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PREVALENCE AND CORRELATES OF CONDOM ERRORS AMONG SEXUALLY ACTIVE RESIDENTS OF GEM SUB-COUNTY, SIAYA, COUNTY WESTERN KENYA, 2012-2014

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Abstract: *Condom effectiveness is compromised by user errors. We set out to examine the rates of condom use and condom errors among sexually active persons living within a Health Demographic Surveillance this high HIV prevalence area in Western Kenya. We analyzed data from the second round of a longitudinal bio-behavioral survey that was conducted in Gem, Siaya County between November 2012 and February 2014. Logistic regression analysis was done to identify predictors of condom use among all sexually active persons and condom errors among participants reporting condom use in the past 3 months. Of 7815 persons interviewed minority (39%) reported having used male condoms with at least one sexual partner in the past 3 months of whom 459 (15%) reported condom errors. Majority of those reporting condom errors had experienced ‘incomplete use’ (i.e. a combination of early removal, late application or both early removal and late application). Participants who had experienced condom errors were significantly more likely to be aged <25 years and 25-34 years compared to those who were aged 35 years and older (OR 1.5; 95% CI 1.1-1.9 and OR 1.3; 95% CI 1.0-1.8 respectively to have had 3 or more and 2 sexual partners in the past 12 months compared to those who had one (OR 2.4; 95% CI 1.7-3.5 and OR 1.6; 95% CI 1.2-2.1 respectively), to have reported their sex partners to have ever been drunk during sex (OR 1.7; 95% CI 1.1-2.7), to have used mind altering substances in the past 12 months compared to those who had never used mind altering substances in the past 12 months (OR 1.9; 95% CI 1.2-3.1), and to report that their sex partner had ever used mind altering substances in the past 12 months (OR 1.7; 95% CI 1.0-2.8). Limited experience with condom use and the use mind-altering substances may partly be responsible for condom errors. Sexual and reproductive health programs should provide health education to promote condom use and HIV risk awareness. Additional strategies to mitigate effects of drug abuse as a harm reduction strategy should be considered for HIV prevention.*

Key words: *condom errors, condom use,*

1. Background

According to the Kenya AIDS indicator Survey of 2012, Siaya County of Western Kenya is one of the five counties with the highest HIV prevalence in Kenya; 17.8% against the country’s

average of 5.6% [1]. The Kenya AIDS Indicator Survey of 2012 illustrated that, 19% of sexually active persons reported condom use in the past three months with 20% reporting at least one instance of condom errors with majority being condom slippage [2].

The male latex condom is the single most efficient available technology to reduce sexual transmission of HIV and other sexually transmitted infections [3]. The Kenyan government advocates for condom use for HIV prevention [4]. However, condom effectiveness is compromised by user errors that include lack of use and incorrect use [5].

With health programs focusing on condom distribution, uptake and frequency of use, condom use errors are overlooked [5, 6]. Consequently, this has substantial implications for HIV and STI prevention [5]. Additionally, national surveys are sporadic and may not be representative of the general population [7]. Furthermore, majority of studies have focused on men attending STI clinics, MSM, FSW, PLHIV or women [3, 8-10]. We set out to examine the rate of condom use and condom errors among persons that had been sexually active within the past three months who lived within KEMRI/CDC Health Demographic Surveillance Area which is a high HIV prevalence area in Western Kenya with a view to informing HIV prevention programs.

2. Methods

2.1 Study design and setting

Two rounds of cross-sectional surveys evaluating HIV risk behaviors, HIV sero-status factors and HIV prevention interventions, have been conducted in Gem, Siaya County between March 2011 to September 2012 and January 2013 to February 2014 respectively. We chose to analyze data from the more recent second round of the survey which represents the most recent data. Kenya Medical Research Institute (KEMRI)/US Centers for Disease Control and Prevention (CDC) Health and Demographic Surveillance System Area (KEMRI/CDC HDSS) provided a sampling frame from which a random sample of 4,000 compounds were selected through a community-based simple random approach. Detailed description of the HDSS has been described by Odhiambo et al [11].

