant in reporting of time since last sex, condom use at last sex, or current contraceptive use. We used multiple linear regression to predict time since last coitus as reported by wives of couples from whom concordant reports were obtained for time since last sex. Logistic regressions were run for contraceptive use and condom use, with these variables coded as 1 if both partners reported contraceptive use and condom use, and as 0 if neither reported use. Following Stock and Watson (2003), we assumed heteroskedasticity in our models and used heteroskedasticity-robust standard errors.

We hypothesize that: (1) On average, wives tend to report shorter durations of last coitus than husbands. (2) There is a positive association between couples' reports on time since last sex and background characteristics of couples: education, urban residence, higher socioeconomic status, and duration of marriage; a negative association is expected with age difference between

spouses and couples' fertility preferences. 3) Condom use and contraceptive use are positively associated with urban residency, couples' level of education, and negatively associated with age differences and marital duration.

RESULTS

Background characteristics

The mean age ranged from 31 to 32 years for wives and 35 to 36 for husbands; the difference of the mean age between wives and husbands varied from about 4 years in Namibia to 5 years in Liberia. Husbands tended to have more years of education than wives in Liberia and Madagascar, in contrast to Namibia where wives were more educated than men. Except for Namibia, the majority of couples lived in urban areas. The proportion of uneducated couples ranged from 7% in Namibia to 17% in Liberia. In Namibia, more than 50% of couples reported that both wanted no more children, compared to 30% in Madagascar and 41% in Liberia.

Inter-spousal concurrence in reports on time since last coitus

In Madagascar and Namibia, the mean days since last coitus was significantly higher for husbands than for wives (Table 2). To examine the difference in individual couple's reports on time since last coitus, the difference was calculated by subtracting the husband's reports of time since last coitus in days from the wife's report (after adjusting for the day of the interview). Results are presented graphically in Figure 2. The bar on zero indicates couples in which both spouses reported exactly the same time since last coitus in days. Positive difference indicates couples in which the wife reported a longer duration than her husband, whereas negative numbers of the difference connoted couples in which the wife reported a shorter duration than her husband.

In the three countries, a sizable percentage of couples showed some difference in reports. About 37% of couples in Liberia, 60% in Madagascar, and 17% in Namibia gave exactly the same durations (Figure 2). The percentages of couples whose inter-spousal difference was within ±1 day (the sum of the percentages of -1, 0, and 1), were 57% in Liberia, 72% in Madagascar, and 29% in Namibia (Table 3). The mean of the inter-spousal difference (mean of wife's report minus husband's report) was 0 in Liberia, -0.1 in Madagascar and Namibia. Therefore,

on average, wives tended to report shorter durations than husbands and the mean of the inter-spousal difference was significantly different from zero in Madagascar and Namibia. Concurrence tests run on the countries' samples indicated moderate (0.57), fair (0.38) and poor (0.14) concordance between spousal reports, respectively, in Madagascar, Liberia and Namibia.

Concurrence in reports of condom and contraceptive use at last coitus

For these outcomes, the difference between reports of wives and husbands varied across countries, irrespective of the levels of condom or contraceptive use. The differences between wives and husbands were all negative for condom and positive for contraceptive use, indicating that for condom use, husbands' reports were higher than wives' reports, but lower for contraceptive use. In 71%-97% and 30%-81% of all couples, both husbands and wives reported no condom use, and no contraceptive use, respectively. The level of concordance in reports of condom use in the three countries was high, ranging from 82% in Namibia to 94% in Liberia. But the kappa statistic suggested a fair concordance (0.23) in Liberia and a moderate concordance in Madagascar (0.41) and Namibia (0.45).

Current use of contraception, as reported by husbands and wives, showed 85% overall agreement in Liberia, 82% in Madagascar, and 67% in Namibia (Figure 3). The kappa statistic indicated a substantial agreement (0.64) beyond chance in Madagascar, fair in Liberia (0.23) and in Namibia (0.34).

Multivariate findings

The outcome variable in Tables 6 and 7 was time since last coitus among concordant and discordant couples for this variable, respectively. The model in Table 6 includes household and joint characteristics and regression coefficients and also reports on the robust standard errors. Table 7, instead, reports the odds of having wives' report of a shorter time since last coitus than their husbands among discordant couples.

Hence, concordant couples living in a rural area reported a shorter time since last coitus, as compared to concordant couples in urban region, albeit

marginally. For instance, concordant Namibian couples living in rural regions reported a time since last coitus of about 3 days less than couples in the urban regions. Yet, among discordant couples in Namibia, wives in the rural area, as compared to those in the urban region, were 50% less likely to report shorter time since last coitus (Table 7). Concordant couples in the wealthiest quintile tended to report a shorter time since last sex, compared to couples in the poorest quintile in all three countries. However, wives in the richest and discordant couples in Namibia were 0.3 times as likely as wives in the poorest and discordant couples, to report a shorter time since last coitus.

Couples where the wife was 3 or more years older than her husband were more likely to report a shorter time since last coitus compared to couples of same-age partners in all three countries. Conversely, older husbands in a couple tended to report a longer time since last coitus, although not significantly.

Education showed different patterns in the selected countries: in Liberia and Namibia, concordant couples with some education reported shorter time since last coitus compared to uneducated concordant couples. This is overall the reverse situation in Madagascar, where couples with education tended to report a longer time since last coitus, compared to uneducated couples, although not significantly. Older couples reported a shorter time since last sex compared to younger couples, more significantly in Namibia. Concordant couples in which both wives and husbands wanted another child had had sex more recently compared to couples who wanted no more children; this was significant in Madagascar and Namibia. Among discordant couples in Liberia, wives in couples where both want another child were 1.7 times as likely as wives in couples where both did not want any more children, to report of a shorter time since last coitus than their husbands. Furthermore, among discordant couples, wives' report of shorter time since last coitus was positively and negatively associated with couples where only the wife wanted another child in Liberia and Namibia, respectively. In Namibia, wives in couples where only the husband wanted another child were significantly 0.2 times as likely as wives in couples where both wanted no more children, to report a shorter time since last coitus.

Our last set of logistic regressions assessed covariates of condom use and current contraceptive use as reported by concordant couples (Tables 8). Measures of urban-rural residency did not retain significance for either of the outcome variables. Yet, living in rural areas tended to increase the odds for couples to have used a condom at last coitus in Liberia and Madagascar. But, couples living in this area reported lower use of contraception compared to couples in urban areas. Couples in the wealthiest quintiles were more likely to report use of condoms and contraceptive use at last coitus, compared to couples of the poorest quintiles across countries. Couples with some education in Madagascar, were significantly more likely than uneducated couples to report use of contraceptive methods at last coitus. Couples' concurrent desire for another child was negatively associated with contraceptive use at last coitus in all three countries, and significantly in Liberia and Madagascar. It was significantly and negatively associated with condom use in Liberia.
Couples in which the wife alone wanted another child were less likely to have used a condom at last coitus in Liberia, but were more than 2 times more likely than couples where both spouses wanted no more children to use condom at last coitus in Madagascar and Namibia.

