Levels of and reasons for switching contraceptive methods in 8 countries: A competing risks approach using DHS calendar data

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Introduction

Contraceptive switching, particularly between methods with very different effectiveness rates, can impact levels of unintended pregnancy, induced abortion, and fertility rates. As contraceptive prevalence rates increase, contraceptive continuation and effectiveness gain importance in determining the demographic impact of contraceptive use (Jain, 1989; Leite et. al., 1999). Method switching is the "primary determinant of the prevalence of use of specific contraceptives" (Grady et al. 2002: p. 135). Yet, contraceptive switching remains the least studied area in efforts to understand the dynamics of women's contraceptive use (Curtis and Blanc 1997). Though numerous reports have compared rates of failure or contraceptive abandonment across countries, few recent multicountry studies have focused on contraceptive switching. In this paper, we aim to fill that gap by using recent (2002-2006) Demographic and Health Survey (DHS) data to answer the following questions:

1. How common is contraceptive switching?
2. Why do women switch contraceptive methods?
3. Which methods do women switch from and to?
4. What characteristics are associated with switching?

Background

There are four types of contraceptive discontinuation that are commonly studied: failure (becoming pregnant while using contraception), abandonment while not in need of contraception (stopping use in order to become pregnant or because contraception is no longer needed), abandonment while in need of contraception (stopping use due to reasons other than failure or no need), and switching (stopping use of one method to switch to a different method). The majority of developing-country studies on contraceptive discontinuation use data from the DHS calendar, a month-by-month retrospective history of every birth, pregnancy, termination, and episode of contraceptive use a woman had in the five years preceding the survey. Previous studies have consistently found that the factor most consistently associated with contraceptive discontinuation is the contraceptive method type (Jejeebhoy, 1991; Steele et al., 1996; Ferguson, 1992; Ali and Cleland, 1995). Discontinuation occurs least often among users of intrauterine devices (IUDs) and implants—methods that require device removal by a health professional (except in relatively rare cases of IUD expulsion). Discontinuation rates are much higher for methods that do not require user action to stop the method (sometimes referred to as passive discontinuation) such as condoms, pills, and injectables (Steele and Curtis, 2003; Ali and Cleland, 1995; Blanc et al., 2002). Steele and Curtis (2003) found that method choice is endogenous to contraceptive discontinuation; however, they also determined that general conclusions about factors related to contraceptive discontinuation are robust to the biases introduced by not considering this endogeneity.

Along with the contraceptive method chosen, women's demographic and socioeconomic characteristics have also been found to be associated with contraceptive discontinuation and failure. Women under age 25 have higher contraceptive discontinuation rates than women 25 years of age or older (Moreno, 1993; Ali and Cleland, 1999). Higher parity is associated with longer episodes of continuous injectable use (Riley et al., 1994) and decreased risks of abandonment in need (Curtis and Blanc, 1997). Additionally, women with children are less likely to experience method failure or discontinuation than women without children (Steele et al., 1996). Higher

socioeconomic status has been shown to be associated with lower levels of failure and abandonment in need and higher levels of switching (Curtis and Blanc, 1997; Steele and Curtis, 2003). Studies on contraceptive discontinuation have significant programmatic implications. Blanc et al. (2002) concluded that, with a decline in fertility, programs should shift their emphasis from simply providing contraceptive methods toward providing services such as counseling in order to reduce discontinuation rates. As pointed out by Ali and Cleland (1999), studies on contraceptive discontinuation give insight into both the adequacy of family planning services and client satisfaction with methods. Similarly, in an earlier study, those authors discuss how high rates of discontinuation may signal discontent with the method and/or family planning service provision, and that high failure rates likely indicate inadequate counseling (Ali and Cleland, 1995).

