Exploring the condom gap: is supply or demand the limiting factor – condom access and use in an urban and a rural setting in Kilifi district, Kenya

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Objective: To explore the extent of the condom gap, investigating the relative roles of supply-side and demand-side factors in determining condom use.

Design: GPS mapping of condom outlets, and population-based survey.

Methods: An urban and a rural site were selected within the Epidemiological and Demographic Surveillance Site in Kilifi district, Kenya. Potential condom outlets ($n = 281$) were mapped and surveyed, and questionnaires on condom access and use ($n = 630$) were administered to a random sample of men and women aged 15–49. Multivariate logistic regression was performed to assess the relative roles of supply-side and demand-side barriers on condom use.

Results: The median straight-line distance to free condoms was 18-fold higher in the rural versus urban site. Among sexually active respondents, 42% had ever used a condom, and 23% had used a condom over the past 12 months, with lower levels among rural versus urban respondents ($P < 0.05$). The mean number of condoms used was 2.2/person per year among all sexually active individuals (condom users and nonusers), amounting to 8.2% protected sex acts/person per year. The adjusted odds of condom use (past 12 months) were 8.1 times greater among individuals experiencing no supply-side or demand-side barriers, compared with individuals experiencing both types of barriers. Despite low levels of usage and the presence of supply-side and demand-side barriers, reported unmet need for condoms was low.

Conclusions: There is an urgent need for renewed condom promotion efforts aimed at building demand, in addition to improving physical access, in resource-limited settings with generalized HIV epidemics in sub-Saharan Africa.

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Introduction

'The male latex condom is the single, most efficient, available technology to reduce the sexual transmission of HIV and other sexually transmitted infections (STIs)' [1]. This 2004/2009 position statement continues to hold true. Despite recent advances [2], the use of safe and effective vaccines and microbicides for HIV prevention remains years away [3], male circumcision offers only partial protection against HIV transmission [4], and ethical and logistical challenges associated with the mass roll-out of antiretroviral

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therapy (ART) treatment-as-prevention have yet to be addressed [5,6].

While the efficacy of condoms for HIV prevention at the individual level is well established, with a 80–95% reduction in transmission when used consistently [7,8], the effectiveness of condoms at the population level in countries with generalized HIV epidemics remains unclear [9]. This may be explained by the possibility of risk compensation, whereby the benefits of increased condom use (in terms of HIV infections averted) may be offset by higher levels of sexual activity and/or numbers of sexual partners [10,11]; the difficulties of drawing associations between population-level data on condom use with population-level data on HIV incidence and prevalence [9,12]; and, most significantly, by low levels of condom uptake, including nonuse, inconsistent and incorrect use [13,14].

Despite over two decades of condom promotion in sub-Saharan Africa, population-based surveys point to persistently low levels of condom use [13], with only modest increases over time [15,16]. Barriers to condom use range from structural, to socio-cultural, interpersonal and individual-level factors [17]. In 2000, the 'condom gap' in sub-Saharan Africa was highlighted, with an estimated public sector provision of 4.6 condoms per male aged 15–59 per year [18]; in 2008, this figure was estimated at 4 condoms per male of reproductive age per year [19].

In order to better understand the relative roles of supply-side (distance, cost) and demand-side factors (social barriers) in determining condom access and use, we undertook a study in an urban and a rural setting in Kilifi district, Coast Province, Kenya. Kilifi district offers an example of a resource-limited setting with a generalized HIV epidemic (5% HIV prevalence among pregnant women, Kilifi District Hospital, 2005), ongoing awareness campaigns, and available services for HIV testing, prevention and treatment.

According to the 2007 Kenya AIDS Indicator Survey, national adult HIV prevalence was 7.1%, HSV-2 prevalence was 35%, 37% had ever tested for HIV, and 84% of respondents who tested HIV-positive at the time of the survey were unaware of their correct status [20]. In 2006, 93% of new HIV infections in Kenya were estimated to have occurred through sexual transmission [21]. According to the 2003 Kenya Demographic and Health Survey, condom use was less than 50% at last sex with a nonmarital/noncohabiting partner, and less than 2% among marital partners (as a contraceptive) [22]. In Kenya, as in much of sub-Saharan Africa, the potential of condoms as a public health tool for the prevention of HIV and other STIs remains far from being achieved.