DISCUSSION

Interpartner concordance varies depending on the information being reported. Of the three variables of interest, time since last coitus showed the lowest concurrence in the three selected countries. Another finding of this paper was the tendency of wives to report a shorter time since last coitus than husbands. As shorter time since last coitus implies higher frequency of coitus, the finding suggests that women within monogamous marriage reported higher coital frequency than husbands; this confirmed findings of previous studies (Lagarde et al., 1995).
This study also showed that discrepancies between husbands' and wives' reports of condom and current contraceptive use or nonuse were frequent on the continent. Consistent with prior studies (Becker S. & Costenbader E., 2001; Becker et al., 2006), interpartner concordance of self-reported condom or

contraceptive use behaviors in the prior 28 days yielded fair to substantial agreement on the Kappa index. In the three countries of interest, husbands reported a higher rate of condom use at last coitus than their wives. As for contraceptive use at last coitus, that was the reverse: husbands' responses were 3-11% lower than their wives reports. These differences in spouses' responses are found in many other developing countries. However, these results should be interpreted with caution, for previous studies warned that husbands were more likely to over-report use of contraception than their wives were to under-report use (Ezeh & Mboup, 1997). A related reason for discrepancies in reports is social acceptability biais. It may be possible that higher reports of condom use among males are due to a tendency to provide more socially desirable answers because of AIDS. Social desirability for condom use reports may also be higher among males than females because it is a male method. It is also possible that it is due to the inclusion of males' extramarital condom use (although we had excluded them from the current analysis). Some researchers have suggested that to obtain the best estimate of contraceptive prevalence, women's reports of female methods and men's reports of male methods should be used (Bankole & Ezeh, 1997).

The curious regression of time since last coitus on couples' marital duration and wealth quintiles needs explaining. In particular, why do the richest couples have shorter time since last coitus (thereby, higher coital frequency) than the poorest couples? And why do the oldest couples have higher coital frequency than youngest couples? Studies from both developed and developing countries have shown that the frequency of marital intercourse declines with marital duration (James, 1983; Blank & Rutenberg, 1991).

Another finding of this paper was that a couple where a wife is older than the husband tended to report higher coital frequency where as couples with a younger wife conversely had shorter frequency. From this finding, it seems reasonable to infer that the age of husbands has a considerably greater effect on time since last coitus than has age of wives. This accords well with the speculation of Kinsey et al. (1953) that there is a higher correlation of marital coital rates with husband's age than with wife's age, and the decline observed in

coital rates when husband' age increased was attributed to waning male capacity (Kinsey et al., 1953) and motivation (Martin, 1981).

The use of contraceptive techniques is more efficient and more widespread among richer than poorer social classes. And the richest classes have been found to have more frequent coital activities. One explanation is that they may be more successful in getting contraceptive methods, in securing an abortion—legal or not—in the event of contraceptive failure (James, 1970).

Consistent with previous findings, the addiction of a new infant to a family, as reported by both partners, has the effect of shortening the time since last coitus as well as diminishing the odds of contraceptive use among concordant couples. Sometimes only the wife seems less inclined to use contraceptive, then it seems like wives have more say than husbands about contraceptive and condom use in Liberia but this responsibility is attributed to husbands, instead, in Namibia.

CONCLUSION

In conclusion, our findings concede that interpartner concordance is higher for reports of contraceptive and condom-use behavior compared with reports of time since last coitus. Thus, large discrepancies between spouses should give pause to those wanting to employ these sexual behaviors as an outcome variable at the individual level. Yet, this growing body of work suggests that discrepancies between partners' reports of sexual behavior could be small. As contraceptive use becomes socially acceptable in sub-Saharan Africa, the full implication of spouses through Family Planning program could lead to husband and wife reports of sexual behaviors to be more concordant. In addition, since the lack of concordance is influenced by a combination of several error sources, addressing their relative effects can provide clearer questions, more valid and reliable measures, and more precise data collection procedures.

Table 1: Summary of couples characteristics in selected countries

Country	Survey year	Husband's age range*	Respondents		Number of couples	Monogamous couples			No sex with other than spouse	Last time since last sex within the last 28 days
						Wife's report	Husband's report	Both reports		
			Women	Men		Wives who said no other wife	Husbands who said having 1 wife	Couples where both say 1 wife	Monogamous couples both spouses reported no sex with others at last intercourse	Monogamous couples both spouses reported no sex with others at last intercourse within the previous 28 days
Liberia	2007	15-49	7092	6009	2677	2259 (85)	2378 (89)	2208 (83)	1728 (66)	1672 (63)
Madagascar	2008-09	15-59	17375	8586	4599	4347 (95)	4532 (99)	4334 (94)	4199 (91)	4138 (90)
Namibia	2006-07	15-49	9804	3915	867	740 (86)	849 (98)	732 (84)	639 (74)	588 (68)

*: Sample size comprised women aged 15-49 for all countries

Table 2: Study outcomes and individual characteristics as reported by wives and husbands whose response were in agreement and associated kappa values ,in selected countries[§]

	Liberia (N=1672)					Madagascar (N=4138)					Namibia (N=588)				
	Wife	Husb.	Diff[§§]	% agree.	Kappa	Wife	Husb.	Diff[§§]	agree.	Kappa	Wife	Husb.	Diff[§§]	agree.	Kappa
Study outcomes															
Mean days since last coitus	9.5	9.5	0	44.8	0.38	6.9	7.0	-0.1***	61.0	0.57	9.4	9.5	-0.1*	24.2	0.14
Condom use at last sex (%)	3.1	5.5	-2.4***	93.7	0.23	1.9	2.1	-0.2	98.0	0.41	18.2	22.8	-4.6*	81.5	0.45
Current contraceptive use (%)	13.3	10	3.3**	84.3	0.27	40.6	29.4	11.2***	83.5	0.64	56.7	50.3	6.4*	66.8	0.34
Individual characteristics															
Mean age	31.3	36.5	-5.2***	4.1	0.01	31.2	35.9	-4.7***	5.4	0.03	32	35.6	-3.6***	6.0	0.03
Mean number of living children	3	3.5	-0.5***	42.4	0.34	3.3	3.4	-0.1***	69.1	0.65	2.6	3.2	-0.6***	44.9	0.35
Mean years of education	3.1	6.7	-3.6***	21.5	0.09	3.8	4.3	-0.5***	25.6	0.15	8	7.4	0.6***	16.4	0.10
Mean years since last marriage	12.7	12.5	0.2	29.0	0.26	12.5	13.2	-0.7***	44.0	0.42	9.5	10.1	-0.6	29.3	0.26

§: Weighted data (couple weighted), except for % agree. and kappa estimates; * p≤0.05; ** p≤0.01; ***p≤0.001; **§§**: Mcnemar's chi-square test and ttest for paired data are used to test the statistical significance of husband-wife differences. Note: Diff; Difference (of estimates between wife and husband); %agree.: Percent agreement; Husb.: Husband; the test of significance along with the kappa test are based on unweighted data.