Though failure and contraceptive abandonment have been studied numerous times, few analyses are available that focus on contraceptive switching. Previous analyses of contraceptive switching have investigated levels of switching as a potential marker of family planning service quality, though whether high rates of switching equate to strong or weak service provision has been debated in the literature. Some studies suggest that high rates of switching among modern methods can indicate an adequate range of available methods and a service environment flexible to women's needs (Steele and Diamond, 1999; Jain, 1989). High switching rates could, therefore, be seen as indicative of a high-quality service environment in which clients are encouraged to present problems early, enabling providers to guide women to a method with side effects that are acceptable without judgment (Bongaarts and Bruce, 1995). On the other hand, high levels of switching may indicate poor counseling on the original method chosen, unsatisfactory management of method-related side effects, or method stock-outs (Steele and Diamond, 1999). Additionally, Ping (1995) noted that relatively low contraceptive switching behavior is correlated with limited method choice.

In this analysis, we aim to extend previous research on contraceptive discontinuation by focusing on contraceptive switching behaviors using recent data from a range of countries with very different contraceptive method mixes and family planning program contexts. This article examines not only levels of switching, but also the reasons given for switching methods. We also disaggregate contraceptive switching into switching from less-to-more and more-to-less effective methods based on published failure rates (WHO/RHR and CCP 2008; UNDP, 2004; Hatcher et al., 2003) and use multilevel hazard models to examine correlates of switching.

Data and Methods

Data come from the most recent[1] DHS surveys with complete calendars in Armenia, Bangladesh, Colombia, the Dominican Republic, Egypt, Indonesia, Kenya, and Zimbabwe. In complete calendars, when a woman reported discontinuing a contraceptive method, she was asked what the primary reason was for that discontinuation. The format of the contraceptive calendar allows only one reason for discontinuation. Data were extracted from the calendar, formed into episodes of contraceptive use, and coded according to the outcome of and reason for discontinuation and outcome of the episode. Episodes of contraceptive use that were ongoing when the calendar began were excluded from analysis, as we do not have a start date for these episodes and so cannot determine duration. The length of the calendar is at least five years, and varies according to the month in which

[1] Though surveys were conducted in 2008 in Egypt and 2007 in Indonesia, the data were not available in time to be included in analysis. We therefore used the Egypt 2005 and Indonesia 2003 surveys.

the woman was interviewed. For discontinuation rate calculation, we standardize the period of observation as 3-62 months preceding the interview for all women. This timeframe allows for a full five-year period of observation for each woman. The three months immediately preceding the interview are excluded to avoid underestimating contraceptive failure, as a woman in her first trimester may not yet realize that she is pregnant. Episodes of contraceptive use that began before month 62 in the calendar and continued into the period of observation are treated as late entries in discontinuation rate calculation.

Each episode of use fell into one of four possible categories. First, if an episode of use was immediately followed by use of a different method in the following calendar month, that episode of use was categorized as a contraceptive switch, regardless of the reason she gave for discontinuing. Following the DHS standard methodology, we also considered discontinuations to be contraceptive switches methods if (a) the reason the woman gave for discontinuation was "wanted a more effective method," (b) there was no contraceptive use for only one month following this discontinuation, and (c) the woman began using a different contraceptive method in the following month. This additional consideration allowed women one month to switch to a different method if that was their stated objective. Second, discontinuations because women became pregnant while using contraception were coded as experiencing contraceptive failure. Third, discontinuations for fertility-related reasons (wanted to become pregnant; difficult to get pregnant, no/infrequent sex, husband away, or marital dissolution) were called abandonments while not in need of contraception (abandoned not in need). Finally, discontinuations for all other reasons (health concerns, side effects, wanted a more effective method, method inconvenient to use, lack of access/too far, costs too much, husband opposed, other, don't know, and other country-specific reasons[2]) were coded as abandonments while in need of contraception.

Episodes of method switching were further categorized according to whether the switch was from a more effective method to a less effective one, or vice versa. Determinations of which methods were most effective were based on published failure rates.[3]

Discontinuation Rates

One difficulty in handling calendar data is that a number of episodes of contraceptive use are still ongoing at the time of interview, so we have no way to calculate the complete duration of the episode. Therefore, we use a competing risks approach (analogous to multiple-decrement life tables) that is able to handle events that are ongoing, or right-censored. Many previous analyses comparing discontinuation rates by reason for discontinuation have calculated rates for each possible reason separately, as though all other potential reasons for discontinuation did not exist. For example, a switching rate calculated separately as an independent rate

[2] Some reasons, such as "Fatalistic," "IUD expelled," and "Ramadan" were not given as options in every country.

