Contraceptive Dynamics in Rural Northern Malawi: A Prospective Longitudinal Study

By Aisha Nandini Zoe Dasgupta, Basia Zaba and Amelia C. Crampin

CONTEXT: *Increased use of contraceptives in Malawi has not translated into a commensurate reduction in fertility, but the reason is unknown. Insight into contraceptive switching and discontinuation may shed light on this conundrum and on whether the commonly used modern contraceptive prevalence rate (mCPR) is the best indicator of family planning program performance.*

METHODS: *A one-year prospective longitudinal data set was created from patient-held family planning cards of 4,678 reproductive-age women living in a demographic surveillance site in rural northern Malawi. Contraceptive service data recorded on the women's cards by providers were linked to their socioeconomic, demographic and health data. Contraceptive point prevalence estimates calculated from these data were compared with mCPR estimates from cross-sectional surveys. Survival analyses examined contraceptive adherence.*

RESULTS: *The contraceptive point prevalence of 35% was slightly lower than comparable cross-sectional estimates of mCPR. Only 51% of users of the injectable—the most widely used modern method—received their first reinjection on time, and just 15% adhered to the method for 12 months. Although various study variables were associated with contraceptive use, none were associated with adherence.*

CONCLUSIONS: *Gaps in and discontinuation of use of the injectable may play a role in the discrepancy between mCPR and fertility. Interventions to help women adhere to injectable use and to promote long-acting methods should be strengthened.*

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Aisha Nandini Zoe Dasgupta, at the time the study was conducted, was a PhD candidate, Amelia C. Crampin is senior lecturer and Basia Zaba is professor of demography–all with the London School of Hygiene and Tropical Medicine, London.

Malawi is a poor country in Sub-Saharan Africa that has made attempts to address its population and fertility problems,[1–5] by initiating programs to encourage birthspacing[6] and by organizing conferences on population and development.[1,7–9] Such activities may be showing some results. Malawi's modern contraceptive prevalence rate (mCPR)—the proportion of women of reproductive age who report that they (or their partner) are currently using a modern contraceptive—was six times as high in 2010 as it was in 1992 (42% vs. 7%),[10] a remarkable achievement and a higher level of use than in other countries in the region.[11] During that period, the percentage of married women using the injectable rose from 1.5% to nearly 26%.[10]

The mCPR is the most widely used measure of success of contraception programs.[12,13] It is typically captured in Demographic and Health Surveys (DHS), the Multiple Indicator Cluster Survey and other large-scale national surveys with the question "Are you currently doing something or using any method to delay or avoid getting pregnant?" If the reply is "yes," the woman is asked what method she is using; nonmodern methods (e.g., withdrawal, the calendar method) are excluded for calculation of mCPR.

Given Malawi's high mCPR, the country has been heralded by the international community as a success story.[14] However, the country's total fertility rate (TFR) has decreased only marginally, from 6.7 births per woman in 1992 to 5.7 in 2010,[10] and remains among the highest in the region.[11] That Malawi's greatly increased contraceptive use rate has not translated into notably lower fertility is surprising. Mozambique attained a similar TFR (5.9) in 2011 with just 11% of women using modern contraceptives; likewise, Tanzania had a TFR of 5.8 in 1996, when its mCPR was only 13%.[11]

One explanation for Malawi's fertility remaining high despite relatively high contraceptive use could be that although mCPR is estimated cross-sectionally, the DHS uses births from the five years preceding the survey to calculate the TFR; thus, any increase in mCPR might not be reflected in the TFR until a few years later. Another possibility is an ecological analysis fallacy, in which contraceptive users might tend to be at low risk of pregnancy (e.g., women who are single, older or experiencing postpartum amenorrhea) and nonusers might contribute a disproportionately high number of births. Alternatively, proximate determinants of fertility other than contraceptive use might play a significant role: for example, short breast-feeding periods and early age at sexual debut and marriage.

Another potential explanation is that fertility might be overreported. It is more likely, however, that contraceptive use is overreported. Women who have adopted the pill or the injectable might consider themselves contraceptive users and report themselves as such, even though they

missed their last appointment to pick up a new supply of pills or get their next injection, and so technically are not current users. There could be something different about provision of contraception services in Malawi (e.g., more common stockouts) that means women there are more likely than women in other countries to miss reinjection or resupply appointments and, thus, overreport their contraceptive use. The mCPR, which tends toward a measure of period prevalence rather than point prevalence, might fail to capture these gaps; long-term inconsistent use of short-term methods amplifies this issue. Moreover, Malawian women may give what they perceive to be the desired response, as a result of exposure to media campaigns and multiple provider-initiated family planning conversations.

One way of assessing the quality of contraceptive data is to compare linked husband and wife reports, and identify any discrepancies.[15,16] Typically, husbands report higher levels of contraceptive use than their wives.[16] In addition, findings from Malawi suggest that when couples give discordant responses to survey questions (e.g., on ownership of household items, use of family planning), generally the husband responds "yes" and the wife "no."[17] Another study found better agreement on contraceptive use among monogamous couples than among those in polygamous unions.[18] Underreporting and overreporting can occur simultaneously, and in the Malawi context, overreporting could possibly be more common. According to the Malawi DHS, only 5% of contraceptive users have not told their husband that they are using contraceptives;[10] this suggests that the users may be unlikely to underreport use to an independent interviewer.