2.2 Study population

Our study population of interest included all persons aged ≥ 13 years, who had had sex in the three months preceding the interview date, were found within the selected compounds and had spent the previous night in the said household. Persons were interviewed prior to survey HIV testing by HIV Testing and Counseling counselors certified by the National AIDS Control Council in Kenya of the same gender prior to survey testing [4]. Interview topics included participant demographics, sexual behavior, and utilization of HIV health services.

2.3 Definitions of ‘variables of interest’

Participants were described as ‘currently married’ if they reported to be in a relationship, cohabiting or married in a monogamous or polygamous relationship and ‘previously married’ if they reported being divorced or widowed. Participants were described as having attained ‘primary level’ education if they had either complete or incomplete primary level education, as having ‘secondary level’ education if they had either complete or incomplete secondary level education, or ‘tertiary level’ education if they were in or had completed tertiary level training.

Participants were described as having used drugs in the past year if they answered in the affirmative to the question *'have you used any mind altering substances e.g. bhang, miraa, in the past 12 months'*.

2.4 Definitions of 'outcomes of interest'

Participants were described as ever having used a condom if they answered yes to the question *'have you ever used a condom when having sex with partner x'*. Condom errors three months preceding the interview, were described either as 'late application' if the participant answered yes to the question *'while using condoms with partner x, did you ever put on the condom after you had already started having sexual intercourse'* and 'early removal' if the participant answered yes to the question *'while using condoms with partner x, did you ever take off the condom before you were finished having sexual intercourse'* and 'condom slippage' if the participant answered yes to the question *'while using condoms with partner x, did the condom you were using ever slip off during sex or while pulling out'* and 'condom breakage' if the participant answered yes to the question *'while using condoms with partner x, did the condom you were using ever break or leak during sex or while pulling out?'* 'Incomplete condom use', was described as a combination of 'early removal' and 'late application' [5]. A participant was described as ever having experienced a condom error if he or she reported experiencing any of the condom errors described above.

2.5 Data analysis

Chi square statistics were used to describe participant characteristics by history of condom use in the past 3 months among all participants and by history of experiencing a condom error in the past three months and all participants who reported having ever used a condom in the past 3 months.

We fitted logistic regression to identify predictors of condom use among all sexually active persons and condom errors among participants reporting condom use in the past 3 months. All variables with $p\text{-value} \leq 0.1$ in the univariate were included in the multivariate mode. All estimates were reported at 95% confidence interval.

2.6 Ethical considerations

Ethical approval to conduct this study was granted by the Kenya Medical Research Institute Ethics Review Committee (SSC. 1801).

3. Results

3.1 Participant selection

A total of 14116 persons were interviewed during the survey. Of these, 7815 met the criteria for inclusion in our analysis (Figure 1).

