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Reported condom use is not associated with incidence of sexually transmitted diseases in Malawi

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Objectives: To establish frequency of reported condom use and validate reliability of self-reporting among urban women in Malawi.

Design: Cross-sectional survey in antenatal women in 1989 and 1993. Prospective study in cohort first surveyed in 1989.

Methods: A total of 6561 women in 1989 and 2460 women in 1993 answered questions about condom use and sexual activity, had a physical examination and were screened for HIV. A subset of women from the 1989 screening were administered a questionnaire and tested for syphilis, *Neisseria gonorrhoeae* and *Trichomonas vaginalis* infections every 6 months.

Results: Although between the two cross-sectional studies intermittent condom use increased from 6 to 15% ($P<0.001$) with no difference according to HIV infection, consistent use was reported by less than 1%. In the prospective study, women reported a higher condom use at any visit than either group assessed cross-sectionally. Consistent condom use peaked at 62% in the first 6 months, but declined to as low as 8% in the second year of follow-up. Condom use at each visit, either intermittent or consistent, was higher in HIV-seropositive than HIV-seronegative women. Overall, the incidence of gonorrhea, trichomoniasis and syphilis did not decline in women reporting consistent condom use.

Conclusions: In prospectively followed women reports of consistent condom use was substantially higher than in cross-sectional surveys, but rapidly decreased over time, irrespective of HIV status. The presence of new sexually transmitted diseases suggests that this population of urban women overreports condom use or underreports sexual activity, or both. Intensive and sustained education is needed to achieve consistent condom use. Biologic markers of sexual activity are useful in interpreting reported condom use.

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Introduction

Condoms have only recently become better known in the general population in Africa, as part of HIV/AIDS control strategies. The effectiveness of condoms in reducing transmission of HIV and other sexually transmitted diseases (STD) has been widely reported [1–3] and condom use is now considered a critical measure in controlling the heterosexual spread of HIV worldwide [4,5]. Condom availability is increasing through such means as social marketing and community-based distribution, but condom use is still largely unmonitored [6]. Attempts

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to monitor condom use have relied mainly on cross-sectional surveys of self-reported use [7]. However, cross-sectional data on sexual behavior have known limitations [8] and self-reporting is difficult to validate with objective measurements. The monitoring of STD incidence in defined populations can be used to validate reported condom use [9]. Consistent condom use has been shown to reduce the risk of HIV transmission by an estimated 69%, while intermittent use has been associated with failure of protection against transmission of HIV [7,10]. In a prospective study, the European Study Group [11] reported no cases of HIV seroconversion among 124 HIV-seronegative partners who had a stable heterosexual relationship with an HIV-infected partner and who used condoms consistently during a period of 20 months of follow-up and a total of 15 000 episodes of intercourse. However, the risk of seroconversion was 4.8 per 100 person-years among partners who used condoms intermittently. The present study was conducted to compare reported condom use in two similar populations of urban women in Malawi who were surveyed 4 years apart, to determine any changes in condom use in a prospectively followed female population, and to evaluate the reliability of self-reporting of condom use and sexual activity using laboratory diagnosis of incident STD.

Materials and methods

Study population

A study of HIV transmission among pregnant women in urban Malawi has been conducted since 1989. The study populations in this report consisted of consecutive women presenting for their first antenatal visit to Queen Elizabeth Central Hospital (QECH), a tertiary care hospital in Blantyre, the commercial center of Malawi. Most women living in and around Blantyre receive their antenatal care at this hospital, making this study population a representative sample of childbearing women in an urban setting in Malawi. All consenting women presenting to the antenatal clinic over a 12-month period in 1989–1990 and a 5-month period in 1993 answered a questionnaire, had a physical examination and were screened for antibodies to HIV-1. All women received pre- and post-test counselling. Over 95% of all women attending the clinic consented to participate [12]. The questionnaire during the screening visit for both periods collected demographic information and medical, sexual and obstetric history. When women were interviewed, condom use was elicited in a specific question before pre-test counselling and HIV testing. Condom use was categorized as 'never', 'occasionally', 'most of the time', 'always' and, for this study, no attempt was made to differentiate between use with husband and use with other partners. Sera twice reactive for HIV-1 by enzyme-linked immunosorbent assay (Wellcozyme, Wellcome Diagnostics, Dartford, England, UK) were confirmed by Western blot analysis (Bio-Rad, Hercules, California, USA). Condoms were made freely available and women were encouraged to refer their male partners to the study clinic for HIV counselling and testing.