Methods

Setting

The study was conducted within the Epidemiological and Demographic Surveillance Site (Epi-DSS) of Kilifi district, Kenya (see Figure, Supplemental Digital Content 1, which shows a map of the Kilifi Epi-DSS, http://links.lww.com/QAD/A99). The Kilifi Epi-DSS covers an area of 891 km^2, with 29 000 households and 240 000 residents (2007). Residents are defined as individuals who have lived or intend to live in the household for 3 months or more.

In order to represent a setting with high and low physical access to condoms, an urban site (Kilifi Town) and a rural site (Sokoke) were selected (see Figure, Supplemental Digital Content 2, which shows the location of the study sites within the Kilifi Epi-DSS, http://links.lww.com/QAD/A99). Kilifi Town is located along the Mombasa-Malindi highway, has high population density (21-fold that of Sokoke), and numerous potential condom outlets within a small geographical area (9 km^2). Sokoke is located further inland with limited road accessibility, has low population density and few potential condom outlets within a wide geographical area (62 km^2).

Data collection

Prior to data collection, a subset of the full range of outlets was visited to identify potential condom outlets. Public and private health facilities, shops/kiosks, chemists, bars, discos, hotels and guesthouses were identified as typically providing condoms. Schools, barbers/hair-salons, small restaurants, video-shows (informal mini-cinemas), and mnazi dens (informal bars) were identified as not providing condoms, and were excluded from the data collection. A listing of the outlets typically providing condoms was obtained from the local government registration offices. In addition, the full geographic area of each site was visited on foot and/or vehicle by different fieldworkers on separate occasions to ensure no hidden or nonregistered outlets had been omitted.

A total of 281 potential condom outlets (248 Kilifi Town, 33 Sokoke) were identified and surveyed. If an outlet stocked condoms, the fieldworkers asked the outlet provider about the type of condoms (free/commercial, male/female, brands); answers were validated through observation. The condom outlets' geographical coordinates were collected using a Garmin Etrex 12-channel Global Positioning System (GPS) handheld device (Garmin International, Inc., Olathe, Kansas, USA).

Building on a range of questionnaire items developed by the Kenya Demographic and Health Survey [22], WHO, UNAIDS, the UN Refugee Agency, and Family Health International, as well as on a review of the strengths and limitations of previous studies on condom use [23], a questionnaire on condom access and use was developed.

Supply-side barriers were measured based on self-reported time to the nearest health facility with free condoms, and ability to pay 0.15 USD for a pack of three condoms from a commercial source. Demand-side barriers were measured based on self-reported embarrassment at getting a condom, difficulty asking one's partner to use a condom, negative/ambivalent attitude towards condoms (reporting condoms as being 'a bad thing, good and bad, or neither'), reporting that religion influenced their attitude towards condoms, and having never been exposed to condoms (never given, never shown how to use a condom, and never attended an awareness event). Felt unmet need was measured based on having ever wanted to access or use a condom and been unable to. Prevailing attitudes towards condoms were captured through respondents' open-ended remarks when answering questions on demand-side barriers.

The questionnaire was translated into Kiswahili and Giriama, back-translated, and piloted through one-on-one interviews as well as focus group discussions with community members in both sites. A random sample of 990 individuals was generated from the Epi-DSS population database (590 Kilifi Town, 400 Sokoke) using Stata 9 (StataCorp LP, College Station, Texas, USA). The sampling strategy was designed to achieve equal numbers of males and females. Age was restricted to individuals 15–49 years old. Individuals were approached by local fieldworkers at their households. Up to three visits were conducted until an individual was considered unreachable. A total of 630 individuals (322 Kilifi Town, 308 Sokoke) participated in the study. The survey was administered through one-on-one interviews after obtaining informed consent. The fieldworkers used an open and nonjudgemental approach, and ensured no third parties were present during the interviews.

The study obtained research ethics committee approval from the Kenya Medical Research Institute (KEMRI) National Ethical Review Committee and the Oxford Tropical Research Ethics Committee. Data collection was carried out from June to November 2007.