Table 3 : Percentage distribution of concordant and discordant couples in reporting of time since last coitus, by household and joint characteristics in the selected countries

	Liberia				Madagascar				Namibia			
	Number of couples	**Concordant couples**	**Wife shorter time**	**Husband shorter time**	**Number of couples**	**Concordant couples**	**Wife shorter time**	**Husband shorter time**	**Number of couples**	**Concordant couples**	**Wife shorter time**	**Husband shorter time**
Household characteristics												
Residency												
Urban	**623**	54	25	21	**542**	65	20	15	**313**	25	39	36
Rural	**1049**	58	22	20	**3596**	73	16	12	**275**	34	32	34
Wealth quintiles												
Poorest	**327**	57	25	18	**757**	79	11	10	**94**	35	33	31
Poorer	**341**	60	16	24	**822**	75	15	10	**67**	31	40	29
Middle	**320**	59	23	18	**837**	71	17	12	**117**	31	35	33
Richer	**332**	60	24	17	**862**	71	16	12	**144**	31	34	36
Richest	**352**	49	27	24	**860**	64	21	15	**165**	22	37	40
Joint characteristics												
Age difference												
Same age	**371**	57	25	18	**1222**	73	17	11	**172**	25	38	38
Wife 3+ years older	**118**	49	25	26	**208**	70	16	13	**70**	33	38	29
Husband 3+ years older	**1183**	57	22	20	**2708**	71	16	12	**346**	31	34	35
Education difference												
Both uneducated	**292**	62	20	18	**402**	77	11	12	**42**	43	31	26
Wife has primary, husband has no	**236**	57	17	26	**1798**	73	15	11	**99**	29	31	40
Husband has primary, wife has no	**231**	60	22	18	**410**	77	12	11	**25**	36	47	17
Either has secondary+	**903**	54	26	20	**1474**	67	20	13	**387**	28	36	36
Both have secondary+	**11**	78	22	0	**53**	72	16	12	**35**	21	46	33
Marital duration												
Both 0-4	**199**	58	22	20	**678**	77	14	9	**117**	27	38	35
Both 5-14	**498**	54	28	18	**1401**	70	17	13	**90**	38	35	28
Both 15+	**462**	52	26	22	**712**	63	18	18	**178**	29	33	37
Others	**512**	63	17	21	**1347**	75	16	10	**203**	27	37	36
Fertility preferences												
Both want no more child	**505**	56	21	23	**1700**	68	19	13	**319**	28	40	32
Both want another child	**845**	58	24	18	**1860**	76	14	10	**130**	36	37	27
Only wife wants another child	**145**	58	26	16	**244**	68	17	14	**39**	26	36	38
Only husband wants another child	**177**	52	22	25	**334**	66	18	16	**101**	25	20	55
TOTAL	**1672**	57	23	20	**4138**	72	16	12	**588**	29	36	35

All of the values (otherwise stated are row percentages; rc: reference category

Table 4 : Percentage distribution of couples in reporting of condom use at last coitus, by household and joint characteristics in the selected countries

	Liberia					Madagascar					Namibia				
	Number of couples	**Both_Yes**	**Both_No**	**Wife**	**Husb.**	**Number of couples**	**Both_Yes**	**Both_No**	**Wife**	**Husb.**	**Number of couples**	**Both_Yes**	**Both_No**	**Wife**	**Husb.**
Household characteristics															
Residency															
Urban	**623**	1	93	2	3	**542**	1	97	1	1	**313**	8	67	7	11
Rural	**1049**	1	92	1	5	**3596**	2	93	2	4	**275**	15	76	5	11
Wealth quintiles															
Poorest	**327**	0	96	1	3	**757**	0	99	1	0	**94**	3	82	6	10
Poorer	**341**	2	95	1	2	**822**	0	98	1	1	**67**	12	67	4	16
Middle	**320**	1	92	2	6	**837**	0	98	1	1	**117**	10	71	4	14
Richer	**332**	2	89	3	6	**862**	1	97	0	2	**144**	15	64	7	14
Richest	**352**	2	92	1	5	**860**	2	92	3	3	**165**	16	72	8	4
Joint characteristics															
Age difference															
Same age	**371**	0	97	0	3	**1222**	1	96	1	1	**172**	9	74	9	8
Wife 3+ years older	**118**	0	95	1	4	**208**	3	95	0	1	**70**	17	61	3	18
Husband 3+ years older	**1183**	2	91	2	5	**2708**	0	97	1	1	**346**	12	71	5	11
Education difference															
Both uneducated	**292**	1	96	1	1	**402**	0	100	0	0	**42**	4	75	9	12
Wife has primary, husband has no	**236**	2	92	1	5	**1798**	0	98	1	1	**99**	5	77	7	11
Husband has primary, wife has no	**231**	1	97	0	2	**410**	0	98	1	0	**25**	5	88	2	5
Either has secondary+	**903**	1	91	2	6	**1474**	0	94	2	3	**387**	16	66	6	12
Both have secondary+	**11**	0	100	0	0	**53**	1	93	6	0	**35**	1	92	2	5
Marital duration															
Both 0-4	**199**	1	93	1	5	**678**	1	98	1	1	**117**	22	51	12	15
Both 5-14	**498**	2	94	2	2	**1401**	1	97	2	1	**90**	0	90	3	7
Both 15+	**462**	1	93	2	4	**712**	1	95	1	3	**178**	14	67	6	13
Others	**512**	2	92	1	6	**1347**	1	97	1	2	**203**	9	78	5	8
Fertility preferences															
Both want no more child	**505**	2	92	2	3	**1700**	1	96	1	2	**319**	11	72	6	11
Both want another child	**845**	1	93	1	5	**1860**	1	98	1	1	**130**	12	73	6	10
Only wife wants another child	**145**	1	93	2	3	**244**	2	94	2	3	**39**	29	55	9	7
Only husband wants another child	**177**	3	91	3	4	**334**	2	97	1	1	**101**	10	72	6	12
TOTAL	**1672**	1	93	2	4	**4138**	1	97	1	1	**588**	12	71	11	6

All of the values (otherwise stated) are row percentages; Note: Wife: Only wife said yes; Husb: Only husband said yes; rc: reference category