A subset of HIV-positive and negative women from the 1989–1990 screening were enrolled in a prospective study at delivery. The enrollment was conducted for 1 year and required the immediate enrollment of an HIV-seronegative woman for each HIV-seropositive woman enrolled. At their 6-monthly visit each woman was administered a questionnaire that elicited interim medical history, sexual activity and condom use. Blood samples were collected for syphilis testing [quantitative rapid plasma reagin (RPR) with fluorescent treponemal antibody testing for confirmation] and confirmatory HIV testing. Cervical swabs were cultured for *Neisseria gonorrhoeae* and vaginal wet mounts were examined for motile *Trichomonas vaginalis*. All identified bacterial and protozoan STD were treated and women were asked to refer their partners for treatment. All women received repeated HIV prevention education and condoms were freely available at the study site and in selected family planning clinics in the city.

Data analysis

Questionnaires were regularly checked for consistency and completeness. For analysis purposes the reported condom use was collapsed to three strata: no reported condom use ('never'), intermittent condom use ('occasionally' and 'most of the time') and consistent condom use ('always'). Incident syphilis was established by the presence, at the 12-month visit, of a new reactive syphilis serology or a fourfold increase in RPR titer from the previous test. Incident gonorrhea was established by a positive gonorrhea culture and incident trichomoniasis by a positive wet mount test at the 12-month visit.

Frequency distributions and proportions were calculated for reported sexual frequency and condom use. χ^2 analysis was used for tests of significance. Analyses were performed using the Statistical Analysis System software package (SAS, Cary, North Carolina, USA). In the 1989 and 1993 datasets a small number of individuals was present in both years. The *P* values are therefore likely to be conservative.

Results

A total of 6561 pregnant women were screened for HIV between October 1989 and October 1990. Of these women, 1366 (679 HIV-seropositive and 687 HIV-seronegative) were enrolled at delivery in a follow-up study. A further 2460 pregnant women, as part of a subsequent study, were screened for HIV between January and May 1993. HIV seroprevalence in the two populations was 19% in 1989 and 30% in 1993.

Reported condom knowledge and use in the two populations of pregnant women at their first antenatal clinic

visit is shown in Table 1. Almost all women, regardless of their HIV status, knew about condoms in 1993, while in 1989 only 16% of HIV-seronegative and 20% of HIV-seropositive women reported such knowledge. An almost threefold increase in any condom use was reported by the women surveyed, from 5.8% in 1989 to 15% in 1993 ($P<0.001$). Intermittent condom use was higher at both timepoints among HIV-seropositive than among seronegative women ($P<0.01$) and increased between 1989 and 1993 in both HIV-seropositive and seronegative women ($P<0.001$). Consistent condom use was reported by less than 1% of the women, regardless of HIV infection status, and did not increase significantly between 1989 and 1993.

Table 1. Reported condom knowledge and use in two populations of pregnant women surveyed 4 years apart in Blantyre, Malawi.

	%		
	1989 (n = 6561)	1993 (n = 2460)	*P*
Know about condoms			
HIV-positive	20.36	92.15	<0.0001
HIV-negative	15.93	88.1	<0.0001
Condom use			
All women			
Intermittent	5.76	14.92	<0.0001
Consistent	0.24	0.28	0.733
HIV-positive			
Intermittent	7.34	18.40	<0.0001
Consistent	0.13	0.27	0.464
HIV-negative			
Intermittent	5.29	13.42	<0.0001
Consistent	0.28	0.29	0.929
By age (years)			
<21	3.21	13.31	<0.0001
21–25	6.14	17.43	<0.0001
26–30	9.18	18.07	<0.0001
31–35	7.42	14.89	<0.0001
>35	4.51	6.43	0.296
By marital status			
Single	5.52	22.92	<0.0001
Married	6.03	14.69	<0.0001
D/S/W	6.67	18.52	0.121
By women's education			
None	2.47	4.78	0.022
Standard 1–8*	5.64	14.00	<0.0001
Form 1–4†	13.67	31.86	<0.0001
University	40.0	0	0.439
By history of STD			
No history	5.89	14.39	<0.0001
Reported history	6.91	20.28	<0.0001

STD, Sexually transmitted disease; D/S/W, divorced/separated/widowed. *Primary and †secondary education.

More women, irrespective of age, reported ever using condoms in 1993 than in 1989, and the largest proportion of users was observed, in both years, among women aged 26–30 years. In 1989 no significant difference was observed in reported condom use according to marital status, whereas in 1993 a significantly higher percentage of single than married women reported condom use. In both years, reported use increased significantly (*P* trend <0.0001) with the women's level of education. Unlike in 1989, in 1993 there was a significantly higher proportion of women reporting condom use among women with history of STD than among women without such a history.