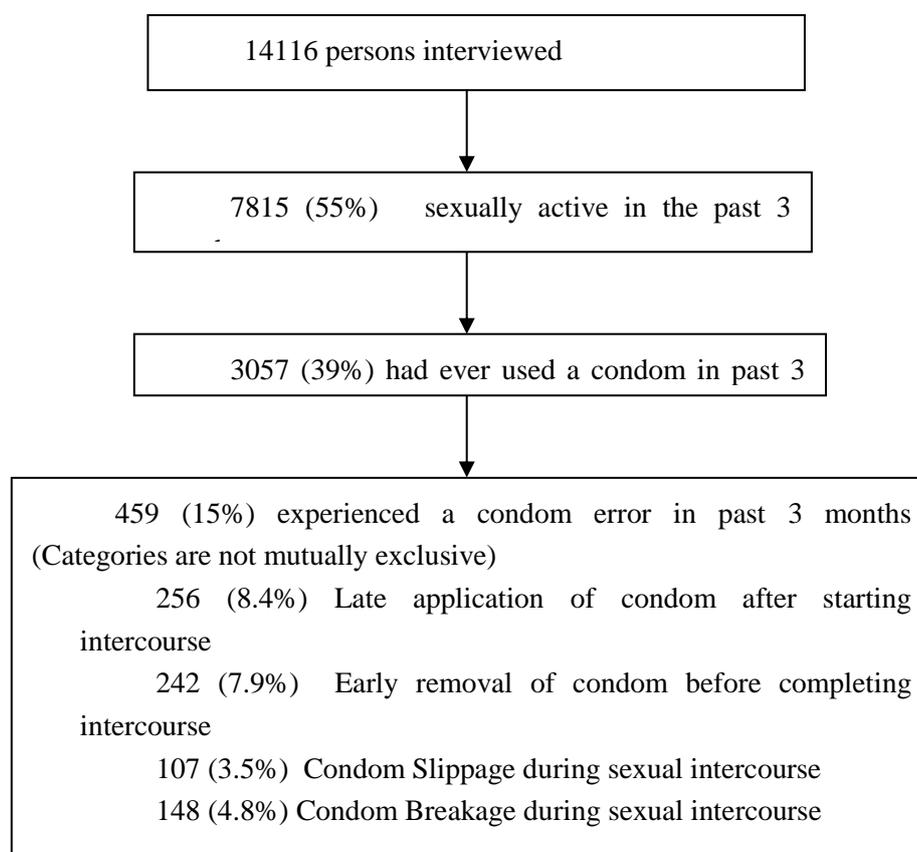


Figure 1. Participant selection

Majority were, aged ≥ 35 years (45%), female (58%), currently married (78%), had attained primary level education (73%), engaged in some form of employment (82%), and had had one sex partner in the past 12 months (90%). The majority had never taken alcohol before sex (95%) or been drunk during sex (97%) or used mind-altering substances in the past one year (97%). Nearly all reported that their partners had never taken alcohol before sex (96%), nor had been drunk during sex (96%) or had used mind-altering substances in the past one year (97%) (Table 1)

Table 1. Characteristics of participants who had ever used a condom in the past 3 months during sexual intercourse, Gem, Siaya County, 2012-2014

| Characteristic | Total N=7815 N (%) | Used condom in past 3 months 3057 (39%) N (%) | Did not use condom in past 3 months N (%) | P value |
|----------------|--------------------------|--------------------------------------------------------|-------------------------------------------------|---------|
| Age group | | | | |
| <25 years | 1992 (25) | 1256 (63) | 736 (37) | <0.01 |
| 25-34 years | 2331 (30) | 1001 (43) | 1330 (57) | |
| 35+ years | 3492 (45) | 800 (23) | 2692 (77) | |
| Gender | | | | |
| Male | 3287 (42) | 1500 (46) | 1787 (54) | <0.01 |
| Female | 4528 (58) | 1557 (34) | 2971 (66) | |
| Marital status | | | | |

| | | | | |
|-----------------------------------------------------------|-----------|-----------|-----------|-------|
| Single | 1270 (16) | 981 (77) | 289 (23) | <0.01 |
| Currently married | 6074 (78) | 1854 (31) | 4220 (69) | |
| Previously married | 451 (6) | 211 (47) | 240 (53) | |
| Education | | | | |
| None | 398 (5) | 50 (13) | 348 (87) | <0.01 |
| Primary | 5678 (73) | 2057 (36) | 3621 (64) | |
| Secondary | 1499 (19) | 800 (53) | 699 (47) | |
| Tertiary | 240 (3) | 150 (63) | 90 (37) | |
| Occupation | | | | |
| Employed | 6339 (82) | 2208 (35) | 4161 (65) | <0.01 |
| Unemployed | 1405 (18) | 809 (58) | 596 (42) | |
| 12 months sex partners | | | | |
| 1 | 7035 (90) | 2555 (36) | 4480 (64) | <0.01 |
| 2 | 574 (7) | 349 (61) | 225 (39) | |
| 3+ | 206 (3) | 153 (74) | 53 (26) | |
| Ever taken alcohol before sex | | | | |
| Yes | 421 (5) | 209 (50) | 212 (50) | <0.01 |
| No | 7394 (95) | 2848 (39) | 4546 (61) | |
| Ever been drunk during sex | | | | |
| Yes | 207 (3) | 96 (46) | 111 (54) | 0.03 |
| No | 7608 (97) | 2961 (39) | 4647 (61) | |
| Partner took alcohol before last sex | | | | |
| Yes | 505 (6) | 180 (36) | 325 (64) | 0.09 |
| No | 7310 (94) | 2877 (39) | 4433 (61) | |
| Partner was drunk during sex | | | | |
| Yes | 314 (4) | 113 (36) | 201 (64) | 0.25 |
| No | 7501 (96) | 2944 (39) | 4557 (61) | |
| Ever used mind altering substances in past 12 months | | | | |
| Yes | 229 (3) | 106 (46) | 123 (54) | 0.02 |
| No | 7586 (97) | 2951 (39) | 4635 (61) | |
| Partner ever used mind altering substances past 12 months | | | | |
| Yes | 260 (3) | 93 (36) | 167 (64) | 0.26 |
| No | 7555 (97) | 2964 (39) | 4591 (61) | |