Another explanation could be inconsistent use of contraceptives. In their seminal paper, Curtis and Blanc argue that it is important to examine such contraceptive dynamics as switching and discontinuation because, as desired family size declines and contraceptive prevalence increases, effectiveness and duration of use become increasingly significant determinants of total fertility, unintended pregnancies and induced abortions.[19] In our article, consistent contraceptive use refers to continuous use with no breaks; it can include method switching, as long as there are no gaps in use.

Information on family planning comes from a variety of sources, such as routine health facility records and retrospective surveys. The contraceptive calendar developed by the DHS captures a woman's retrospective self-reported contraceptive status and method every calendar month for the five years prior to interview. Retrospective contraceptive calendars are prone to selection bias, because only those surviving to interview can report. In addition, it can be difficult for many women to recall their contraceptive use or interruptions in use for as long as five years. Yet, with the exception of the calendar method, assessments of contraceptive use do not attempt to capture method switching or discontinuation. Using 2004 DHS calendar data, Ali and colleagues found high contraceptive discontinuation rates in Malawi.[20] They also found that of 17 countries studied, Malawi had the lowest proportion of women who reported switching to another modern method within three months of method-related discontinuation, which suggests poor switching behavior in the context of discontinuation.

We conducted a prospective study that used an innovative method for collecting data on contraception: Patient-held records of provider-recorded service information were used to build a longitudinal data set that allowed the exploration of continuity of use and method switching. Individual records were linked to a demographic surveillance site through a unique identifier system. This was done to help shed light on contraceptive use, discontinuation and switching, and to explore how these behaviors relate to fertility in Malawi.

METHODS

Data

The Karonga Prevention Study (KPS) operates a health and demographic surveillance site in rural northern Malawi that included 36,524 individuals in 8,076 households at the end of 2012.[21] Other recent demographic surveillance site studies have focused on adult HIV, sexual and reproductive behavior and fertility intentions.[18,22–24] The KPS used cross-sectional data from 2008–2009 and questions similar to those in the DHS, and estimated the mCPR among married women to be 45%,[18] which is the same as that for Karonga district in the 2010 DHS.[10] A range of contraceptive methods is available in the study area from government, Christian Health Association of Malawi, nongovernmental organization (NGO) and private facilities,[25,26] as well as at the community level, from such sources as government outreach posts and providers' or clients' homes. There are also various types of service providers, including clinical officers, nurses, medical assistants, health surveillance assistants (some of whom are trained to provide the three-month injectable) and community-based distribution agents (volunteers who may provide two cycles of oral contraceptives at a time, and condoms).[27–29]

Between January and April 2012, family planning cards were offered to all 7,393 women aged 15–49 living in the KPS demographic surveillance site. Cards were attached to women's health passport (i.e., patient-held medical record); women were asked to keep the card for one year. To allow rapid distribution of cards, KPS fieldworkers trained 278 local key informants (who make monthly reports to KPS of all births and deaths in the site) to issue the cards using project-generated listings of eligible women.

All 132 health care providers working in the study area were trained to record information on women's cards whenever they provided women with contraceptives; multiple refresher trainings were conducted. Providers were given free mobile phone airtime, and periodically received motivational text messages to encourage them to continue recording data on cards. The task was formally designated by the district family planning coordinator as part of providers' record-keeping responsibilities.

Between February and May 2013, a year after the family planning cards were distributed, the KPS field team collected the cards from women at designated meeting points in the community, and checked the cards against health passport entries to ensure that all family planning episodes were noted on cards. In addition, women were asked to give a verbal report of their family planning use over the previous year at the time that their card was collected. Team members recorded any missing family planning episodes onto the card, and noted the source of the information (health passport or women's self-report). Thus, the majority of data were entered by health care providers at the time of service, but gaps in data were filled retrospectively by women's recollections to allow a more complete and accurate data set than would be possible with conventional methods. Women who had had a tubal ligation or had received an implant or IUD prior to receiving a family planning card had this recorded on their card, which explained why their card was blank when collected.

Ethical approval for the study was granted by the College of Medicine Research and Ethics Committee, Malawi, and the ethics committee at the London School of Hygiene and Tropical Medicine. Informed written consent for the collection and analysis of data was obtained from the study participants upon collection of the family planning cards. More detailed methods and an evaluation of the success of the data collection are described elsewhere.[30]

Data Management and Analytic Approach

We used identifying information on women to link their family planning card data to their data in the existing KPS database. Stata 12 was used for all analyses.