[3] Estimates of contraceptive effectiveness vary. We used effectiveness rates for contraceptive methods as the methods are commonly used in the general population and relied predominantly on data collected in developing countries, supplementing these rates with developed-country data as needed. Using these rates, we ranked contraceptive methods in order of effectiveness, from most to least effective: sterilization, implant, IUD, injectable, lactational amenorrhea method (LAM) if preceded by a birth and used for six months or less, male condoms, female condoms, diaphragm, spermicides, withdrawal, periodic abstinence, other traditional methods, and LAM if used for 7+ months (WHO, 2007; UNDP, 2004; Hatcher et al., 2003). Switches from a higher-ranked method to a lower-ranked method were categorized as switches to a less effective method, and switches from a lower-ranked to a higher-ranked method were categorized as switches to a more effective method.

would not be dependent on the rate of failure or abandonment. Such independent rates[4] are often used in multi-country comparisons because they are unaffected by discontinuation rates for other reasons (Farley et al., 2001; Curtis and Hammerslough, 1995). Despite the advantage of comparability, we use a competing risks approach in this paper that takes into account the fact that women are simultaneously at risk of discontinuing due to switching, failure, abandonment in need, or abandonment not in need. Competing risks estimates are "observable" or reflective of what is actually happening in the population. Using a competing risks approach, a switching rate would be affected by the rates of failure and abandonment. We use the "stcompet" command in Stata 10 to estimate discontinuation rates using the competing risks approach (Coviello and Boggess, 2004). Although we sacrifice some comparability across countries due to cross-country differences in the proportion of users discontinuing for each reason, we felt that competing risks estimates would provide more useful information for program managers by showing discontinuation rates as they actually occurred on the ground, rather than what would occur if other potential reasons for discontinuation did not exist.

Discontinuation rates are presented for all reversible methods together, and separately for pills, injectables, IUDs, male condoms, and traditional methods (traditional methods include withdrawal, periodic abstinence, and other non-modern methods, including "prolonged breastfeeding" in Egypt). If there were less than 125 unweighted episodes of contraceptive use for a method, rates for that method are not shown.

Survival models

To investigate whether some women are more likely than others to switch methods, we use multilevel discrete time hazard models to estimate the odds of switching after controlling for knowledge about contraceptive methods, community-level contraceptive prevalence, spousal communication on desired family size, and background characteristics. Similar to the competing risks estimates, these models are able to handle right-censored data. The models use logit transformations, also referred to as pooled logistic regression analysis. Pooled logistic regression has been demonstrated to provide valid estimates that are similar to those from continuous time survival analysis, or Cox proportional hazards models (D'Agostino et al., 1990).

The outcomes of interest in the hazard models are switching and, where sample size allowed[5], switching to more effective or less effective methods. The reference category for both models is women who did not discontinue while in need of contraception (women who abandoned while not in need or who continued to use contraception throughout the period of observation). Because we are not concerned with underestimating failure in these models, the most recent 3 months of use are not censored. As switches after three years of use were rare, we focused on the odds of switching within the first three years of use. Episodes of contraceptive use longer than 36 months were censored (treated as non-discontinuations) and included in the reference category "did not abandon in need." We used the most recent episode of discontinuation for each woman who discontinued a method during the period of observation. For women who had no episodes of discontinuation during the period of observation, we use the most recent episode of continued use.

[4] Also referred to as "unobservable," "hypothetical," or "associated single decrement" rates.

[5] Models are not presented for switching to a less effective method in Kenya and Armenia due to small sample sizes - Less than 50 unweighted cases of switching to a less effective method as the most recent type of discontinuation.

DHS sampling strategy involves selecting households from clusters, or small geographic areas, and interviewing all eligible women in those households. Women residing in the same cluster area may share characteristics associated with our outcome of interest that we are not able to capture in our models. Therefore, we measure variation at both the individual and cluster levels using multilevel models. By restricting our analysis to only one episode of contraceptive use per woman, we do not need to include the episode as a level of analysis in our multilevel models.