Reported sexual activity and condom use in women enrolled in 1989 and followed for 24 months after delivery are shown in Table 2. This group included women who, during the 24-month period, attended the clinic and had a living child. The proportion of women reporting sexual intercourse was lowest in the first 6 months post-partum and reached a plateau by 1 year; this trend was similar among HIV-seropositive and seronegative women, but, at each visit, the proportion of women reporting sexual activity was higher among seronegative women.

Table 2. Reported sexual activity and condom use in women followed for 24 months.

	Months post-partum (%)			
	6	12	18	24
HIV-positive (n)	501	399	328	188
Reported sex	52	79	78	73
Condom use*				
Intermittent	28	41	46	58
Consistent	51	41	16	11
HIV-negative (n)	535	456	381	216
Reported sex	57	83	86	83
Condom use*				
Intermittent	12	21	32	33
Consistent	16	23	16	8
OR (95% CI) for reported sex among HIV– and HIV+ women	1.2 (1.0–1.6)	1.3 (0.9–1.9)	1.7 (1.2–2.6)	1.8 (1.1–3.0)
All women (n)	1036	855	709	404
Reported sex	55	81	84	78
Condom use*	76	72	54	44

*Among those reporting sex. OR, Odds ratios; CI, confidence intervals.

Reported intermittent condom use, among both HIV-seropositive and seronegative women reporting sexual activity, was lowest in the first 6 months post-partum (28 and 12% for HIV-seropositive and seronegative women, respectively), but increased steadily thereafter, to 58% for HIV-seropositive and to 33% for seronegative women by 24 months of follow-up (Table 2). Conversely, reported consistent condom use was highest in the first 6 months post-partum and declined thereafter, irrespective of HIV serostatus. Condom use at each visit, either intermittent or consistent, was higher in HIV-seropositive than in seronegative women.

Table 3 shows the incidence of STD, according to sexual activity and condom use, between 6 and 12 months post-partum. Among HIV-seropositive women, the in-

Table 3. Sexually transmitted disease (STD) incidence in women 6 and 12 months post-partum, according to sexual activity and condom use*.

	% (total)			
		Sex with condoms		
	No sex	Consistent	Intermittent	Never
HIV-positive (total†)	69	51	74	181
Gonorrhea	3.3 (60)	4.7 (43)	1.6 (63)	1.8 (164)
Trichomoniasis	12.2 (49)	20.6 (34)	11.5 (61)	14.4 (132)
Syphilis	1.9 (54)	3.1 (32)	2.0 (49)	5.2 (135)
HIV-negative (total†)	59	16	57	300
Gonorrhea	0.0 (54)	0.0 (16)	0.0 (53)	1.9 (269)
Trichomoniasis	10.0 (40)	0.0 (14)	15.6 (45)	9.8 (234)
Syphilis	0.0 (47)	0.0 (14)	0.0 (44)	4.2 (217)

*Figures in parentheses are the appropriate denominators. †Number of women who were available at 6 and 12 months of follow-up. The difference between these numbers and the denominators in parentheses is due to exclusion of women who had a positive STD test at the 6-month visit or had missing laboratory data.

cidence of gonorrhea and trichomoniasis was comparable in women who reported no sex and those who reported sex with intermittent or no condom use. In addition, contrary to expectations, the incidence of those STD was highest in women reporting sex with consistent condom use. For example, HIV-seropositive women who reported sex and used condoms 'always' had the highest incidence of trichomoniasis (21%).

Among HIV-seronegative women, the incidence of gonorrhea was highest for women who reported sex with no use of condoms at all (19%; Table 3). No new episodes of gonorrhea infections were detected between 6 and 12 months post-partum in women who reported no sex, or in those who reported sex, but also reported consistent or intermittent condom use. The incidence of trichomoniasis was the same (10%) in women who reported no sex and those who reported sex, but never used a condom. HIV-seronegative women who reported sex and intermittent condom use had the highest incidence of trichomoniasis, although there was no new trichomoniasis infections in these women when condoms were consistently used.

The incidence of syphilis between 6 and 12 months post-partum was highest in women who 'never' used condoms (Table 3). This was particularly apparent among HIV-seronegative women, where new cases of syphilis were only detected in women who 'never' used condoms.