We used birth dates from demographic surveillance site records to calculate women's age when they received their card, and obtained their highest level of education from previous KPS socioeconomic surveys. HIV status had been collected as part of previous KPS studies that included door-to-door HIV testing with rapid tests. We assumed that women were HIV negative if they had had a negative test result less than four years before receiving the card (HIV incidence in the area is less than 0.1% per annum[31]), and HIV positive if they had received a positive result at any time before receiving the card; the HIV status for all other women was unknown. For other time-varying covariates (marital status and fertility intention, both collected as part of a 2010–2011 adult sexual behavior survey), we used the most recent observation within two years of receiving the card; those who did not have an observation within that time frame were considered to have missing data. Eighty-five percent and 45% of women had an observation for marital status and fertility intentions, respectively, recorded within one year before they received a card. Because GPS coordinates are available for all residents (including community health care workers) in the demographic surveillance site, we were able to calculate distances from women's residences to the closest road and the closest provider of family planning (i.e., a health facility or, at the community level, a health surveillance assistant or community-based distribution agent).

TABLE 1. Percentage distribution of all eligible women, and percentage distribution of study participants, by contraceptive use, Karonga Prevention Study, Malawi, 2012

Characteristic	All eligible women	Participants		
		All	Contraceptive users	Contraceptive nonusers†
Marital status* **	(N=7,362)	(N=4,593)	(N=1,981)	(N=2,612)
Currently married	66.9	73.3	86.1	63.6
Separated/widowed/ divorced	13.5	13.2	11.1	14.9
Never married	19.6	13.5	2.8	21.6
Proximity to road**	(N=7,388)	(N=4,602)	(N=1,984)	(N=2,618)
<1km	47.9	44.3	46.7	42.5
>1km	52.1	55.7	53.3	57.5
Proximity to family planning provider* **	(N=7,388)	(N=4,595)	(N=1,987)	(N=2,608)
<0.5km	39.1	39.5	42.6	37.2
0.5–1.5km	54.7	54.0	52.0	55.6
>1.5km	6.2	6.4	5.4	7.2
Education**	(N=7,379)	(N=4,598)	(N=1,983)	(N=2,615)
Incomplete primary	7.4	7.6	6.3	8.6
Complete primary	57.0	61.4	63.3	60.0
≥secondary	35.6	30.9	30.4	31.4
HIV status	(N=6,396)	(N=4075)	(N=1,837)	(N=2,238)
Positive	8.9	9.0	8.4	9.4
Negative	91.1	91.0	91.6	90.6
Parity* **	(N=5,416)	(N=3,747)	(N=1903)	(N=1,844)
0	3.4	2.7	2.9	2.5
1–4	61.5	58.8	61.6	55.9
≥5	35.2	38.5	35.5	41.6
Fertility intention* **	(N=5,013)	(N=3,361)	(N=1,525)	(N=1,836)
No more children	42.1	45.7	53.5	39.3
Wait ≥2 years	37.8	35.6	35.0	36.1
Want within two years	12.7	12.7	8.4	16.3
Unsure	7.4	6.0	3.1	8.3
Total	100.0	100.0	100.0	100.0

**Difference between contraceptive users and nonusers significant at p<.01. ***Difference between contraceptive users and nonusers significant at p<.001. †Includes users of condoms (male and female) and traditional methods.

Our data collection method correctly identified all women who had reported in three previous KPS surveys that they had had a tubal ligation. In cases in which the supply date of contraceptive services was not reported, we imputed it on the basis of supply dates of other services the woman received, and the date she received and submitted her card.

At the time their family planning card was collected, women were asked to report on condom use during the study period; however, we made no systematic attempt to get dates for when women purchased or obtained condoms. Condoms are generally considered to be for HIV prevention rather than contraception, but are often used for dual protection.[32] In addition, condoms can be obtained by women's partners (which would not be recorded on cards) and used later rather than at the time of purchase. Moreover, they tend to be used inconsistently,[33] either to a different extent with different partners or only when HIV or other STIs are present.[34] Therefore, we did

TABLE 2. Percentage distribution of provider-client contacts for contraception during the study period, by method type, provider type and location where contraceptive services were provided

Detail	%
Method type†	(N=3,281)
Tubal ligation	1.7
Implant	5.6
IUD	0.0‡
Injectable	79.0
Pill	13.4
Removal of implant/IUD	0.3
Provider type	(N=3,142)
Clinical officer	5.2
Medical assistant	1.4
Nurse	16.6
Health surveillance assistant	65.8
CBDA	11.0
Youth CBDA	0.2
Location	(N=3,251)
Government facility	37.1
CHAM facility	3.4
NGO/private facility	1.4
Outreach post	14.1
Provider's home	36.8
Woman's home	7.0
Other	0.2
Total	100.0

†Excludes condoms (male and female) and traditional methods. *Notes:* CBDA=Community-based distribution agent. CHAM=Christian Health Association of Malawi. ‡One contact was for IUD use.

not conduct event-history analyses of condom use. Information on ever-use of traditional methods (withdrawal and the calendar method) was obtained from women at the time their card was collected, but was not subject to event-history analysis.

Because of the predominance of short-term methods in Malawi, we needed a measure that would allow a precise estimation of the proportion of women actually protected by a modern contraceptive method on a specific day, taking into account discontinuation and gaps in use. We therefore developed a new measure, contraceptive point prevalence (CPP). In this article, we calculate the CPP at three points in time, using the provider-recorded prospective data collected on patient-held records. To investigate the consistency of the CPP, we estimated it for married women and all women at five, seven and nine months after they received a family planning card, on the basis of service provision dates. Retrospective verbal reports of the injectable and the pill were excluded, as they are likely to be overreported.