Independent variables

When selecting independent variables for the multivariate models, we based our approach on Bulatao's (1989) framework for understanding contraceptive method choice, as contraceptive discontinuation and method choice are highly correlated (Steele and Curtis, 2003). We were limited to variables that were available in all surveys used. The only exception was media exposure, which was not included in the Colombia survey with the understanding that all women in Colombia are exposed to multiple forms of media regularly. As the most recent episode may have occurred some time in the past (usually within two years of the interview),[6] we also could not use variables that were relevant only to the time of the interview (e.g., visits from a family planning worker within the last six months, or visits to a health facility in the last two weeks). Based on Bulatao's framework, we selected variables that were available in all surveys to represent women's contraceptive goals, competence, access, and evaluation.

[6] The mean and median time from the end of the episode to the date of interview were less than one year in all countries, and 75 percent of events had ended within 20 months of the interview in all but two countries: 75th percentiles were 24 months in Colombia and 25 months in the Dominican Republic. We make the assumption that the independent variables that were not measured at the time of discontinuation did not vary between the time of discontinuation and time of interview; for example, that women who lived in an urban area at the time of interview did not live in a rural area at the time of discontinuation. In some cases (most likely in Colombia and the Dominican Republic, due to longer times between the end of the episode and interview), it is inevitable that this assumption will be violated, which would lead to a decrease in the strength of any association between these variables and discontinuation type. We avoid this situation as much as possible by using only the episode of discontinuation closest to the date of interview; however, some mis-specification for this reason is unavoidable.

Contraceptive goals are measured by the contraceptive method switched from, the woman's her age and parity at the time of discontinuation, and whether or not she worked in the past year.[7] The type of contraceptive method discontinued is included in all models except the switching to more or less effective methods models (the categorization of switch type was dependent upon the methods a woman switched from and to). In models of switching to a more or less effective method, we could not include the contraceptive method used as the contraceptive method switched from was used in determining whether the user switched to a more or less effective method. Pills, injectables, male condoms, and IUDs were included as separate methods unless noted below. Traditional methods (withdrawal, periodic abstinence, and other non-modern methods) were grouped into one category. All other less common modern methods (diaphragm, female condoms, foam, jelly, and implants) were grouped into "other modern methods." There were too few IUD users in Kenya, Zimbabwe, Armenia, and Bangladesh to maintain the IUD as a separate category so in these countries the IUD was included in "other modern methods." Additionally, in Armenia there were too few users of the pill and injectable; therefore, all modern methods other than the male condom in Armenia are included in the "other modern methods" category.

Contraceptive competence is measured via three variables: respondent's years of education; the number of contraceptive methods known; and spousal agreement on number of children desired. The number of contraceptive methods women know reflects contraceptive awareness, the foundation of contraceptive competence. The number of methods known ("have you ever heard of this method?") is included as a continuous variable and is centered at the mean. In the Bulatao framework, contraceptive competence is measured not only by a respondent's understanding of a method and competence of use, but also the spouse's ability to cooperate in using the method. Because spousal communication about family planning was not asked in most recent surveys, we use a proxy measure for spousal cooperation based on the question "Do you think your husband wants the same number of children that you want, or does he want more or fewer than you want?" Responses are coded as the partner wanting the same, more, or fewer children than the respondent, or the respondent does not know, which indicates that they have not discussed the number of children they want with their partner. The "don't know" category reflects limited spousal communication on reproductive intentions, and likely indicates a lack of discussion of issues around contraceptive use.

[7] Having worked in the past year is used as a proxy of ever-exposure to work. We assume that women who had worked in the past year were more likely to have worked previously than women who had not worked in the past year. Therefore, they have higher opportunity costs associated with becoming pregnant. In Bangladesh, information on working in the past year was not available, so current working status was used.

Contraceptive access is measured using three variables: whether the woman is living in an urban or rural area; the household wealth status;[8] and the region or province[9] in which she is living.