3.2 Condom use

Less than a half of the participants (n=3057; 39%) reported having used condoms with at least one sexual partner in the 3 months preceding the interview date (Figure 1). Data not shown indicates that majority (99%) used the male condom.

In the univariate analyses persons who used mind-altering substances were significantly more likely to be aged < 25 years, male, single, of secondary or tertiary level education, unemployed, had more than 3 sex partners in the 12 months preceding the interview, had ever taken alcohol before sex, reported being drunk before sex and having used mind altering substances in the 12 months preceding the interview (Table 1).

In the multivariate analyses, persons who had used condoms were more likely to; be aged <25 years and 25-34 years compared to those who were aged 35 years and older (OR =3.5; 95% CI 3.0-4.1 and OR =2.4; 95% CI 2.1-2.7 respectively), be male (OR=1.3; 95% CI 1.1-1.4), be single and previously married compared to those who were currently married (OR 3.2; 95% 2.7-3.8 and OR 2.4; 95% CI 1.9-2.9 respectively), be of primary, secondary or tertiary level education compared to those who had 'no education' (2.3 95% CI 1.7-3.1, OR 3.7; 95%CI 2.6-5.1, and 5.4; 95% CI 3.5-8.3 respectively), to have had 3 or more and 2 sexual partners in the 12 months preceding the interview date, compared to those who had one (OR 3.1; 95CI 2.2-4.5 and OR 2.0;95%CI 1.7-2.5 respectively), to have ever taken alcohol before sex compared to those who had never taken alcohol before sex (OR 1.7; 95% CI 1.3-2.4)and to have never been drunk during sex in the 3 months preceding the interview date compared to those who had ever been drunk during the same time period (OR 1.6; 95% CI 1.0-2.5) (Table 2).

Table 2. Factors associated with condom use among sexually active participants, Gem, Siaya County, 2012-2014

| Characteristic | Crude Odds Ratio (COR) (95% CI) | P value | Adjusted Odds Ratio (AOR) (95% CI) | P value |
|-------------------------------|---------------------------------|---------|------------------------------------|---------|
| Age group | | | | |
| <25 years | 5.7 (5.1-6.5) | <0.01 | 3.5 (3.0-4.1) | <0.01 |
| 25-34 years | 2.5 (2.3-2.8) | | 2.4 (2.1-2.7) | |
| 35+ years | Ref | | Ref | |
| Gender | | | | |
| Male | 1.6 (1.5-1.8) | <0.01 | 1.3 (1.1-1.4) | <0.01 |
| Female | Ref | | Ref | |
| Marital status | | | | |
| Single | 7.7 (6.7-8.9) | <0.01 | 3.2 (2.7-3.8) | <0.01 |
| Currently married | Ref | | Ref | |
| Previously married | 2.0 (1.7-2.4) | | 2.4 (1.9-2.9) | |
| Education | | | | |
| None | Ref | <0.01 | Ref | <0.01 |
| Primary | 3.9 (2.9-5.3) | | 2.3 (1.7-3.1) | |
| Secondary | 7.9 (5.8-10.9) | | 3.7 (2.6-5.1) | |
| Tertiary | 11.6 (7.8-17.2) | | 5.4 (3.5-8.3) | |
| 12 months sex partners | | | | |
| 1 | Ref | <0.01 | Ref | <0.01 |
| 2 | 2.7 (2.3-3.2) | | 2.0 (1.7-2.5) | |
| 3+ | 5.1 (3.7-6.9) | | 3.1 (2.2-4.5) | |
| Ever taken alcohol before sex | | | | |
| Yes | 1.6 (1.3-1.9) | <0.01 | 1.7 (1.3-2.4) | <0.01 |
| No | Ref | | Ref | |
| Ever been drunk during sex | | | | |
| Yes | Ref | | Ref | |
| No | 1.4 (1.1-1.7) | 0.03 | 1.6 (1.0-2.5) | 0.03 |