Table 5 : Percentage distribution of couples in reporting of current contraceptive use , by household and joint characteristics in the selected countries

	Liberia					Madagascar					Namibia				
	n	**Both_Yes**	**Both_No**	**Wife**	**Husb.**	**n**	**Both_Yes**	**Both_No**	**Wife**	**Husb.**	**n**	**Both_Yes**	**Both_No**	**Wife**	**Husb.**
Household characteristics															
Residency															
Urban	**623**	2	87	6	5	**542**	25	58	14	3	**313**	27	39	19	15
Rural	**1049**	6	69	16	8	**3596**	34	39	22	5	**275**	46	22	20	12
Wealth quintiles															
Poorest	**327**	0	94	3	3	**757**	16	77	6	2	**94**	14	57	14	14
Poorer	**341**	2	91	2	4	**822**	18	68	11	3	**67**	29	29	20	22
Middle	**320**	5	77	12	6	**837**	25	57	14	4	**117**	30	33	24	14
Richer	**332**	6	74	13	8	**862**	34	45	16	4	**144**	46	23	19	12
Richest	**352**	7	68	16	9	**860**	33	35	26	5	**165**	50	18	21	11
Joint characteristics															
Age difference															
Same age	**371**	3	82	9	5	**1222**	27	56	15	3	**172**	36	25	23	16
Wife 3+ years older	**118**	0	85	8	7	**208**	22	57	16	5	**70**	40	36	15	9
Husband 3+ years older	**1183**	4	79	10	6	**2708**	26	56	15	4	**346**	36	31	19	13
Education difference															
Both uneducated	**292**	3	91	4	2	**402**	9	85	5	1	**42**	18	44	25	13
Wife has primary, husband has no	**236**	3	81	7	9	**1798**	24	59	14	3	**99**	20	38	26	16
Husband has primary, wife has no	**231**	1	95	2	2	**410**	18	71	8	3	**25**	15	51	18	17
Either has secondary+	**903**	5	73	14	8	**1474**	35	40	19	5	**387**	43	26	18	13
Both have secondary+	**11**	0	71	19	10	**53**	22	36	41	0	**35**	61	18	13	8
Marital duration															
Both 0-4	**199**	5	83	7	5	**678**	21	64	11	3	**117**	39	26	16	19
Both 5-14	**498**	6	79	11	4	**1401**	26	54	16	4	**90**	32	29	20	18
Both 15+	**462**	2	81	10	7	**712**	20	62	13	4	**178**	36	34	18	12
Others	**512**	3	81	8	8	**1347**	31	50	16	3	**203**	39	29	23	10
Fertility preferences															
Both want no more child	**505**	6	76	12	7	**1700**	30	47	19	4	**319**	39	25	23	13
Both want another child	**845**	3	84	7	6	**1860**	21	65	10	3	**130**	35	35	13	17
Only wife wants another child	**145**	2	81	11	7	**244**	25	47	23	5	**39**	30	28	26	16
Only husband wants another child	**177**	6	79	12	3	**334**	27	55	14	4	**101**	35	39	17	9
TOTAL	**1672**	4	81	10	6	**4138**	26	56	15	3	**588**	37	30	13	20

All of the values (otherwise stated) are row percentages; Note: Wife: Only wife said yes; Husb: Only husband said yes; rc: reference category

Table 6: Linear regression coefficients (and Robust standard errors) assessing the association between explanatory variables and time since last coitus among concordant couples, by selected countries.

	Liberia	Madagascar	Namibia
EXPLORATORY VARIABLES			
Residency			
Urban	rc	rc	rc
Rural	-0.9 (1.244)	-0.3 (0.620)	-3.0 (2.657)
Wealth quintiles			
Poorest	rc	rc	rc
Poorer	0.3 (1.473)	-1.2 (0.643)	**-9.2 (3.910)***
Middle	0.0 (1.553)	-0.8 (0.682)	-4.9 (3.888)
Richer	-1.7 (1.693)	**-2.3 (0.685)*****	-4.6 (3.823)
Richest	**-4.7 (1.774)****	**-2.5 (0.878)****	**-8.6 (4.409)***
Age difference			
Same age	rc	rc	rc
Wife 3+ years older	**-3.9 (1.542)***	**-1.5 (0.682)***	-2.8 (3.422)
Husband 3+ years older	0.7 (1.112)	0.2 (0.441)	0.1 (2.495)
Education difference			
Both uneducated	rc	rc	rc
Wife has primary, husband has no	**-3.6 (1.498)***	**1.3 (0.641)***	-7.5 (4.437)
Husband has primary, wife has no	-0.7 (1.646)	1.0 (0.788)	-2.1 (5.770)
Either has secondary+	-1.7 (1.323)	0.5 (0.720)	-4.09 (4.380)
Both have secondary+	**-5.5 (1.788)****	0.1 (1.469)	-8.5 (4.905)
Marital duration			
Both 0-4	rc	rc	rc
Both 5-14	-2.6 (1.606)	-0.9 (0.662)	**-7 .1 (3.252)***
Both 15+	0.0 (1.660)	-0.6 (0.704)	-1.3 (3.417)
Others	-1.0 (1.576)	-0.1 (0.608)	-4.5 (3.346)
Fertility preferences			
Both want no more child	rc	rc	rc
Both want another child	-1.4 (1.060)	**-1.7 (0.497)*****	**-4.8 (2.447)***
Only wife wants another child	-0.2 (1.682)	-0.8 (1.029)	-3.4 (3.385)
Only husband wants another child	0.0 (1.687)	-1.2 (0.728)	-2.0 (3.506)
Constant	*14.3 (2.540)****	*9.0 (1.151)****	*26.3 (6.517)****
Number of couples	*876*	*2975*	*184*
R-squared (p value)	*0.053 (<0.001)*	*0.020 (0.0010)*	*0.146 (0.0016)*

* p≤0.05; ** p≤0.01; ***p≤0.001; rc: reference category; rc: reference category

Table 7: Odds ratios (and Robust Standard Errors) from logistic regression analysis assessing the exploratory variables associated with wives reporting of shorter time since last coitus among discordant couples, by selected countries