Data analysis

The geographical data were downloaded and mapped using ArcMap 9.2 (ESRI, Redlands, California, USA). The questionnaires were entered in FoxPro 6.0 (Microsoft, Redmond, Washington, USA) using double data entry. Data analysis was carried out in Stata 9 (StataCorp LP). The geographical data were linked to the questionnaires by calculating straight-line distances between individuals' households and the nearest free and commercial condom outlets.

Continuous data were summarized using medians and means. Differences across location for the binary and categorical variables were investigated using chi-squared tests. The roles of socio-demographic characteristics as well as supply-side and demand-side factors in determining condom use were investigated using logistic regression. The prevalence of supply-side and demand-side barriers was compared across sex, location and marital status using chi-squared tests. Results were considered statistically significant at a two-sided $P < 0.05$ for all analyses. Open-ended comments reflecting attitudes towards condoms were grouped by theme, and categorized as being positive or negative/ambivalent.

Results

Physical availability of condoms

Forty-two percent ($n = 119/281$) of potential condom outlets usually provided condoms, although 19% of these were temporarily out of stock. The number and range of condom outlets was greater in Kilifi Town ($n = 107$) than Sokoke ($n = 12$). In Kilifi Town (see Figure, Supplemental Digital Content 3, which shows the location of the condom outlets in Kilifi Town, http://links.lww.com/QAD/A99), condoms were available through shops/kiosks, chemists, health facilities, bars/discos, hotels, and guesthouses. In Sokoke (see Figure, Supplemental Digital Content 4, which shows the location of the condom outlets in Sokoke, http://links.lww.com/QAD/A99), condoms were mainly available through shops/kiosks, as well as three health facilities located outside the study boundaries.

The median straight-line distance from respondents' households to the nearest outlet with free condoms was 18 times farther in the rural site [4.45 km; interquartile range (IQR) 3.10–5.54] compared to the urban site (0.25 km; IQR 0.15–0.56). Commercial condoms were more readily available than free condoms in both sites, with a near-halving of the distance in the urban site (0.13 km; IQR 0.07–0.23), and a reduction to nearly a fifth in the rural site (0.98 km; IQR 0.64–1.53). Among outlets providing commercial condoms, 97% provided 'Trust', socially marketed by Population Services International (PSI). Among outlets not providing condoms, providers' deliberate choice not to supply condoms (60%) was the main reason for nonprovision. Female condoms were available in 1% ($n = 3/281$) of potential outlets, and were absent in Sokoke.

Interview population characteristics

Among the Epi-DSS-generated sample ($n = 990$), 669 individuals (68%) were reached. Among those reached, 630 (94%) participated in the study. The main reasons for individuals not being reached included out-migration (33%), not being found after three visits (31%), and living mostly elsewhere (19%). Participants were evenly distributed across location and sex ($n = 322$: 172M/150F in Kilifi Town; $n = 308$: 152M/156F in Sokoke).

Table 1. Condom use in the urban and rural site.

	Total % (*N*)	Kilifi Town % (*n*)	Sokoke % (*n*)	*P* value
Among individuals who have ever had sex (73% of total sample)				
Ever used a condom	42 (191/458)	48 (122/253)	34 (69/205)	0.002
Among individuals sexually active over the past 12 months (57% of total sample)				
Used a condom over the past 12 months	23 (82/354)	28 (56/200)	17 (26/154)	0.014
Among currently married respondents (45% of total sample)				
Use condoms always/most of the time with their marital/cohabiting partner	1 (4/282)	2 (4/164)	0 (0/118)	0.088
Among respondents who have had a nonmarital/noncohabiting partner over the past 12 months (15% of total sample)				
Use condoms always/most of the time with their nonmarital/noncohabiting partner	40 (39/97)	50 (24/48)	31 (15/49)	0.052

Nonparticipants (i.e. individuals who refused to participate or who were never reached) did not differ significantly from participants in terms of sex, age and distance to the nearest free or commercial condom.

The mean age of respondents was 27.2 years, the population was predominantly of the Mijikenda tribe, and over two-thirds lived on less than a dollar a day. The sites differed in terms of education, poverty level, ethnic and religious make-up, marital status, and HIV testing levels (see Table, Supplemental Digital Content 5, which outlines the socio-demographic characteristics of the study sample, http://links.lww.com/QAD/A99). These differences were typical of rural–urban differences nationally [22].