3.3 Condom errors

Only 459(15%) among those who reported having used condoms with at least one sexual partner in the past 3 months reported a condom error. The condom errors experienced were late application (8.4%), early removal (7.9%), Condom breakage (4.8%) and condom slippage (3.5%); participants may have experienced more than one error therefore, these categories are not mutually exclusive (Figure 1). Data not shown indicates that the majority of respondents had experienced 'incomplete use' (i.e. (a combination of early removal, late application or both early removal and late application) (55%), condom breakage (15%), slippage (8%), a combination of all four errors (5%) amongst other errors.

In the univariate analyses, participants who experienced condom errors were more likely to be, aged less than 25 years, to have had 3 sex partners in the 12 months preceding the interview date, either they themselves or their sex partners had ever taken alcohol before sex, or been drunk during sex or used mind altering substances (Table 3).

Table 3. Characteristics of participants who had ever experienced condom errors past 3 among those who used condoms in the past 3months, Gem, Siaya County, 2012-2014

| Characteristic | Total who used condoms in the past 3 months 3057 | Experienced condom in the past 3 months 459 (15%) | Did not Experienced condom in the past 3 months | P value |
|-------------------------------|-----------------------------------------------------|------------------------------------------------------|-------------------------------------------------|---------|
| Age group | | | | |
| <25 years | 1256 (41) | 207 (17) | 1049 (83) | <0.01 |
| 25-34 years | 1001 (33) | 158 (16) | 843 (84) | |
| 35+ years | 800 (26) | 94 (12) | 706 (88) | |
| Gender | | | | |
| Male | 1500 (49) | 245 (16) | 1255 (84) | 0.05 |
| Female | 1557 (51) | 214 (14) | 1343 (86) | |
| Marital status | | | | |
| Single | 981 (32) | 170 (17) | 811 (83) | 0.05 |
| Currently married | 1854 (61) | 259 (14) | 1595 (86) | |
| Previously married | 211 (7) | 29 (14) | 182 (86) | |
| Education | | | | |
| None | 50 (2) | 3 (6) | 47 (94) | 0.11 |
| Primary | 2057 (67) | 327 (16) | 1730 (84) | |
| Secondary | 800 (26) | 109 (14) | 691 (86) | |
| Tertiary | 150 (5) | 20 (13) | 130 (87) | |
| Occupation | | | | |
| Employed | 2208 (73) | 335 (15) | 1873 (85) | 0.56 |
| Unemployed | 809 (27) | 116 (14) | 693 (86) | |
| 12 months sex partners | | | | |
| 1 | 2555 (84) | 342 (13) | 2213 (87) | <0.01 |
| 2 | 349 (11) | 71 (20) | 278 (80) | |
| 3+ | 153 (5) | 46 (30) | 107 (70) | |
| Ever taken alcohol before sex | | | | |
| Yes | 209 (7) | 48 (23) | 161 (77) | <0.01 |

| | | | | |
|------------------------------------------------------------------|-----------|----------|-----------|-------|
| No | 2848 (93) | 411 (14) | 2437 (86) | |
| Ever been drunk during sex | | | | |
| Yes | 96 (3) | 26 (27) | 70 (73) | <0.01 |
| No | 2961 (97) | 433 (15) | 2528 (85) | |
| Partner took alcohol before last sex | | | | |
| Yes | 180 (6) | 41 (23) | 139 (77) | <0.01 |
| No | 2877 (94) | 418 (15) | 2459 (85) | |
| Partner was drunk during sex | | | | |
| Yes | 113 (4) | 30 (27) | 83 (73) | <0.01 |
| No | 2944 (96) | 429 (15) | 2515 (85) | |
| Ever used mind altering substances in the past 12 months | | | | |
| Yes | 106 (3) | 33 (31) | 73 (69) | <0.01 |
| No | 2951 (97) | 426 (14) | 2525 (86) | |
| Partner ever used mind altering substances in the past 12 months | | | | |
| Yes | 93 (3) | 26 (28) | 67 (72) | <0.01 |
| No | 2964 (97) | 433 (15) | 2531 (85) | |