Contraceptive evaluation involves women's judgments, practical and moral, about the implications of using a particular method (Bulatao, 1989). We measure contraceptive evaluation in multivariate models through media access and the community-level contraceptive prevalence. Media access is measured by the number of media sources women usually see or hear in a week. Access to media may influence women's perceptions of the acceptability of contraception in general. If specific methods are mentioned, they may influence perceptions as well, particularly if the benefits or side effects of particular methods are discussed. This value can range from 0 (no media exposure) to 3 (exposed to television, radio, and newspapers/printed material in an average week). The value is included as a continuous variable in the models. To assess the community environment in which women may consider, discuss, judge, use, and discontinue contraceptives, a community-level CPR is calculated as the percentage of women in a cluster, excluding the index woman, using contraception.

Limitations

There are several limitations that should be kept in mind when interpreting the results below.

In collecting the calendar data, women are asked to recall events that occurred up to five years ago; thus, the data may be less reliable than current status data. Previous analyses of the overall quality of calendar data, however, show that information reported in the calendar is not subject to selection bias or attrition (Goldman et al., 1983; Moreno and Goldman, 1991; Moreno, 1993). We assessed the quality of the calendar data used in this analysis by examining data heaping. We then calculated estimates of CPR from the calendar for each country in which the calendar from a more recent survey included the interview dates from an earlier survey. We compared the estimated contraceptive prevalence at the time of the earlier survey using the calendar data from each recent survey to the current status data from the corresponding earlier survey (not shown). Briefly, we found some heaping at 6 and 12 months in all countries, but overall the heaping was probably not severe enough to significantly affect estimates of discontinuation. We found consistently lower estimates of contraceptive prevalence with the calendar data from the more recent survey as compared with current status data from the earlier survey for each country. The difference in prevalence from the two data sources shows that not all contraceptive use is captured in the calendar. As a result, our analysis may slightly underestimate discontinuation rates.

[8] DHS surveys do not collect direct information on income or wealth, but collect information on household ownership of durable goods and amenities that have been shown to be correlated with household wealth status (Rutstein and Johnson, 2004). For each DHS survey, a "wealth index" made up of these survey items is constructed using principal components analysis, placing households on a continuous scale of wealth within a given country. We divided this continuous score into terciles, with the lowest tercile representing the poorest third of the population, and the highest tercile representing the wealthiest third of each country. We use terciles rather than the standard quintiles to preserve statistical power.

[9] The region/province variable is included to control for differences in contraceptive behaviors and access by regional residence, as well as to help program managers and planners assess the impact of regional programs. Regions are identified by number in each table. A listing of region names for each country and the corresponding numbers is shown in Appendix 1. In all countries, the region including the capital city was used as the reference category.

Another limitation is that only one reason for discontinuation was collected. In reality, there are often multiple reasons for discontinuing a contraceptive method. Analysis of data from Morocco shows that this approach oversimplifies contraceptive decisionmaking and is unreliable (Strickler at al., 1997). We recognize our analyses of reasons for discontinuation are likely oversimplified, and highlight this unavoidable limitation for the reader.

A final limitation is methodological. While we include right-censored episodes of use that did not end before the date of interview, we are unable to include left-censored episodes that began before the calendar period started. Between 2 and 20 percent of women in each country are excluded from discontinuation rates and hazard models because they used the same reversible method of contraception consistently throughout the entire calendar period (data not shown). As these women are the "strongest" or most consistent users of contraception, it is problematic to exclude them from analysis. Excluding these women, who are at risk of discontinuation but do not discontinue during the observation period, puts us at risk of overestimating the discontinuation rates. Naturally, this risk is highest for countries with a higher proportion of women using the same method continuously throughout the calendar period, which includes Armenia, Egypt, and Indonesia where greater than 15 percent of women used the same reversible method throughout the calendar period.

Results

Twelve month discontinuation rates for all reversible methods due to switching, as well as other types of discontinuation and the all-cause discontinuation rate, are shown in table 1. As shown, the probability of switching in the first 12 months of contraceptive use is highest in Bangladesh and Colombia, where over 20 percent of women switched methods in the first year of use. Switching makes up between 15 percent (in Armenia) and 50 percent (in Bangladesh) of all discontinuations in the first year. Rates of abandonment in need are higher than switching rates for all methods combined in Kenya and the Dominican Republic, and the failure rate is more than three times higher than the switching rate in Armenia.