Discussion

This study shows that there was a secular increase, 5.76% in 1989 to 14.92% in 1993, in condom use reported by urban pregnant women at their first antenatal visit in Blantyre, the commercial center of Malawi (Table 1). In the same period and the same population, HIV seroprevalence increased from 19 to 30%. The increase in condom use could be attributed to a better knowledge about condoms and a wider availability of them among city dwellers, as a results of AIDS control efforts in Malawi. In both 1989 and 1993, women aged 26–30 years were the largest age group reporting condom use, but women aged 21 years or less reported the largest increase in use during the 4-year interval. Marital status did not play a role in condom use in 1989, although in 1993 a higher proportion of single than married women reported using condoms. In both years, better educated women reported considerably more condom use than uneducated women. The intense education and counseling on HIV/STD provided at every visit by our study workers and the availability of condoms at our clinic may be invoked to partially explain that more condom use was reported by women enrolled in 1989 and followed for 24 months (Table 2), compared to women who were administered a one-time questionnaire, whether in 1989 (5.76%) or 1993 (14.92%).

There are only a few prospective studies of condom use in non-prostitute populations. In Rwanda, a program of condom promotion associated with HIV testing and counselling of both partners resulted in a higher proportion of women, from 7 to 22%, who reported ever using condoms. This higher condom use was associated with a decrease in new HIV and gonorrhea infection rates [9]. In the United States, a prospective study among STD clinic attenders by Zenilman *et al.* [13] found that a higher self-reported condom use among both women and men was not associated with lower STD incidence. Determining the degree of condom use over time, not merely of condom availability, is important because consistent use is thought to be key to achieve a reduction in HIV transmission [7]. Women in our follow-up study, unlike women in the two cross-sectional studies, were exposed to repeated information on prevention of HIV and STD, which may explain the large rise in condom use (up to 76%; Table 2) reported by women in the follow-up study. However, overreporting of condom use may have been more likely during the prospective study, as women may have been eager to show their compliance

with the information on safe sex. Conversely, women may have been less likely to overreport condom use in both the 1989 and the 1993 cross-sectional surveys because, in each survey, condom use was ascertained only once and before women knew their HIV infection status.

Although the reporting of 'any' condom use was substantially higher in regularly followed women, the prolonged educational effort and one-to-one counselling over a 2-year period did not result in consistent condom use, a finding in agreement with other studies in Africa [14].

In our study, after the first few months following delivery, reports of consistent condom use declined, while reports of intermittent use increased. This trend was observed in both HIV-seropositive and seronegative women, even though condom use at each visit was higher among HIV-seropositive women. Some women in our study population rationalized this intermittent use, when informally queried, as an attempt to protect themselves against HIV and STD while increasing their chances of becoming pregnant. A different explanation for the increase in intermittent use after 6 months postpartum may be that women and their partners were actually attempting to prevent further pregnancies. Intermittent condom use was also observed in a study of prostitutes in The Gambia, who were less likely to use condoms with regular sexual partners than with clients [14,15].

Reported sexual activity was lowest in the first 6 months post-partum (Table 2). This is in keeping with the common cultural practice of a prolonged sexual abstinence after delivery [16]. During this period, it might be appropriate to educate both women and men about the importance of consistent condom use at the resumption of sexual activity. Several factors are critical for the success of such educational efforts [17]. First, condoms should be widely available, inexpensive and acceptable by users. Second, education should be extended to the husbands or sexual partners, as studies in Africa have shown that decisions to practice family planning and, more generally, decisions involving the sexual sphere are male-dominated [18]. The importance of educating men is confirmed by the finding, in Rwanda, of higher condom use and lower STD rates among women when men were also included in HIV testing and counselling [9,19]. Third, for condoms, as for other risk-reducing measures, the educational effort is more likely to succeed when it is continuous and repetitive [20]. In our study, incidence of STD did not decline, contrary to expectations, in women reporting consistent condom use. The presence of new STD between 6 and 12 months of follow-up in HIV-seropositive women suggests that either sexual activity post-partum was underreported or condom use was overreported, or both.

This study's results should be interpreted in light of some limitations. As in most such surveys, the recall of intermittent and consistent condom use may have differed among respondents, especially as their condom use changed over time and with different partners. Confirmation of the degree of use from the women's sexual partners was not obtained. The frequency of new STD may have been influenced by an incorrect use of condoms.

To better estimate the impact of condom use on HIV/STD prevention, practical ways to monitor such use must be devised. Our findings in Malawi, similar to findings in the United States [11], suggest that using only questionnaires to monitor condom use in a community is not adequate. Reported condom use and sexual activity, variables commonly utilized in program evaluation, can be validated using objective parameters, as we attempted to do in this study using incident STD. When resources for health care are scarce and cost-effective choices for control of HIV and STD must be made, such choices should take into account several factors: that actual condom use may be difficult to establish; that other measures for reducing risk, such as selecting a low-risk partner, have been shown to have considerable impact [7]; and that intensive, sustained efforts will be needed to achieve both consistent and correct condom use.

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