In the multivariate analyses, participants who had experienced condom errors were more likely to be aged <25 years and 25-34 years compared to those who were 35 years and older (OR 1.5; 95% CI 1.1-1.9 and OR 1.3; 95% CI 1.0-1.8 respectively); to have had 3 or more and 2 sexual partners in the past 12 months compared to those who had one (OR 2.4; 95% CI 1.7-3.5 and OR 1.6; 95% CI 1.2-2.1 respectively) and, to have reported their sex partners to have ever been drunk during sex compared to those who did not (OR 1.7; 95% CI 1.1-2.7). In the 12 months preceding the interview date, they were more likely to have used mind altering substances compared to those who had not (OR 1.9; 95% CI 1.2-3.1), and to report that their sex partner had ever used mind altering substances compared to those who did not give such a report (OR 1.7; 95% CI 1.0-2.8) (Table 4).

Table 4. Factors associated with condom errors among sexually active participants who had ever used condoms in the past 3 months, Gem, Siaya County, 2012-2014

| Characteristic | Crude Odds Ratio (COR) (95% CI) | P value | Adjusted Odds Ratio (AOR) (95% CI) | P value |
|------------------------------|---------------------------------|---------|------------------------------------|---------|
| Age group | | | | |
| <25 years | 1.5 (1.1-1.9) | <0.01 | 1.5 (1.1-1.9) | 0.02 |
| 25-34 years | 1.4 (1.1-1.9) | | 1.3 (1.0-1.8) | |
| 35+ years | Ref | | Ref | |
| 12 months sex partners | | | | |
| 1 | Ref | <0.01 | Ref | <0.01 |
| 2 | 1.7 (1.2-2.2) | | 1.6 (1.2-2.1) | |
| 3+ | 2.8 (1.9-4.0) | | 2.4 (1.7-3.5) | |
| Partner was drunk during sex | | | | |
| Yes | 2.0 (1.4-3.3) | <0.01 | 1.7 (1.1-2.7) | 0.03 |
| No | Ref | | Ref | |

| | | | | |
|---------------------------------------------------------|---------------|-------|---------------|-------|
| Used mind altering substances in past 12 months | | | | |
| Yes | 2.5 (1.7-5.0) | <0.01 | 1.9 (1.2-3.1) | <0.01 |
| No | Ref | | Ref | |
| Partner used mind altering substances in past 12 months | | | | |
| Yes | 2.5 (1.4-3.3) | <0.01 | 1.7 (1.0-2.8) | 0.04 |
| No | Ref | | Ref | |

4. Discussion

Our evaluation revealed that less than half of sexually active young single educated male participants that were not in stable partnerships and had multiple sex partners had used condoms in the past three months. Among them, 15% reported condom errors. These were young men with multiple sex partners who either consumed drugs by themselves, or their partners' consumed drugs, or were inebriated during intercourse. The fact that our evaluation revealed higher condom use rates and lower condom errors rates than in the nation-wide Kenya AIDS Indicator survey in this high HIV prevalence area, illustrates the on-going HIV prevention efforts in this region [1].

Older persons who did not use condoms may have perceived themselves to be at a lower risk for HIV as shown from unpublished data from a HBCT survey in the same population. Similarly, persons in stable partnerships (i.e. those who were described as being in a relationship or cohabiting or married), may have felt that condom use in such partnerships is associated with infidelity and mistrust. This is supported by reports of FSW, who are a high-risk HIV group, who said that they did not consistently use condoms with their regular partners since "regular partners should not use condoms" [8, 12]. This is supported by the fact that persons with multiple sex partners in our evaluation were more likely to use condoms. The fact that more men than women reported a history of condom use may indicate challenges with negotiating condom use by women within sexual relationships⁹. A higher education level among persons who use condoms may be related being more knowledgeable about condom that has been associated with enhanced condom use [3, 8].