	Liberia	Madagascar	Namibia
EXPLORATORY VARIABLES			
Residency			
Urban	rc	rc	rc
Rural	1.3 (0.324)	1.1 (0.290)	**0.5 (0.161)***
Wealth quintiles			
Poorest	rc	rc	rc
Poorer	**0.5 (0.141)***	1.2 (0.285)	1.1 (0.508)
Middle	1.0 (0.314)	1.1 (0.265)	0.7 (0.308)
Richer	1.2 (0.405)	0.9 (0.240)	0.5 (0.206)
Richest	1.0 (0.359)	1.0 (0.334)	**0.3 (0.155)***
Age difference			
Same age	rc	rc	rc
Wife 3+ years older	0.7 (0.279)	0.8 (0.285)	1.4 (0.661)
Husband 3+ years older	0.8 (0.173)	0.8 (0.143)	1.0 (0.279)
Education difference			
Both uneducated	rc	rc	rc
Wife has primary, husband has no	0.5 (0.182)	1.3 (0.357)	0.7 (0.385)
Husband has primary, wife has no	1.0 (0.366)	1.0 (0.345)	3.6 (2.940)
Either has secondary+	1.0 (0.268)	1.6 (0.492)	1.3 (0.630)
Both have secondary+	__	1.5 (0.851)	2.2 (1.601)
Marital duration			
Both 0-4	rc	rc	rc
Both 5-14	1.8 (0.587)	0.9 (0.257)	1.3 (0.630)
Both 15+	1.3 (0.405)	0.7 (0.180)	1.0 (0.369)
Others	0.9 (0.285)	1.1 (0.292)	0.9 (0.333)
Fertility preferences			
Both want no more child	rc	rc	rc
Both want another child	**1.7 (0.015)***	1.0 (0.198)	1.1 (0.350)
Only wife wants another child	**2.2 (0.781) ***	0.9 (0.283)	0.8 (0.431)
Only husband wants another child	1.0 (0.328)	0.8 (0.207)	**0.2 (0.079)*****
Number of couples	*794*	*1163*	*404*
-2LL (p-value)	*480.8 (0.012)*	*793.2 (0.671)*	*265.6 (0.016)*
Pseudo R-squared	*0.045*	*0.013*	*0.071*

* p≤0.05; ** p≤0.01; ***p≤0.001; rc: reference category; rc: reference category

Table 8: Odds ratios (and Robust standard Errors) from logistic regression analysis assessing the association between explanatory variables and condom and contraceptive use at last coitus among concordant couples, by selected countries.

	Liberia		Madagascar		Namibia	
	Condom use	**Contraceptive use**	**Condom use**	**Contraceptive use**	**Condom use**	**Contraceptive use**
EXPLORATORY VARIABLES						
Residency						
Urban	rc	rc	rc	rc	rc	rc
Rural	1.4 (0.917)	0.7 (0.303)	1.2 (0.653)	0.9 (0.154)	0.9 (0.379)	0.9 (0.321)
Wealth quintiles						
Poorest	rc	rc	rc	rc	rc	rc
Poorer	7.4 (7.727)	**6.5 (5.387)***	0.6 (0.670)	1.1 (0.179)	**6.9 (5.785)***	**4.6 (2.106)****
Middle	4.2 (5.163)	**15.9 (10.870)*****	0.5 (0.668)	**1.5 (0.244)***	3.4 (2.877)	**3.1 (1.367)***
Richer	7.6 (8.946)	**16.2 (12.639)*****	1.1 (1.263)	**2.2 (0.357)*****	**5.6 (4.721)***	**5.7 (2.701)*****
Richest	**10.2 (11.946)***	**19.6 (15.611)*****	2.4 (2.542)	**2.2 (0.480)*****	5.3 (4.725)	**6.0 (3.518)****
Age difference						
Same age	rc	rc	rc	rc	rc	rc
Wife 3+ years older	__	__	**3.7 (2.373)***	0.9 (0.197)	1.4 (0.784)	0.8 (0.365)
Husband 3+ years older	**11.3 (12.146)***	1.5 (0.582)	0.5 (0.249)	1.0 (0.104)	1.2 (0.456)	0.9 (0.321)
Education difference						
Both uneducated	rc	rc	rc	rc	rc	rc
Wife has primary, husband has no	1.7 (1.471)	0.9 (0.583)	5.3 (6.975)	**2.6 (0.608)*****	0.7 (0.568)	1.2 (0.608)
Husband has primary, wife has no	0.6 (0.854)	0.4 (0.449)	__	**2.0 (0.527)****	0.6 (0.709)	0.7 (0.492)
Either has secondary+	0.7 (0.646)	1.2 (0.631)	**21.0 (25.573)***	**4.3 (1.060)*****	1.9 (1.475)	**2.6 (1.248)***
Both have secondary+	__	__	6.2 (9.540)	**2.5 (1.167)***	0.1 (0.134)	3.5 (2.750)
Marital duration						
Both 0-4	rc	rc	rc	rc	rc	rc
Both 5-14	1.7 (1.472)	1.0 (0.412)	0.9 (0.752)	0.9 (0.163)	**0.1 (0.010)*****	0.6 (0.271)
Both 15+	1.3 (1.131)	0.5 (0.241)	0.6 (0.503)	0.8 (0.152)	0.5 (0.214)	0.7 (0.288)
Others	2.0 (1.809)	0.7 (0.336)	0.5 (0.431)	**1.6 (0.250)****	**0.3 (0.126)****	0.8 (0.297)
Fertility preferences						
Both want no more child	rc	rc	rc	rc	rc	rc
Both want another child	**0.3 (0.177)***	**0.4 (0.129)****	1.1 (0.565)	**0.6 (0.068)*****	0.7 (0.299)	0.6 (0.206)
Only wife wants another child	0.2 (0.266)	**0.2 (0.130)***	2.9 (2.693)	0.8 (0.173)	2.3 (1.303)	0.5 (0.335)
Only husband wants another child	1.4 (1.97)	1.6 (0.842)	2.8 (1.975)	0.9 (0.154)	0.6 (0.305)	0.6 (0.227)
Number of couples	*1458*	*1317*	*3622*	*3455*	*479*	*393*
-2LL (p-value)	*107.9 (<0.001)*	*225.4 (<0.001)*	*157.6 (<0.001)*	*1928.1 (<0.001)*	*160.5 (<0.001)*	*230.2 (<0.001)*
Pseudo R-squared	*0.119*	*0.136*	*0.150*	*0.091*	*0.198*	*0.139*

* p≤0.05; ** p≤0.01; ***p≤0.001; rc: reference category; Dash (__): Not included in the model; rc: reference category

Figure 1: Conceptual framework for individual and couple characteristics' influence on concordance in reporting of sexual and reproductive health (SRH) behaviors