According to the manufacturer's guidelines, the three-month injectable must be resupplied within 13 weeks; however, according to WHO guidelines, if the woman has not yet menstruated, it is acceptable to give her the follow-up injection up to 17 weeks. Therefore, we calculated the CPP using three assumptions for how long the injectable protects a woman against pregnancy (13, 17 and 21 weeks). This demonstrates the impact on the mCPR of different assumptions of injection duration.

In addition, we examined women's adherence to the three-month injectable, because of the Malawi family planning program's focus on this method for contraception. Event-history analysis was used to explore contraceptive discontinuation.

TABLE 3. Proportion of married women and all women currently using a modern method of contraception, as per provider-recorded data (contraceptive point prevalence), by number of months since women received a family planning card, according to assumed duration of injectable

No. of mos. since receiving family planning card	Assume injectable lasts for					
	13 weeks		17 weeks		21 weeks	
	Married women	All women	Married women	All women	Married women	All women
5	33.4	28.0	35.0	29.3	36.0	30.2
7	35.1	29.5	36.9	30.9	37.8	31.7
9	35.6	30.5	37.2	31.8	38.4	32.7

Note: Excludes condoms (male and female).

RESULTS

Descriptive Findings

Of the 7,393 eligible women, 6,861 (93%) were issued a family planning card and 4,678 (63%) submitted their card after one year; participants' mean age was 30.4 years, and the average observation time was 383 days (range, 122–519; standard deviation, 38). Nonparticipants were slightly younger, were more likely to be never married and were more educated than women who participated.[30] Overall, 43% of participants used a modern method of contraception (excluding condoms) at some point during the study period. Among those using contraceptives during the study year, 86% were currently married and only 3% were never married (Table 1, page 147). Contraceptive users were more likely than nonusers to be currently married, live close to a road and to a family planning provider, have achieved a higher level of education and want no more children; in addition, contraceptive users were older (not shown).

Methods that require repeat visits accounted for the most provider-client contacts over the study period, with visits for the injectable making up the great majority (79%; Table 2). Community-level providers were involved in more than three-quarters of contacts (health surveillance assistants in 66% and community-based delivery agents in 11%). And although a notable proportion of contacts occurred at government health facilities, six in 10 occurred outside of facilities at outreach posts (14%), providers' homes (37%) or clients' homes (7%).

Contraceptive Point Prevalence

CPP rose slightly with increased time since receiving a family planning card (Table 3): For example, assuming that the injectable lasts 13 weeks, the CPP for married women was 33% at five months, 35% at seven months and 36% at nine months. This suggests that some of the early injectable provisions may have been missed as the study was being rolled out or that contraceptive uptake was actually

increasing. Similarly, CPP increased with increased injectable duration. For example, the CPP for married women seven months after receiving a card was 35% assuming injections last 13 weeks, 37% if they last 17 weeks, and 38% if they last 21 weeks. This demonstrates that mCPR could be overestimated if women are late for reinjection (and thus technically are no longer contraceptive users), yet continue to consider and report themselves to be contraceptive users.