It is encouraging that younger persons, who shoulder the disproportionate burden of new HIV infections in Kenya, are using condoms [13]. This should nevertheless be interpreted with caution since just as condom distribution rates do not necessarily reflect condom use rates, individual reports of condom use may be biased. However, younger persons were also more likely to report condom errors. This may be due to their inexperience with condom use [14]. With the age of sexual debut decreasing among young persons, this may partially explain the increased incidence of HIV among this population (1). In the literature, persons with multiple sex partners were more likely to report condom errors (10). This may be related to the probability of engaging in risky sexual behavior [15]. With the condom errors being reported by persons with multiple sex partners, this population is at risk of STI including HIV [16]. However, since we did not quantify the number of condom errors among our participants, we could not relate this to more frequent use of condoms.

Incomplete condom use was the most common condom error reported. This may be attributed to alcohol consumption by the participant or his/her sexual partner, or the use of mind altering substances which have been shown to hamper HIV prevention efforts by impairing judgment [3]. Incomplete application has also been attributed to rushed condom application which may be more common among young persons who have unplanned sexual liaisons [17, 18]. Persons who reported having removed a condom prior to completion of sexual intercourse may have had challenges with the fit of the condom or erectile difficulties. On the other hand, persons who reported condom application after starting sexual intercourse had low motivation to use condoms [15, 19]. An early onset of sexual debut, multiple sex partners, lower rates of condom use among females, a high rate of condom errors and use of alcohol and other drugs of abuse vividly illustrate the intersectional risks for HIV among young persons. This may be responsible for the recent increase in HIV burden among the youth [20].

Our evaluation was not without limitations. We did not quantify the number of condom errors and therefore could not compute condom error rate. Additionally, our results may have been affected by recall bias and validity of self-report. We did not quantify the amount of alcohol consumed by participants and this may partially explain the unusual relationship between alcohol consumption prior to sexual activity and condom use. Our analysis did not include the relationship between either intimate partner violence or engaging in anal sex and condom use. This is because the data that was collected was related to IPV or anal sex in the past year which may not have been related to sexual relationships within the three months preceding the interview. We however included the use of mind altering substances in the past year because it was likely to impact on sexual relationships within the past year.

In conclusion, young single men with limited experience with condom use who consume alcohol and other drugs of abuse were more likely to report condom errors; majority of whom reported incomplete use of condoms. We therefore recommend that health education, especially for young persons, be conducted to promote condom use [3, 8, 14], and dispel myths associated with reduced sexual pleasure [8] and to promoting HIV risk awareness among older persons in stable partnerships [21]. Such education should also be directed to techniques of reducing condom error, e.g. allowing ample time for condom application [12] and the use of condoms from beginning to end of penetrative intercourse to reduce the risks of STIs, HPV and pregnancy [19]. Such education should also be directed addressing causes of erectile difficulties and the involvement of female partners whose involvement has been shown to reduce condom errors [22]. Additionally, HIV prevention programs, family planning and STI clinics should avail condoms of different sizes and brands for users to find the right fit to address challenges with incomplete use of condoms [19]. Furthermore, additional strategies for HIV prevention e.g. Pre-Exposure Prophylaxis [23], and microbicides [24] for women may be considered where condom use is at the sole discretion of the male partner and to mitigate effects of drug abuse as a harm reduction strategy [25].