In every country except Bangladesh and Indonesia, the probability of switching to a more effective method during the first year of use is greater than the probability of switching to a less effective method. In Bangladesh and Indonesia, however, the discontinuation rate for switching to a less effective method is equal to or higher than the discontinuation rate for switching to a more effective method.

The rate of switching, along with the rate of discontinuing for any reason in the first 12 months of use, is highest among male condom users and lowest among users of IUDs in almost every country in which both methods were analyzed (table 2). The majority of switches from pills in the first year are to a more effective method in Kenya, Zimbabwe, Egypt, and Indonesia, while in Bangladesh and the Dominican Republic switches from pills to a less effective method are more common. The vast majority of switches from injectables are to a less effective method – in Bangladesh, 28 percent of injectable users switched to a less effective method within the first year of use, while less than 1 percent switched to a more effective one. Almost all switches from IUDs are to a less effective method, as IUDs are one of the most effective forms of contraception. Switches from IUDs are generally low as expected for a method that requires active discontinuation.

Switching, even to a less effective method, is preferable to abandonment while in need or failure because switching still provides at least some protection from unintended pregnancy, while abandonment and failure clearly do not. In most countries, method-specific rates of switching are higher than or equal to rates of

abandonment in need. Rates of abandonment in need are higher than those for switching, however, for pills and injectables in Kenya and the Dominican Republic, IUDs in the Dominican Republic, condoms in Kenya, and traditional methods in Kenya and Zimbabwe. The rate of switching from pills, injectables, IUDs or condoms in the first year of use is larger than the proportion that experienced failure while using that method in all countries studied. The failure rate is higher than the switching rate for traditional methods in Kenya and Armenia.

By far the most common reason for switching to a less effective method is health concerns or side effects (table 3), which may indicate that better counseling in these areas could greatly decrease these types of switches. As expected, wanting a more effective method was a common reason for switching to a more effective method. Interestingly, in every country some women who switch to a less effective method say they made the switch because they wanted a more effective method. In most cases, these were switches between hormonal methods, largely from injectables to pills.

"Method inconvenient to use" is another common reason, particularly for switching to a more effective method (4 to 22 percent of switches to a more effective method). Problems with access to contraceptives, poor availability, or high cost of the method was the reason given for over 10 percent of switches to a less effective method in Zimbabwe, Armenia, and Colombia, indicating areas for improvement.

Table 4 summarizes the distribution of switches by method type. Similar to the discontinuation rates, the percentage of switches that are to a more effective method is higher than the percentage of switches to a less effective method in all countries other than Bangladesh and Indonesia. Over 80 percent of switches in Indonesia are between hormonal contraceptives. As hormonal contraceptives are still much more effective than barrier or traditional methods, these switches are unlikely to have a great demographic impact. In Bangladesh, however, 14 percent of switches are from hormonal to traditional methods, which have much higher failure rates.

In most countries, the most common type of switch is from one hormonal method to another, more effective, hormonal method. Exceptions are Bangladesh, in which 50 percent of switches are from a more effective to a less effective hormonal method, and Armenia, in which 20 percent of switches are from traditional to hormonal methods.

As shown in table 5, switching is most strongly associated with the variables representing women's contraceptive goals (method type, age, and parity); contraceptive competence (contraceptive awareness) and contraceptive evaluation as represented by the community-level CPR. Surprisingly, the variables representing contraceptive access are not consistently significant. In most countries, women are more likely to switch from most modern methods than traditional methods. The exceptions to this pattern are in Egypt, where women are less likely to switch from any modern method than from traditional methods; Kenya, where women are less likely to switch from "other" modern methods; Zimbabwe, Bangladesh, and the Dominican Republic where women are less likely to switch from pills; and Colombia and the Dominican Republic where women are less likely to switch from IUDs. Egypt is the only country in which women are less likely to switch from condoms than from traditional methods.