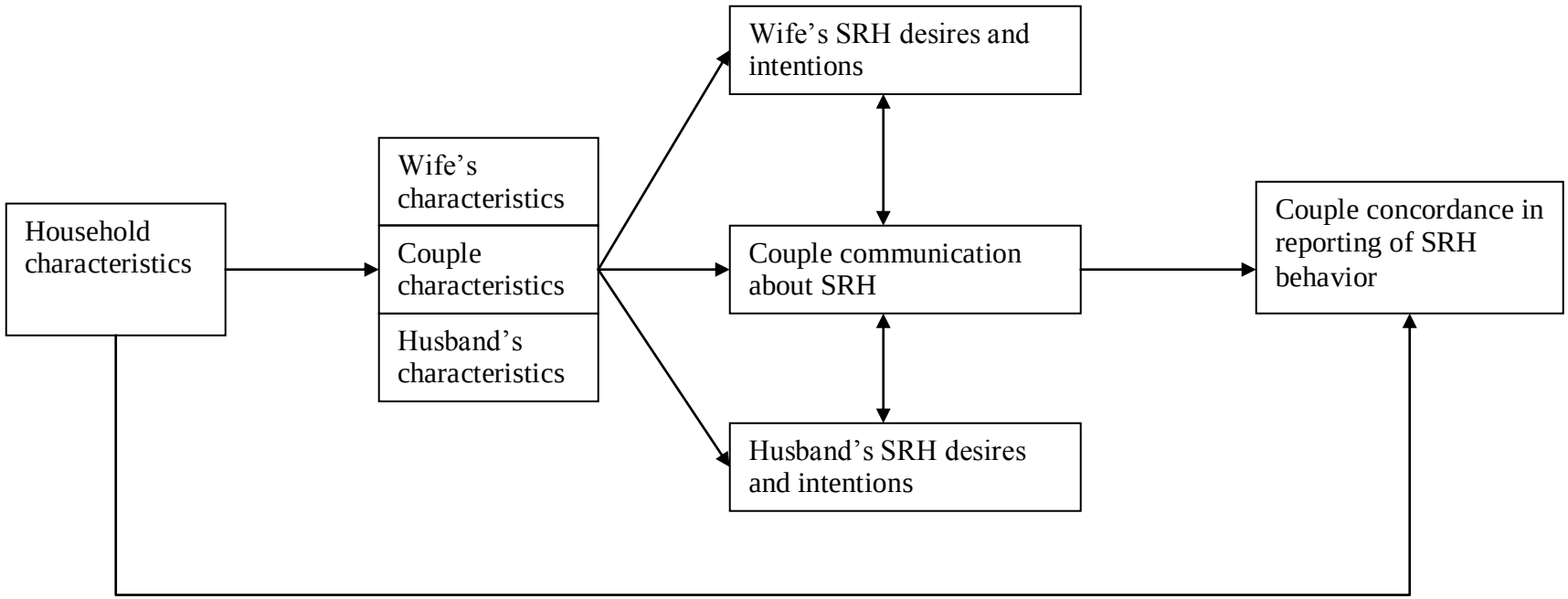
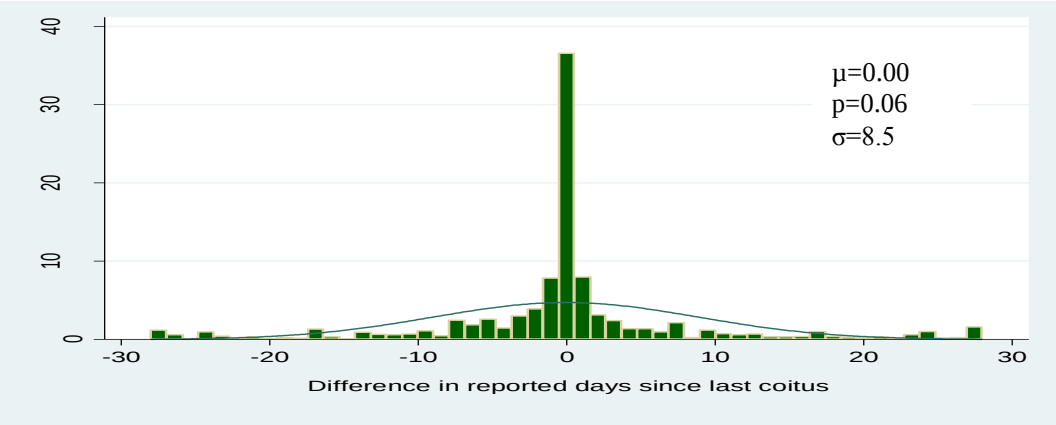
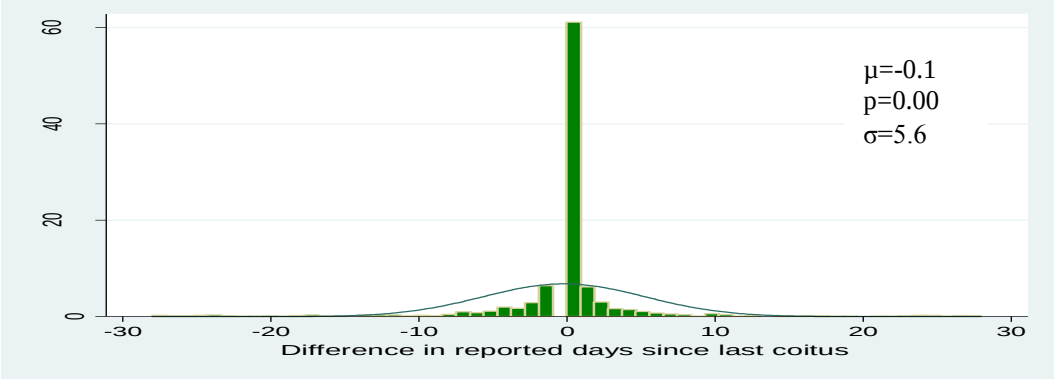


Figure 2: Percent distribution of difference between wife's and husband's reports on days since last coitus (wife minus husband) for monogamous couples without other sexual partners during the previous 28 days in selected countries (adjusted for days of interview)

a: Liberia 2007 (N=1672)



b: Madagascar 2008-09 (N=4138)



c: Namibia 2006-07 (N=588)