Condom use across location

Among sexually active respondents, 42% had ever used a condom, and 23% had used a condom over the past 12 months, with lower levels among the rural than the urban respondents ($P < 0.05$) (Table 1). One percent of married respondents reported using condoms always/most of the time with their marital/cohabiting partner, and 40% of respondents who had had a nonmarital/noncohabiting partner over the past 12 months reported using condoms always/most of the time with their nonmarital/noncohabiting partner.

In bivariate analyses, the odds of condom use in the past 12 months were higher among respondents who were urban residents, male, 15–24 years old, non-Protestant, more highly educated, of lower economic status, and nonmarried/noncohabiting ($P < 0.05$) (Table 2). In multivariate analyses, the odds of condom use were higher among urban residents, men, respondents with no religious affiliation, and nonmarried/noncohabiting individuals ($P < 0.05$). Tribe, formal employment and HIV testing were not significantly associated with condom use at the bivariate or multivariate level (data not shown). Controlling for sex, age, education and marital status, the odds of condom use were 3.2 times [95% confidence interval (CI) 1.6–6.5] higher in Kilifi Town compared with Sokoke.

Among sexually active individuals, including condom users and nonusers, the mean number of condoms used was 2.2/person per year (Table 3). Out of a reported mean of 94.9 sex acts/person per year, this corresponded to 8.2% protected sex acts/person per year. Among condom users, the mean number of condoms used was 9.5/person per year for a mean of 63.6 sex acts/person per year, resulting in 35.8% protected sex acts/person per year.

Eighty-one percent of the sexually active population had heard of female condoms, with a higher proportion among men (90%) than women (73%) ($P < 0.001$). Among all sexually active respondents, only one urban female respondent (0.2%) reported having ever used a female condom.

The relative roles of supply-side and demand-side barriers

Combining data from the urban and rural site, Table 4 outlines the prevalence of supply-side and demand-side barriers and their association with condom use. The proportion of individuals experiencing demand-side barriers (81%) was higher than the proportion of individuals experiencing supply-side barriers (30%), as defined in the model.

Controlling for sex, location, religion and marital status, the odds of condom use (past 12 months) were 3.0 times greater (95% CI 1.4–6.3) among individuals with no supply-side barriers, and 3.8 times greater (95% CI 1.8–7.9) among individuals with no demand-side barriers. Individuals with neither type of barriers were 8.1 times more likely (95% CI 2.7–24.7) to have used a condom over the past 12 months. Among demand-side barriers, condom use was especially low for individuals reporting that asking their partner to use a condom would be difficult.

Table 2. Socio-demographic characteristics and condom use.

Among individuals sexually active over the past 12 months		Used condom(s) past 12 months % (*n*)	Crude odds ratio (OR) (95% CI)	Adjusted[a] OR (95% CI)
Location	Kilifi Town	28 (56/200)	1.9 (1.1–3.2)	3.2 (1.6–6.5)
	Sokoke	17 (26/154)		
Sex	Male	35 (58/167)	3.6 (2.1–6.3)	2.3 (1.2–4.2)
	Female	13 (24/187)		
Age	15–24 years	38 (37/97)	2.9 (1.7–5.0)	1.7 (0.9–3.2)
	Over 24 years	18 (45/257)		
Religion	No religious affiliation	29 (32/112)	1.5 (0.9–2.6)	2.4 (1.2–4.8)
	Religious affiliation	21 (50/242)		
Type of religion[b]	Not Muslim	23 (62/271)	0.9 (0.5–1.7)	1.8 (0.9–3.7)
	Muslim	24 (20/83)		
	Not Protestant	26 (67/257)	1.9 (1.0–3.6)	1.8 (0.9–3.6)
	Protestant	15 (15/97)		
	Not Catholic	23 (73/312)	1.1 (0.5–2.5)	0.9 (0.4–2.1)
	Catholic	21 (9/42)		
Education	Beyond primary	31 (33/106)	1.8 (1.1–3.1)	1.5 (0.8–2.9)
	None or primary	20 (49/248)		
Economic status[c]	Spend <500 KSh/week[d]	32 (25/78)	2.8 (1.2–6.8)	1.3 (0.4–4.9)
	Spend >500 KSh/week[d]	14 (9/63)		
Marital status	Nonmarried/noncohabiting	55 (45/82)	7.7 (4.2–14.2)	6.2 (3.2–12.1)
	Currently married or cohabiting	14 (37/272)		