Younger women (over age 24) and women at higher parities (2 or more children) are significantly more likely to switch methods than their older or lower-parity counterparts, controlling for other factors. Education is positively associated with switching in Indonesia, Colombia, and the Dominican Republic. Contraceptive awareness and community-level CPR are also consistently positively associated with switching in every country, though the associations except Kenya and Zimbabwe, where the associations do not reach statistical significance.

As indicated by the odds ratios for each interval of use, women are generally more likely to switch methods in the first five months than at any other time in the first three years of use. Cluster-level variance not captured by variables in the model is statistically significant in Armenia, Indonesia, Colombia, and the Dominican Republic. As noted by Curtis and Blanc (1997), this variance may capture unobserved effects of the family planning service environment. The service environment includes method availability as well as the quality and availability of counseling on selection of methods and how to properly use contraceptive methods. Thus, it is expected that the local family planning service environment would have an impact on rates of switching.

Results from separate models of switching to more or less effective methods (Table 6) are similar to those from the total switching models. The relationship between both types of switches and age, parity, contraceptive awareness, and community-level CPR are quite similar to each other and to the results for overall switching. Changes in the odds of switching over time, as indicated by the interval variable, and cluster-level effects, are also quite similar. The largest differences between models of switching to a more and switching to a less effective method are seen in the associations with the partner's desired fertility and region variables.

In Kenya, Armenia, and Egypt, women whose partners want fewer children than they do are significantly more likely to switch to a more effective method than women who have the same desired family size as their partners. In Colombia, however, women are more likely to switch to a less effective method and less likely to switch to a more effective if their partners want fewer children. Women who don't know their partners' desired family sizes are more likely to switch to a less effective method in Zimbabwe, Indonesia, and Colombia.

Regional differences between models of switching to a more versus a less effective method were greatest in Zimbabwe, where women in Mashonaland Central and Matabeleland North were between four and six times more likely to switch to a less effective method than women in Harare. Women in Manicaland and Masvingo, however, were more than twice as likely to switch to a more effective method. In Kenya, women in Rift province had decreased odds of switching to a more effective method as compared with women in Nairobi. In Bangladesh, women in the Barisal, Khulna, and Rajshahi divisions were more likely to switch to more effective methods than women in Dhaka. In Indonesia, regional results were the most similar for both switching types: the odds of both types of switches were increased in Kalimantan and Sulawesi compared with Java, though only the odds of switching to a more effective method were higher in Sumatera. In Colombia, women in the Atlántica, Oriental, Central, and Pacífica regions were more likely to switch to a less effective method than women in Bogotá, while women in the Atlántica region were also more likely to switch to a more effective method. In the Dominican Republic, women in Health Region VI were more than twice as likely to switch to a more effective method compared with women in Health Region 0.

Summary and discussion

This analysis was undertaken to answer four questions: 1) How common is contraceptive switching? 2) Why do women switch contraceptive methods? 3) Which methods do women switch from and to? And 4) What characteristics are associated with switching? We aimed to answer these questions while distinguishing between switches to more and switches to less effective methods. In response to the first question, we found that the rate of switching in the first year of use ranges from 5 to 25 percent in the first year for all reversible methods combined. The rate of switching to a more effective method was higher than the rate of switching to a less effective method in every country except Bangladesh and Indonesia. Overall levels of switching vary greatly by country and contraceptive method, from a low of 3 percent for pills in Zimbabwe and IUDs in Armenia to a high of 36 percent for condoms in the Dominican Republic. Rates of switching are generally higher than rates of abandonment in need or failure, though rates of abandonment in need were higher than rates of switching for pills and injectables in Kenya and the Dominican Republic, IUDs in the Dominican Republic, condoms in Kenya, and traditional methods in Kenya and Zimbabwe. The failure rate is higher than the switching rate for traditional methods in Kenya and Armenia. Abandonment in need and failure are of particular concern as these have direct impacts on the levels of unintended pregnancy and, in many countries, induced abortion (Blanc et. al., 1999; Cleland and Ali, 2004) These results suggest potential problems with method supply or family planning counseling, particularly in Kenya.