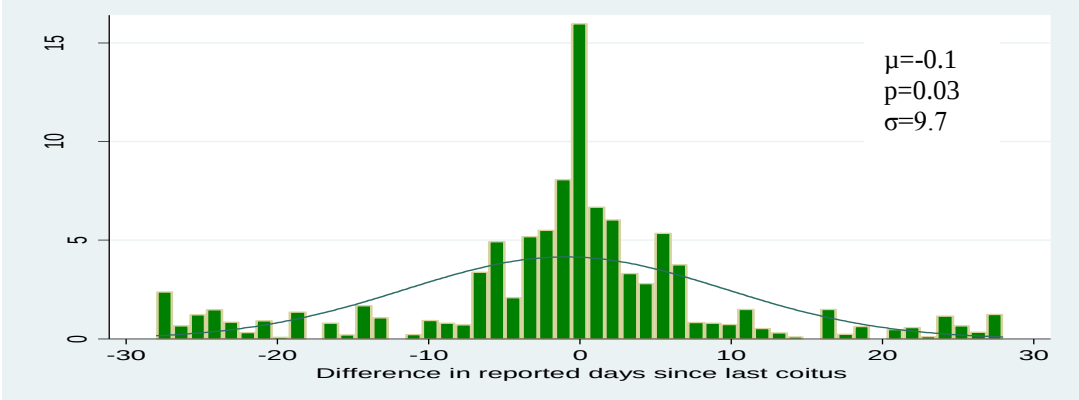
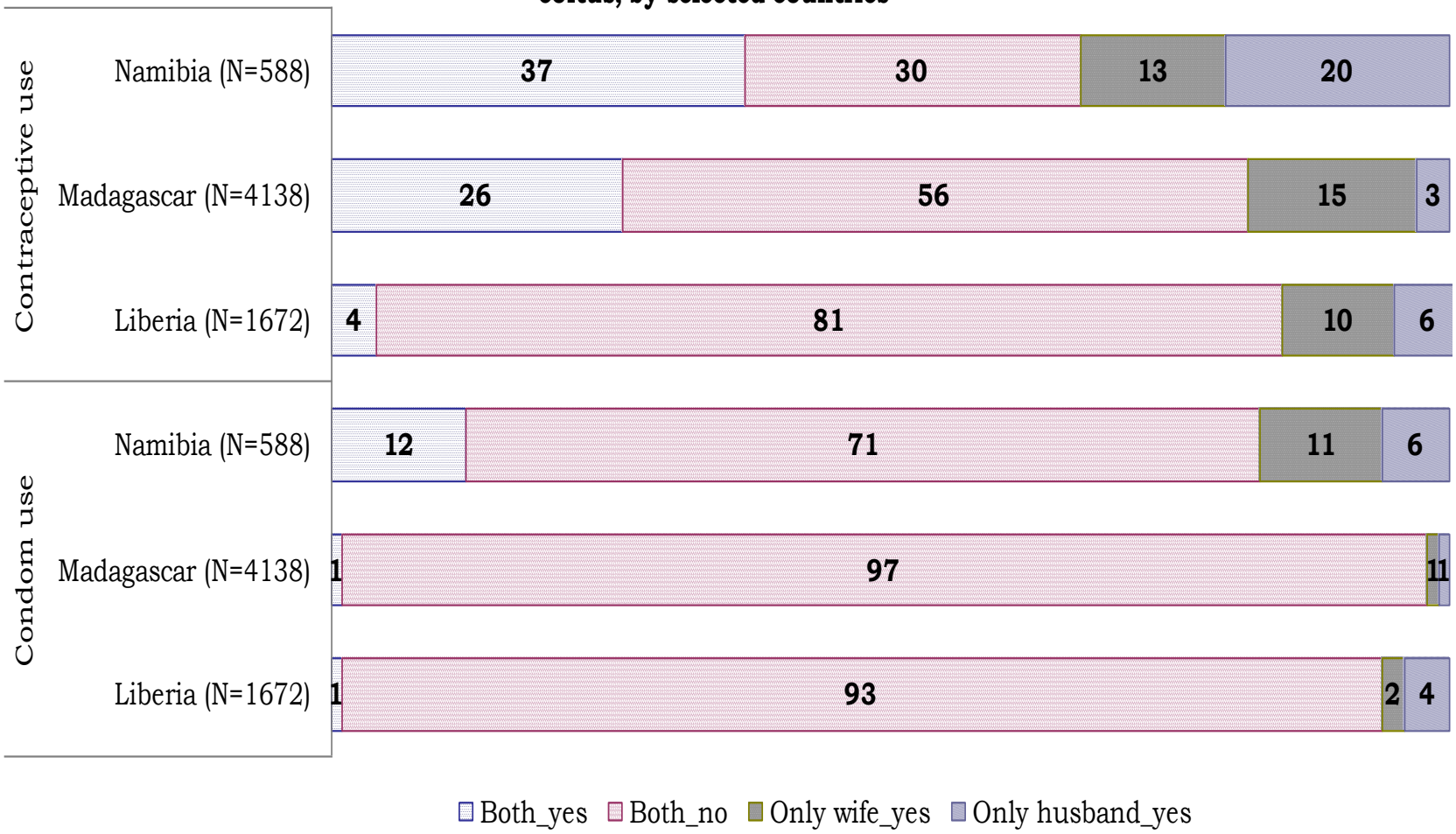


Figure 3: Percentage distributions of couples in reporting of condom use and contraceptive use at last coitus, by selected countries



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APPENDIX

Construction of the couple weights

Sampling weights are adjustment factors applied to each case in tabulations to adjust for differences in probability of selection and interview between cases in a sample, either due to design or happenstance. In the DHS surveys, many times the sample is selected with unequal probability *to* expand the number of cases available (and hence reduce sample variability) for certain areas or subgroups for which statistics are needed. In this case, weights need to be applied when tabulations are made of statistics *to* produce the proper representation. When weights are calculated because of sample design, corrections for differential response rates are also made.

The purpose of weighting sample data is to improve representativeness of the sample in terms of **size, distribution and characteristics** of the study population. By introducing sampling weight, the estimation is carried out in such a way that the estimates reflect the actual situation in the population.

In practice, sample weights may constitute of 3 factors: Design weight, Post-stratification weight, Non-response weight.

The design weight represents the inverse of sample selection probability.

Say, the sample selection probability is P_i.

Then weight, $w_i=1/P_i$

For multi-stage sampling design, the design weight (often called "base weight") reflects the probability of selection at each stage. As an example, for a two-stage design, where i^{th} PSU is selected with the probability of p_i and the j^{th} household is selected with the probability of fj, then: $P_{ij} = p_i * f_j$

So, weight, $W_{ij}=1/P_{ij}=1/(p_i * f_j)$

The post-stratification adjustment (ω_{ps}) compensates for differences between the achieved distribution for the sample for some characteristics and known population distribution for that characteristic. For instance, even a perfectly implemented equal probability sample, the age distribution in the sample will differ somewhat from the population age distribution because of the sampling fluctuations. If the population age distribution is known (for example from a recent census), one can reweight the sample, age group by age group, to bring it

into line with the population distribution. This kind of adjustment is known as post-stratification. When the population distribution of a characteristic is known, the post-stratification type of adjustment can also be used to compensate for nonresponse and noncoverage.

The non-response adjustments (w_{nr}) try to compensate for biases introduced by varying response rates in various part of the sample. They do so by increasing the weights of the respondents to represent the non-respondents.

The final weight, $w_f = w_{ij} * w_{ps} * w_{nr}$

Often data set may contain these weights separately and as a combined final weight. Post-stratification weights are common in the US based National Center of Health Statistics (NCHS) surveys. In developing country surveys, post-stratification weights are often not used. For instance, in the DHS survey, pot-stratification weighting is often avoided unless one has considerable confidence in the accuracy of the census data used, or unless there good reasons for believing that there was severe under-coverage in the survey sample.