[a]Logistic regression for condom use over the past 12 months, controlling for the socio-demographic factors significantly associated with condom use at the bivariate level (sex, age, education, marital status and location). Economic status was not included, as the question had been introduced midway.
[b]Muslim versus Christian, and Catholic versus Protestant did not show significant differences at the bivariate level (not shown in table).
[c]This question was introduced midway, hence the smaller sample size.
[d]500 KSh = 7.5 USD.

The proportion of individuals experiencing one or more supply-side barriers was higher among women and rural respondents ($P < 0.001$) (Table 5). The proportion of individuals experiencing one or more demand-side barriers was higher among women, urban respondents, and married respondents ($P < 0.01$).

Felt need for condoms and prevailing attitudes

Three percent of sexually active respondents reported having ever wanted to access a condom and been unable to, and 5% reported having ever wanted to use a condom and been unable to. This amounted to 7% having ever wanted to access or use a condom and been unable to (reported unmet need). Interestingly, this figure was higher in Kilifi Town (10%) than Sokoke (5%) ($P = 0.048$). Reported unmet need for condoms was higher among condom users (13%) compared with never users (4%), and among men (11%) compared with women (4%) ($P < 0.05$).

Respondents' open-ended comments ($n = 318$) revealed a majority of negative or ambivalent attitudes towards condoms (83%) among both men and women. Among the negative/ambivalent comments, respondents mainly indicated that they 'did not see the need for condoms, did not want them, or did not like them' (30%). Comments also revealed a high level of distrust in the product, with concerns about bursting/tearing and the presence of 'pores' (21%), as well as religious/moralistic reasons against condoms, which were associated with sin and promiscuity (16%).

Discussion

The study offers a 'snapshot picture' of condom access and use in a rural and an urban setting in coastal Kenya. Despite a generalized HIV epidemic and high levels of

Table 3. Mean number of condoms used per sexually active person per year.

	Among all respondents sexually active over the past 12 months, including condom users and nonusers[a] Mean (95% CI)	Among respondents who used a condom over the past 12 months[b] Mean (95% CI)
	$n = 342$	$n = 78$
Number of condoms used per person per year	2.2 (1.5–2.8)	9.5 (7.1–11.8)
Number of sex acts per person per year	94.9 (83.9–105.9)	63.6 (49.7–77.6)
Percentage of protected sex acts per person per year	8.2 (5.7–10.6)	35.8 (27.7–43.9)
Number of unprotected sex acts per person per year	92.9 (81.8–103.9)	54.8 (41.2–68.3)

[a]Excludes 12 individuals (out of 354) for whom there were no data on the number of condoms used.
[b]Excludes four individuals (out of 82) for whom there were no data on the number of condoms used.

Table 4. Prevalence of supply-side and demand-side barriers and their association with condom use.

Among individuals sexually active over the past 12 months	Prevalence % (*n*)	Used condom(s) past 12 months % (*n*)	Adjusted[a] OR of condom use (past 12 months) (95% CI)
Supply-side barriersf			
Self-reported time[b] from the respondent's household to the nearest health facility with free condoms			
<15 min		35 (17/48)	2.3 (1.2–4.5)
≥15 min	86 (306/354)	21 (65/306)	
Affordability			
Can afford a pack as a one-off purchase		26 (79/308)	4.2 (1.1–15.6)
Cannot afford a pack as a one-off purchase	13 (45/353)	7 (3/45)	
Supply-side barriers (composite measure)			
No supply-side barriers[c]		27 (67/246)	3.0 (1.4–6.3)
One or more supply-side barriers present	30 (107/353)	14 (15/107)	
Demand-side barriers			
Embarrassment at getting a condom			
Not embarrassed		30 (64/211)	2.4 (1.2–4.8)
Embarrassed	40 (139/350)	12 (16/139)	
Difficulty asking one's partner to use a condom			
Not difficult		30 (80/263)	28.7 (3.8–217.5)
Difficult	24 (84/347)	1 (1/84)	
Negative/ambivalent attitude towards condoms			
Positive		30 (67/227)	2.7 (1.4–5.5)
Negative/ambivalent	35 (122/349)	11 (14/122)	
Influence of religion on attitude towards condoms			
No influence		26 (57/218)	2.6 (1.4–5.1)
Influence	38 (133/351)	19 (25/133)	
Lack of exposure to condoms (given/shown/event)			
Ever exposed		28 (64/225)	2.5 (1.3–4.8)
Never exposed	36 (128/353)	14 (18/128)	
Demand-side barriers (composite measure)			
No demand-side barriers[d]		43 (29/67)	3.8 (1.8–7.9)
One or more demand-side barriers present	81 (284/351)	18 (51/284)	
Both types of barrier			
Neither type of barrier		50 (22/44)	8.1 (2.7-24.7)
Both types of barrier present	65 (82/126)	10 (8/82)	