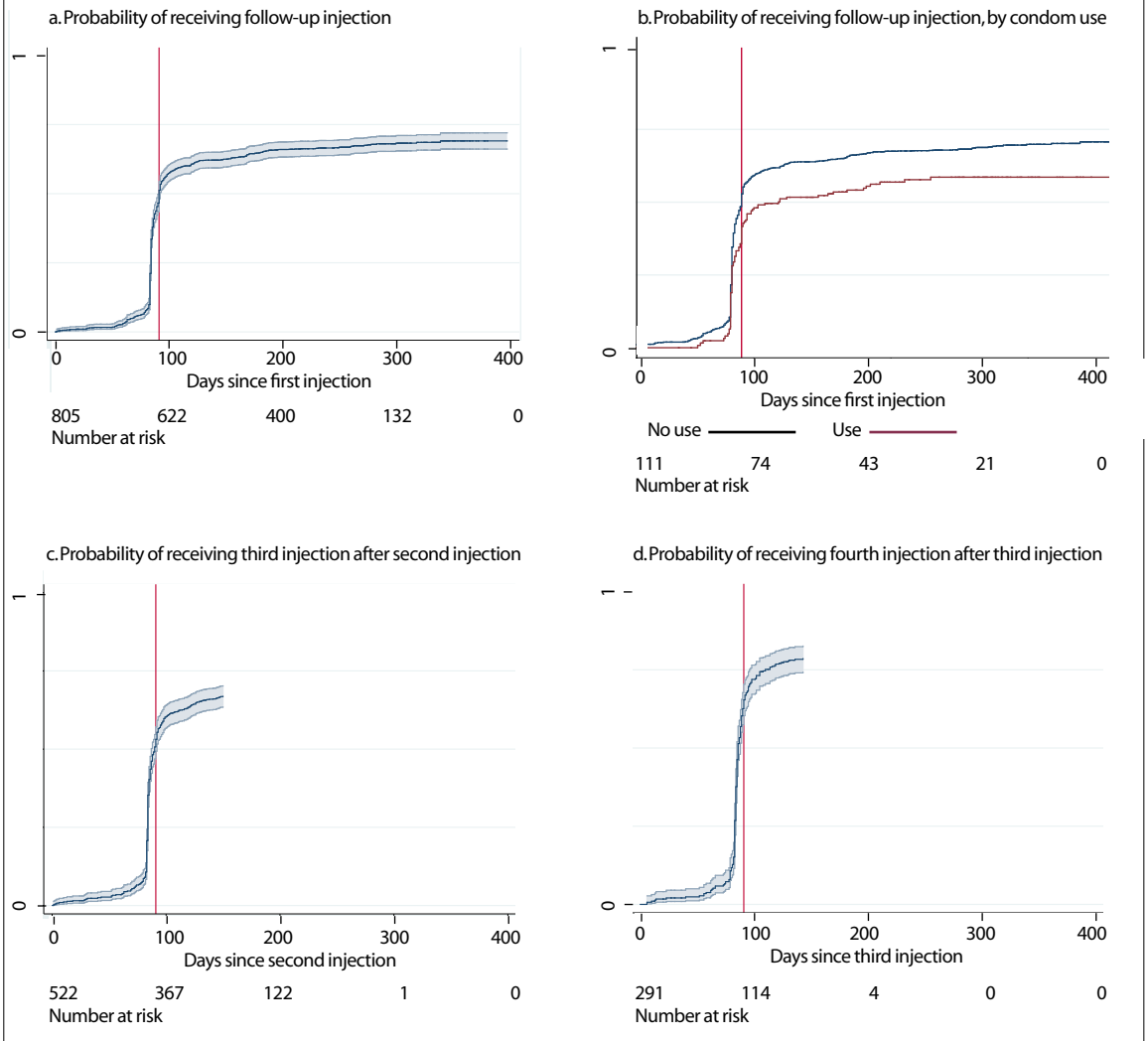
We compared CPP (at seven months and assuming that an injection lasts 13 weeks) and method mix for currently married women derived from family planning card data with cross-sectional mCPR data from a 2010–2011 KPS sexual behavior population survey, and with national and district-level cross-sectional mCPR data from the 2010 Malawi DHS (Table 4). The proportion of injectable use in the method mix estimated from card data (14%) was noticeably lower than other estimates (20–26%), which suggests that conventional cross-sectional data may overestimate point prevalence use of injectables. In addition, the family planning card data estimate of implant use was higher than other estimates (7% vs. 1–3%), but this may have been because card data were collected in 2012–2013 (rather than 2010 for the other data), after a general im-

TABLE 4. Percentage distribution of currently married women, by contraceptive method currently used, according to survey

Method	KPS estimate of CPP, 2012–2013†	KPS estimate of mCPR, 2010–2011‡	mCPR estimate, DHS, 2010	
			Karonga	National
Total mCPR or CPP	35.1	46.2	45.4	42.2
Tubal ligation	12.8	10.5	12.1	9.7
Vasectomy	na	0.0	0.0	0.1
Implant	6.8	2.9	3.2	1.3
IUD	0.3	0.0	0.0	0.3
Injectable	14.1	21.1	19.9	25.8
Pill	1.2	1.7	1.3	2.5
Condom	na	10.0	8.8	2.5

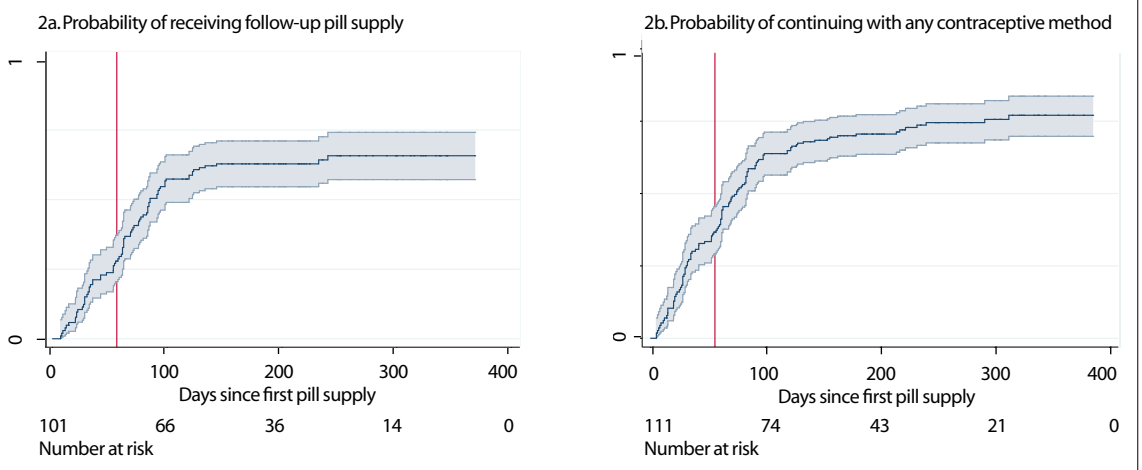
†At seven months since receiving family planning card, assuming injections protect against pregnancy for 13 weeks. ‡From third round of adult sexual behaviour survey, Karonga Prevention Study. *Notes:* CPP=contraceptive point prevalence. DHS=Demographic and Health Survey. na=not available.