DHS sampling weights

In general, the DHS sampling weights have two overall components: the first component is the inverse of the probability of selection, and the second is the inverse of the probability of response which adjusts for potential bias introduced by differential non-response. Hence, the household weight for a particular household is the inverse of its household selection probability multiplied by the inverse of the household response rate of its household response rate group. Likewise, the individual weight of a respondent's case is the household weight multiplied by the inverse of the individual response rate of her individual response rate group. The latter is estimated at the level of the sample domain/strata; estimates at lower levels in the sample design in many instances would be unstable due to small sample sizes. Details depend on the particular survey. To obtain the sample weights, the probabilities multiplied by the response rates are first inverted and then normalized so that the sum of the weights is equal to the number of respondents in the case of household or individual weights or is equal to the number of couple in the case of couple weight estimation. The DHS has customarily included both household weights and individual weights to the men's surveys (modules), normalizing the weights for the number of households in the subset for the men's surveys, and to the

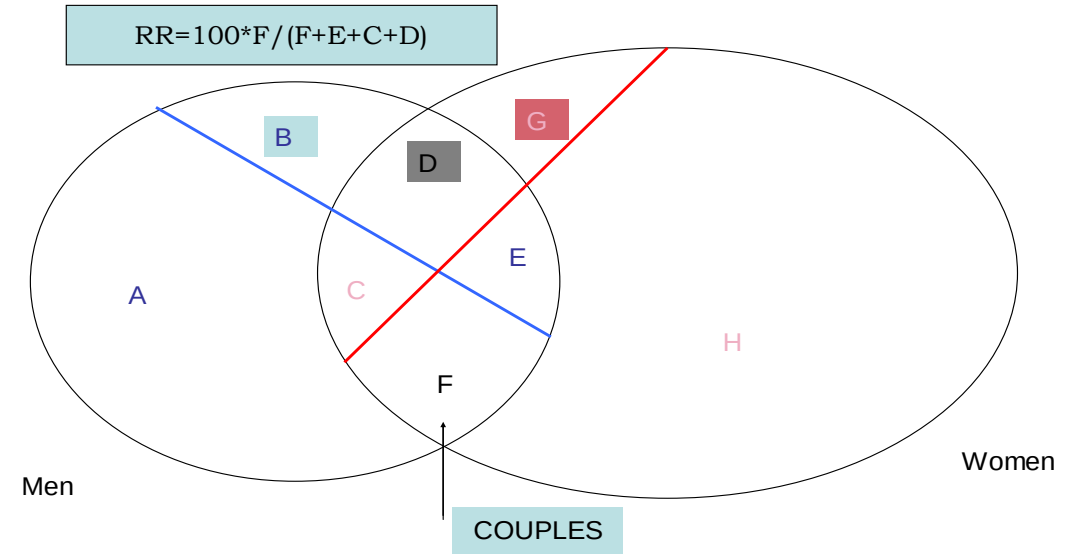
number of men's individual interviews even when no differential sub-selection has been used. Response rate groups are groups of cases for which response rates are calculated. In DHS surveys, households and individuals are grouped into sample domains and response rates are calculated for each domain.

Similarly, the couple weight would be the household selected for male subsample weight multiplied by the inverse of the couple response rate of its couple response rate group. The household selected for male subsample weight is already available in the household data set. That leaves the estimate of the couple response rate. The women's, men's and couple response rates were illustrated in the Venn diagram of Figure 1. Only area F represented completed couples, while completed men's interviews was represented by the sum of areas A, C and F and completed women's interviews by H, E and F. Among couples in a household in which both partners were eligible (i.e. in the appropriate age range), the man, the woman, or both may had incomplete interviews, represented by E, F and D respectively. Thus, the couple response rate was equal to F/(F+E+C+D) where F represented the number of completed couples; E was the number of couples non response for women only; C stood for the number of couples non response for men only, and D represented the number of couples non response for both men and women.

The number of completed couples (F) was available in the Couple's data or Couple Recode. The number of couples' non response for women only (E) derived from the man's data or male recode. We estimated the total number of couples (M) that one could expect from the man's data based on the number of married men and number of respective wives available in this file. Likewise we estimated the total number of couples (W) we could have from the woman's data or individual recode. Understandably, E=M-F and C=W-F.

Lastly, we assumed that the wealthiest quintiles would be likely to be non-respondents, and could then derive the number of couples' non response for both women and men (D) by building a two-by-two table (as seen on Table 1) by geographic regions and wealth quintiles. This procedure is often referred to as the "dual record system" approach, and it was set down in a classic article by Chandrasekar and Deming (1949). Thus, D=C*E/F

Figure1 : Venn diagram showing women, men and couple samples in a demographic and health survey and non-response of neither, one or both partners



A: Men not in union, completed; **B**: Men not in union, non-response
C: Couples-- non-response for man only; **D**: Couples--non-response for both
E: Couples--non-response for woman only; **F**: Couples–-both completed
G: women not in union, non-response; **H**: women not in union, completed

Table 1: Two-by-two table

		Men File	
		In	Out
Women File	In	F	C
	Out	E	D

D*F=E*C

Table 2: Couples' response rate estimation, DHS Madagascar 2008-09

	M	W	F	E	C	D	RR (%)
Geographic regions							
Analamanga	547	644	503	44	141	13	81.0
Vakinankaratra	212	216	199	13	17	1	87.0
Itasy	225	249	218	7	31	1	86.7
Bongolava	277	272	267	10	5	0	95.3
Haute matsiatra	228	237	212	16	25	2	83.2
Anamoroni'i mania	184	193	170	14	23	2	80.8
Vatovavy fitovinany	195	192	171	24	21	3	79.0
Ihorombe	239	240	233	6	7	0	94.5
Atsimo atsinanana	183	185	165	18	20	2	80.9
Atsinanana	233	241	224	9	17	1	91.0
Analanjirofo	175	174	160	15	14	1	84.2
Alaotra mangoro	222	235	216	6	19	1	89.9
Boeny	198	203	187	11	16	1	87.4
Sofia	235	238	231	4	7	0	94.9
Betsiboka	229	233	222	7	11	0	94.0
Melaky	189	193	184	5	9	0	90.3
Atsimo andrefana	185	191	168	17	23	3	83.1
Androy	168	166	154	14	12	1	81.1
Anosy	190	203	183	7	20	1	86.9
Menabe	181	191	166	15	25	3	79.2
Diana	199	201	191	8	10	0	91.4
Sava	196	182	175	21	7	1	85.1
TOTAL	4890	5079	4599	291	480	36	86.7

Note: M: Number of married men- Completed in the men file; W: Number of married women- Completed (in men subsample); F: Number of couples (both completed); E: Number of couples' non-response for women only; C: Number of couples' non-response for men only; D: Couple: non-response for both