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References

- [1] Kenya AIDS Indicator Survey KAIS 2012: Final Report , National AIDS Control Program NASCOP, <http://nacc.or.ke/kais-2012-final-report>
- [2] Grasso, M.A., et al., “Estimating the Prevalence and Predictors of Incorrect Condom Use among Sexually Active Adults in Kenya: Results From a Nationally Representative Survey”, *Sexually transmitted diseases*, 43, 87-93, 2016.
- [3] Emmanuel, W., et al., “Condom Use Determinants and Practices among People Living with HIV in Kisii County, Kenya”, *The open AIDS journal*, 9, 104-111, 2015.
- [4] National Guidelines for HIV Testing and Counselling in Kenya 2010, National AIDS and STI Control Program, http://guidelines.health.go.ke:8000/media/National_Guidelines_for_HTC_in_Kenya_2010_dWuc0Rr.pdf
- [5] Sanders, S.A., et al., “Condom use errors and problems: a global view”, *Sexual Health*, 9, 81-95, 2012.
- [6] Crosby, R., et al., “Condom-use errors and problems: a neglected aspect of studies assessing condom effectiveness”, *American Journal of Preventive Medicine*, 24, 367-370, 2003.
- [7] Bruce, N.G., *Quantitative methods for health research: a practical interactive guide to epidemiology and statistics*, John Wiley and Sons Inc., Chichester, 2008.
- [8] Andrews, C.H., et al., “Determinants of consistent condom use among female sex workers in Savannakhet, Lao PDR”, *BMC Womens Health*, 15, 2015
- [9] Exavery, A., et al., Role of condom negotiation on condom use among women of reproductive age in three districts in Tanzania. *BMC Public Health*. 12, 2012.
- [10] Crosby, R.A., et al., “Young African American men having sex with multiple partners are more likely to use condoms incorrectly: a clinic-based study”, *American Journal of Men’s Health*, 2, 340-343, 2008.
- [11] Odhiambo, F.O., et al., “Profile: the KEMRI/CDC Health and Demographic Surveillance System--Western Kenya”, *International Journal of Epidemiology*, 41, 977-987, 2012.
- [12] Crosby, R., et al., “Condom Use Errors and Problems: A Comparative Study of HIV-Positive Versus HIV-Negative Young Black Men Who Have Sex With Men”, *Sexually Transmitted Diseases*, 42, 634-636, 2015.
- [13] Kenya AIDS strategic framework, 2014/2015-2018/2019, National Aids Control Council, <http://www.undp.org/content/dam/kenya/docs/Democratic%20Governance/KENYA%20AIDS%20STRATEGIC%20FRAMEWORK.pdf>
- [14] de Visser, R.O., et al., “Sex in Australia: experience of condom failure among a representative sample of men”, *Australia and New Zealand Journal of Public Health*, 27, 217-222, 2003
- [15] Sanders, S., et al. “Starting late, ending early: Correlates of incomplete condom use among young adults” *The Eta Sigma Gamman*, 25, 45-50, 2008.
- [16] Crosby, R.A., et al., “Men with broken condoms: who and why?”, *Sexually transmitted infections*, 83, 71-75, 2007.
- [17] Oindo, M.L., “Contraception and sexuality among the youth in Kisumu, Kenya”, *African Journal of Health Sciences*, 2, 33-39, 2002.
- [18] Crosby, R., et al., “Associations between rushed condom application and condom use errors and problems”, *Sexually Transmitted Infections*, 91, 275-277, 2015.
- [19] Yarber, W.L., et al., “Correlates of putting condoms on after sex has begun and of removing them before sex ends: a study of men attending an urban public STD clinic”, *American Journal of Men’s Health*, 1, 190-196, 2007.
- [20] Kenya's fast-track plan to end HIV and AIDS among adolescents and young people , National Aids Control Council, https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_532691.pdf
- [21] Chepngeno-Langat, G., “Perception of vulnerability to HIV infection among older people in Nairobi, Kenya: a need for intervention”, *Journal of Biosocial Science*, 45, 249-266, 2013.

- [22] Crosby, R., et al., “Two heads are better than one: the association between condom decision-making and condom use errors and problems”, *Sexually Transmitted Infections*, 84, 198-201, 2008.
- [23] Mathur, S., et al., “PrEP introduction for adolescent girls and young women”, *Lancet HIV*, 3, e406-e8, 2016.
- [24] Power, J., “Microbicides and HIV prevention in women: the state of research”, *HIV Australia*, 13, 2015.
- [25] Leslie, K.M., et al., “Harm reduction: An approach to reducing risky health behaviours in adolescents”, *Paediatrics & Child Health*, 13, 53-56, 2008.