FIGURE 1. Probabilities of receiving a follow-up contraceptive injection



Note: Vertical lines indicate 91 days, the time by which WHO guidelines state the next injection must be administered.

FIGURE 2. Probabilities of receiving resupply of oral contraceptives and of continuing use of a contraceptive method after oral contraceptive use



Note: Vertical lines indicate 56 days, as two 28-day cycles of pills are typically provided to women at each contact.

plant promotion in Malawi.

The family planning card data did not capture vasectomy or condom use, so the total CPP estimate (35%) should be compared with the other mCPR estimates after subtracting condom and vasectomy use (36–40%); vasectomies are extremely rare in Malawi, and condom use is likely to be overestimated in conventional cross-sectional estimates, because of inconsistent use.

Method Adherence

• *Injectable.* Just 51% of women had a follow-up injection within 13 weeks of their first, and only 69% received a follow-up injection within a year (Figure 1a, page 149); these results were not affected by exclusion of imputed dates. Seven percent of women received their second injection within 11 weeks, which is technically too early, is a waste of program resources and may increase side effects. On-schedule reinjection was not associated with women's age, parity, education, proximity to a road, proximity to a health care provider, fertility intentions, marital status or HIV status (not shown). In contrast, women who reported condom use during the study year were less likely than those who did not to have received their second injection on time (Figure 1b, page 149).

Fifty-three percent of women received their third injection on schedule after their second, and 65% received their fourth injection on schedule after their third (Figures 1c and 1d, page 149). The proportion receiving a reinjection on time improves with each additional injection, presumably because women who persevere with the method are a selected group of committed users or have fewer barriers to use. Only 15% of women who had at least one injection managed to adhere to the method for a whole year without experiencing a gap between injections of greater than 13 weeks (not shown), which demonstrates very high discontinuation.

• *Oral contraceptives.* Typically, providers supply women with two cycles (56 days) of oral contraceptives at each contact. Whereas the injectable may offer some protection against pregnancy beyond its recommended duration, a woman is no longer protected once she has run out of pills. Only 28% of women who initially received the pill had gotten a resupply within 56 days (Figure 2a). No variables associated with pill discontinuation were identified, although this may, in part, be because of the small sample of pill users (and the correspondingly wide confidence intervals). Women's probability of either continuing with the pill or switching to another modern method (excluding condoms) within 56 days was 35% (Figure 2b).

TABLE 5. Descriptive statistics of method switching

Statistic	First method used				
	Tubal ligation	Implant	IUD	Injectable	Pill
Total no. of women starting method	49	147	1	956	125
% using exclusively	100	98	100	95	82
% ever-used other methods					
Tubal ligation	na	0	0	0	1
Implant	0	na	0	3	3
IUD	0	0	na	0	0
Injectable	0	2	0	na	14
Pill	0	0	0	2	na
Total no. of methods reported	49	150	1	1,006	148
Index of changeability†	1.00	1.02	1.00	1.05	1.18

†Index of changeability is the average number of methods a woman used. It is the ratio of the total number of methods by total number of women. *Notes:* na=not applicable.

Method Switching

Over the one-year study period, the maximum number of methods (excluding condoms) used by an individual woman was two, even among women who saw providers many times (not shown). Just 84 contraceptive users (4%) switched methods. Switchers tended to be younger, because older women are more likely to use long-acting

methods. Women wanting no more children tended not to switch methods, again because they are more likely than women who want more children to use permanent methods. Marital status, education and parity were not associated with switching. Among contraceptive users who used only one method during the year, 15% also reported condom use, which did not differ significantly from the proportion among women who switched methods (11%). Among women who did not use tubal ligation, the implant, the IUD, injectable or the pill during the study, 28% reported using condoms and 19% traditional methods.

Table 5 (page 150) presents ever-use of contraceptive methods during the study period by the first method women were recorded as using during the study period. For example, 147 women were recorded as first using the implant; of those, 98% used the implant exclusively throughout the study period, and 2% switched to the injectable. None of the 49 women who were first recorded using tubal ligation used any other method.

We include an index of changeability, which indicates the average number of methods women used during the study period and was calculated by dividing the total number of methods used by the total number of women first recorded as using a specified method by the total number of women first recorded using that method. For women who were first recorded using the pill, the index of changeability score was 1.18, which represents a notable rate of switching (predominantly to the injectable). The index scores for women first recorded using the injectable and implant were low (1.05 and 1.02, respectively); those who did switch from the injectable changed to the implant and the pill, and those who switched from the implant changed to the injectable.

DISCUSSION

The prospective longitudinal data set that we generated from patient-held records offers unique insight into contraceptive dynamics among reproductive-age women living in a demographic surveillance site in rural northern Malawi. Key findings of our analyses of these data include very high discontinuation rates of the injectable and the pill, which indicates irregular use of short-term methods that leave women exposed to the risk of pregnancy.