[a]Controlling for the socio-demographic factors significantly associated with condom use at the multivariate level (sex, location, religion and marital status) (see Table 2). The adjusted OR for supply-side barriers was not adjusted for location, as it was part of the definition of the supply-side indicators.
[b]Self-reported time was used rather than straight-line distance, as estimated time takes into account the paths taken and means used to access an outlet. Fifteen min corresponds to the time it takes to walk approximately 1 km.
[c]Individuals experiencing no supply-side factors were defined as individuals living less than 15 min from the nearest health facility with free condoms, or less than 15 min from the nearest shop with commercial condoms which the individual could afford as a one-off purchase.
[d]Individuals experiencing no demand-side factors were defined as individuals experiencing none of the following: embarrassment at getting a condom, difficulty asking one's partner to use a condom, negative/ambivalent attitude towards condoms, reporting the influence of religion on one's attitude, and a lack of exposure to condoms (never given a condom/never shown how to use/and never attended an HIV awareness event).

HIV/AIDS awareness [22], condom use among the general population in both the urban and rural setting was low. Although gaps in the physical availability of condoms existed, especially in the rural site, the main factors accounting for the population's low levels of condom use appeared to be prevalent demand-side barriers, and low levels of felt need. The results highlight the urgent need for renewed condom promotion efforts aimed at building demand, in addition to improving physical access.

Table 5. Prevalence of supply-side and demand-side barriers (composite measures) by sex, location and marital status.

		Sex		Location		Marital status	
Among individuals sexually active over past 12 months	Total % (*N*)	Male % (*n*)	Female % (*n*)	Kilifi Town % (*n*)	Sokoke % (*n*)	Nonmarried % (*n*)	Married % (*n*)
One or more supply-side barriers present (versus none)	30 (107/353)	21 (35/166)	39 (72/187)	13 (26/200)	53 (81/153)	33 (27/82)	30 (80/271)
P value		<0.001		<0.001		0.556	
One or more demand-side barriers present (versus none)	81 (284/351)	73 (119/164)	88 (165/187)	89 (177/199)	70 (107/152)	69 (55/80)	85 (229/271)
P value		<0.001		<0.001		0.002	

The definitions of the composite measures of supply-side and demand-side barriers are the same as those specified in Table 4.

Consistent with the literature demonstrating a negative relationship between condom access and distance [24] and cost [25], the odds of condom use were higher among the urban than the rural respondents, and this difference increased after adjustment for socio-demographic factors. In line with prior research highlighting the roles of embarrassment at accessing condoms [26], difficulty asking one's partner to use condoms [27], negative attitudes towards condoms [28,29], the influence of conservative religious affiliations [30], and a lack of comprehensive condom messaging through schools, health workers, religious institutions and the mass media [31], condom use was negatively associated with each of these factors.

In agreement with past studies pointing to lower levels of condom use in the context of regular partnerships [13,20,32], condom use in the study population was markedly lower with marital partners. With 5.9% of couples estimated to be HIV-discordant in Kenya and 71–81% of married/cohabiting individuals reporting not knowing their partner's HIV status [20], the implications for HIV transmission are severe. For the year 2006, heterosexual sex within regular partnerships was estimated to be the leading source of new infections (44%), followed by casual heterosexual sex (20%) [21].