A number of characteristics were associated with ever-use of modern contraceptives over the study year. Compared to nonusers, contraceptive users were older and more likely to be currently married, live close to a road and to a family planning provider, have achieved a higher level of education and want no more children. However, none of the variables studied were associated with continuity of use, although those who discontinued injectable use were more likely than those who did not to have used condoms during the study period, presumably a consequence rather than a cause of injection discontinuation. This finding demonstrates that no group of women was better than another at adhering to short-term contraceptive use. Thus, interventions that aim to help women to use contraceptives continuously may not need to target any specific subgroups, but instead should target all short-term method users. Similarly, Ali and Cleland found that education had little effect on method discontinuation, although it had an effect on method switching.[35] We are not aware of major stockouts of the injectable in the area during the study period that could explain the lack of association between women's characteristics and adherence; however, some periodic stockouts of the pill did occur, and these may have masked differences in women's characteristics.

Few women switched methods over the study period. This may have been a result of the relatively short follow-up time; however, according to a study by Ali et al., women who did not switch within three months of discontinuation were unlikely to switch thereafter.[20] That study also showed that fewer women in Malawi than in any other country examined switched methods within three months of discontinuation. Thus, our findings of low method switching support those of Ali et al.

Contraceptive injections accounted for most of women's contacts with providers and were generally administered at outreach clinics or at providers' or women's homes by low-cadre health care providers. This finding demonstrates the importance of community-based distribution of short-term contraceptive methods by well-trained, lower-cadre staff. Strategies to improve this model could be explored, with the goal of helping women use contraceptives continuously without gaps; however, there is weak evidence that discontinuation can be reduced by higher quality services.[20] A systematic review of randomized controlled trials of intensive counseling techniques versus routine family planning counseling found no benefit of counseling strategies to improve adherence and continuation.[36] Elsewhere, it has been argued that underlying motivation to avoid pregnancy is an important factor in discontinuation, putting the onus on the woman.[37] Reasons for contraceptive discontinuation under different circumstances need to be better understood.

Nevertheless, the provision of services could be strengthened in other ways. For example, procurement systems could be improved to reduce stockouts, and clinic hours could be increased and confidentiality of services could be ensured to try to reduce discontinuation. Health care providers should be retrained to counsel women on the importance of presenting on time for repeat visits and to assist women dissatisfied with their method in identifying an alternative, so that they can switch methods rather than discontinue use altogether. Further innovative counseling tools are being developed that incorporate theories of behavior with reproductive and sexual health practice,[38,39] but require evaluation, particularly for their impact on continuity of use.

The method mix was skewed in favor of the injectable and tubal ligation (for women who had completed childbearing), which might reflect cultural preferences and social norms; however, it would be problematic if the reason was a lack of access to alternative methods or provider

bias,[40] which may at least in part be the case in rural Malawi. Providers should counsel women who wish to delay or stop childbearing on the full range of long-acting methods, including the implant and IUD (currently rarely used in Malawi), to help them identify the method best suited to them, avoid inconsistent use of short-term methods and ultimately prevent unintended pregnancies.[41] Demand for limiting childbearing is strong in Sub-Saharan Africa, even among younger women.[42] An analysis of DHS data found that family planning users who would prefer to stop childbearing were more likely to use short-term methods than long-acting or permanent methods—a choice that has implications for efficacy and continuity of use.[42]

When we calculated CPP using the assumption that a contraceptive injection protects against pregnancy for 13 weeks, the result for married women was lower than mCPR estimates derived from conventional cross-sectional data. This demonstrates that conventional estimates of mCPR may be prone to overestimation if a woman considers herself to be a contraceptive user even if she is late for her repeat appointment for a short-term method. That conventional estimates of mCPR may overestimate contraceptive use may in part explain why fertility has not declined as much as would have been expected in Malawi. Given that our study sample was slightly older and more likely to be married (characteristics positively associated with contraceptive use) than the eligible population, the CPP presented here may be an overestimate of the population's CPP.

It is difficult to interpret reports of condom use with this data set. We were unable to record the timing or consistency of condom use, although we were able to record ever-use of condoms over the study year. Our CPP was much lower than cross-sectional estimates of mCPR that include condoms; however, it is broadly similar to estimates of mCPR without condoms. We strongly suspect that effective condom use is also overestimated in cross-sectional surveys. Of women who reported being a condom user in a 2008–2009 KPS cross-sectional survey, only 36% reported always using condoms with their husband in a later section of the survey.[43] The majority of women reported only "mostly" or "sometimes" using condoms. Qualitative findings have also shown how inconsistently condoms are used.[33] We, therefore, suspect that the cross-sectional estimates of condom use in Karonga are overestimates in terms of consistent protection against pregnancy.

The methodology of this study had some limitations. Unmarried and young women were underrepresented in this study, and attrition was 36%; thus, the study population differed slightly from the general population.[30] Furthermore, data collection relied on busy nonresearch health providers, so misreporting and underreporting were possible; however, these were minimized by cross-checking family planning cards against the health passports and by asking women to give a retrospective report of their contraceptive use. Nevertheless, lessons can be learned from this data collection approach. Some of the new health passports in Malawi have a family planning section akin to the family planning card, which allows for the recording of injectable or pill provision. If service providers were trained to correctly fill out this page and techniques were implemented to promote their doing so (e.g., text message reminders and financial incentives), a periodic sampling of health passports would provide longitudinal contraceptive data for switching and discontinuation analyses. The page should also more clearly allow for a woman to switch methods, as it tends to be used only for either the pill or the injectable.

Although the study took place in a small area of rural northern Malawi, we believe the findings are likely to be generalizable to other parts of Malawi and Sub-Saharan Africa, given that the challenges around contraceptive use, discontinuation and persistently high fertility are likely to be similar.

Conclusions

Our findings have implications for how conventional mCPR estimates are interpreted, and how to quantify the size of the overestimate. We suggest adding probes to conventional cross-sectional enquiries to ascertain whether women are using a method continuouslyk and whether they are currently protected. For example, in addition to the existing question "Since what month and year have you been using (current method) without stopping?" women using the injectable should also be asked "What date did you last have your injection?" to cross-check whether it was within the last three months; a similar enquiry is needed for pill supplies. These additional questions would validate the enquiry on current use of contraception; however, additional questions have time and cost implications for already-lengthy questionnaires. Alternatively, others have suggested weighting prevalence by method-specific effectiveness or continuation rates, to account for the vagaries of typical use without additional survey questions.[44,45]

That conventional estimates of mCPR may overestimate the true contraceptive point prevalence—particularly in contexts with dependence on short-term methods—is likely to be a contributing factor to the disconnect between self-reported contraceptive use and fertility.

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RESUMEN

Contexto: *El aumento en el uso de anticonceptivos en Malaui no se ha traducido en una reducción proporcional de la fecundidad, y se desconoce la razón. La comprensión del cambio y de la discontinuación del uso de anticonceptivos puede ayudar*

a aclarar este enigma y a determinar si la comúnmente usada tasa de prevalencia de uso de anticonceptivos modernos (TPAm) es el mejor indicador del desempeño de programas de planificación familiar.

Métodos: *Se creó un conjunto prospectivo de datos longitudinales de un año a partir de tarjetas de registro conservadas por 4,678 pacientes mujeres en edad reproductiva que viven en un área de vigilancia demográfica en la región rural del norte de Malaui. Los datos de servicios anticonceptivos registrados por los proveedores de servicios en las tarjetas de las mujeres fueron vinculados con sus datos demográficos y de salud. Las estimaciones relativas a la prevalencia puntual de uso de anticonceptivos calculadas a partir de estos datos se compararon con estimaciones de TPAm provenientes de encuestas transversales. La adherencia a los anticonceptivos se examinó mediante análisis de supervivencia.*

Resultados: *La prevalencia puntual de uso de anticonceptivos del 35% fue ligeramente menor que las estimaciones transversales comparables de TPAm. Solamente el 51% de las usuarias de inyectables –el método moderno más usado– recibió la siguiente inyección a tiempo, y solo el 15% se adhirió al método por 12 meses. Aunque diversas variables del estudio se asociaron con el uso de anticonceptivos, ninguna se asoció con la adherencia.*

Conclusiones: *La interrupción y la discontinuación del uso de los inyectables pueden influir en la discrepancia entre la TPAm y la fecundidad. Deben fortalecerse las intervenciones para ayudar en la adherencia de las mujeres al uso de inyectables y para promover los métodos de larga duración.*

RÉSUMÉ

Contexte: *La pratique accrue de la contraception au Malawi n'a pas donné lieu à une réduction correspondante de la fécondité, mais la raison en est inconnue. Un regard sur les changements de méthode et l'arrêt de la contraception pourrait éclairer l'énigme et la validité ou non du taux de prévalence contraceptive moderne (TPCm) communément utilisé comme le meilleur indicateur de performance du programme de planification familiale.*

Méthodes: *Un ensemble de données longitudinal prospectif sur une année a été créé au départ de cartes-patientes de planification familiale de 4 678 femmes en âge de procréer résidentes d'un site de surveillance démographique dans le nord rural du Malawi. Les données de services contraceptifs enregistrées par les prestataires sur les cartes des femmes ont été liées à leurs données démographiques et de santé. Les estimations de prévalence ponctuelle de la contraception calculées sur la base de ces données ont été comparées aux estimations du TPCm issues d'enquêtes transversales. L'observance contraceptive est examinée par analyses de survie.*

Résultats: *À 35%, la prévalence ponctuelle de la contraception s'est révélée légèrement inférieure aux estimations transversales comparables du TPCm. Parmi les utilisatrices de l'injectable–la méthode moderne la plus répandue –51% seulement avaient reçu une nouvelle injection à temps et 15% à peine avaient observé la méthode pendant 12 mois. Plusieurs variables ont été associées à la pratique contraceptive, mais aucune à l'observance.*

Conclusions: *Les interruptions d'usage et abandons de l'injectable jouent peut-être un rôle dans la divergence observée entre le TPCm et la fécondité. Les interventions propices à l'observance de l'injectable et à la promotion des méthodes longue durée doivent être renforcées.*

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Author contact: *aisha.dasgupta@lshtm.ac.uk*