With a mean of 2.2 condoms used per sexually active person per year, and 9.5 condoms used per person per year among condom users, the potential for condoms as a public health tool was far from being reached. To the authors' knowledge, there are no other studies (in Kenya as well as in other settings in sub-Saharan Africa) documenting self-reported estimates of the number of condoms used among the general population. The study's findings on the frequency of sexual activity were similar to levels documented among couples in rural Uganda [33], and individuals attending public sector health facilities in urban South Africa [34].

Given the complementary nature of addressing supply-side and demand-side barriers, important opportunities for intervention exist. With increased attention going towards universal access to treatment and HIV testing (whether in the context of voluntary counselling and testing, diagnostic testing, provider-initiated testing, or testing for the prevention of mother-to-child transmission) [6,35], condom promotion and distribution should be integral to these initiatives. Given the gap in condom use among couples and the strong role of inter-partner dynamics in determining usage, couple testing for HIV offers an important avenue for the uptake of condoms among HIV-discordant couples [36].

With prevalent negative/ambivalent attitudes towards condoms, efforts should focus on establishing and disseminating positive condom messages, consistent across the spectrum of information sources, from radio and television, to political and religious leaders, health workers and teachers. Given the powerful reach of PSI in reaching outlets with the socially marketed condom 'Trust' in both the urban and rural site, collaborations with the Ministry of Health (e.g. by including free condoms in the ongoing distribution activities of social marketing organizations) may help ensure that free condoms are more widely accessible. As funds and resources allow, door-to-door visits to households by nongovernmental organizations (NGOs), community-based organizations (CBOs) and/or the Ministry of Health should also be considered, especially in rural areas. Such initiatives are underway but are yet to be scaled up nationally.

Although male condoms were physically available, albeit to varying degrees, in both the urban and the rural site, there was a clear gap in the physical availability of female condoms. With current levels of female condom procurement in Kenya accounting for less than 2% of male condom procurement levels [37], consideration should be given to securing increased supplies of female condoms at the national level.

Due to concerns about questionnaire acceptability and complexity, questions on condom use frequency and sexual activity did not disaggregate the information by partner type, type of sex act (vaginal/oral/anal), incorrect condom use/breakage/or slippage, same-gender sex, the number of rounds of sex, condom use over the course of relationships, and paid versus nonpaid sex. Further research may wish to incorporate such distinctions, although these may be better suited to prospective study designs using diary-based approaches. Where possible, future studies should incorporate biological data on HIV status, making it possible to carry out a 'sero-status-based' analysis, situating condom use in the context of an individual's or couple's HIV status [35].

While strong associations were documented between condom use and supply-side and demand-side factors, causal relationships cannot be inferred given the study's cross-sectional design. With respect to generalizability, although the socio-demographic characteristics of the study population were similar to national levels in terms of age, literacy, household characteristics, sexual behaviour, HIV testing and condom use [20,22], Kilifi district differs from the rest of Kenya in terms of its high levels of poverty, low education and employment levels, its predominantly Mijikenda tribe and its greater religious diversity [22]. Finally, all measures were based on self-report. The effects of recall and social desirability bias were minimized by allowing respondents to select their own reference period (daily/weekly/monthly/yearly) for estimating sexual frequency, and ensuring a confidential environment during the interview.

While public health and mortality data point to the urgency of HIV prevention strategies among the general population in coastal Kenya, the extent to which individuals themselves prioritize HIV prevention in the context of their daily lives would be an important area for further research. It is likely that in a setting such as Kilifi district, with high levels of poverty, unequal gender dynamics, a high prevalence of malaria and malnutrition, and threatened livelihoods in the face of drought and rising food prices as well as wider political instability, the reality of people's lives and the primacy of basic survival may overshadow the importance of precautions aimed at preventing a disease whose impact would only be felt years later.

The study has demonstrated a synergistic relationship between condom access and use, and an urgent need for efforts to increase demand and perceived need for condoms. The importance of continued condom promotion efforts among the general population, alongside the roll-out of HIV counselling and testing, treatment and male circumcision services, is paramount to the success of HIV prevention efforts in settings experiencing generalized HIV epidemics.

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