In response to our second question, we found that by far the most common reason women switch to a less effective method is side effects and health concerns. Expanding the availability of reliable contraceptive options with few side effects would likely decrease these types of switches. Additionally, if better family planning counseling could prepare women for side effects and alleviate health concerns, improvements in family planning programs could also impact the rate of switching to a less effective method. As expected, wanting a more effective method was a common reason for switching to a more effective method, but in every country, at least some women who switched to a less effective method also said they made the switch because they wanted a more effective method. This may indicate that women are not well-informed about contraceptive method effectiveness. In particular, many women seem to think the pill is more effective than the injectable. Although the differences in clinical efficacy between hormonal methods are not great, there are larger differences in failure rates in common use as shown in this report. One-year pill failure rates are up to six times higher than injectable failure rates. Given these different failure rates, switching to less effective methods can have a significant impact on the prevalence of unintended pregnancies. It is important that family planning information and counseling incorporate details on method effectiveness to give family planning users all the information on family planning before they make a decision on which method to choose.

In analyzing which methods women switch from and to, we found that switches between hormonal methods are the most common except in Armenia, where switches from traditional to hormonal methods make up 20 percent of all switches. More than 10 percent of all switches are from hormonal to traditional methods in Kenya, Armenia, Bangladesh, Colombia, and the Dominican Republic. As failure rates for traditional methods are much higher than for hormonal methods, these switches could have significant demographic impact. The majority of switches in this category were from pills or injectables and the primary reason for switching was either health concerns or side effects (results not shown). When women select either of these methods, counselors should provide women with clear information about potential side effects, and address any concerns women have that these methods may be harmful to their health. Counselors should also be prepared for the fact that the side

effects will not be tolerated by some women, and provide a range of options for switching to other methods—including barrier methods which are more effective than traditional methods—if women are trying to avoid becoming pregnant.

Correlates of contraceptive switching, our fourth area of study, were found to include age and parity of the woman, her contraceptive awareness, and cluster-level CPR—variables representing contraceptive goals, competence, and evaluation. In models of switching to a more or less effective method, a woman's lack of knowledge of her partners' desired family size was associated with significantly higher odds of switching to a less effective method in Zimbabwe, Indonesia, and Colombia. Although these results do not determine causation, it seems likely that increases in spousal discussion on fertility desires and contraception would be associated with decreases in abandonment in need and switches to less effective methods, highlighting a possible area for programmatic intervention. This recommendation is supported by other research as well (Ngom, 1997).

Results were broadly similar between models of switching to a more or a less effective method, though there were some differences across regions. The differences in odds of switching to a more versus a less effective method at the regional level could indicate problems with method availability in certain regions, or other differences in family planning programs such as counseling. Additionally, the similarity in results between models of switching to a more and switching to a less effective method could be because some methods have similar rates of effectiveness. Had we selected only switches between methods with very different effectiveness rates – say, between hormonal and traditional or hormonal and barrier methods – it is possible we would see greater differences, though this type of selection could have introduced other methodological problems.

Overall, based on the results from this study, we are able to make the following recommendations:

1. Ensure availability of a broad range of contraceptives, particularly improved methods that are effective but have few side effects, to decrease switches to less effective methods because of side effects.
2. Educate women, couples, and family planning counselors on the effectiveness rates of contraceptive methods, and provide information to alleviate health concerns and help women understand expected side effects in order to ensure informed reproductive choices.
3. Encourage spousal communication on issues surrounding family planning to reduce switches to less effective methods and help couples to freely and responsibly decide the number and spacing of their children.

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Appendix 1: Region/Province Listings

In Tables 5 and 6, each region/province/governate in a country is referred to by number. Below is a listing of the country regions that correspond to each code. In each country, the first region/province/governate includes the capital city.

Kenya:

1. Nairobi
2. Central
3. Coast and Northeastern[10]
4. Eastern
5. Nyanza
6. Rift
7. Western

Zimbabwe:

1. Harare
2. Manicaland
3. Mashonaland Central
4. Mashonaland East
5. Mashonaland West
6. Matabeleland North
7. Matabeleland South
8. Midlands
9. Masvingo
10. Bulawayo

Armenia:

1. Yerevan
2. All other regions[11]

Egypt:

1. Urban Governates
2. Lower Egypt
3. Upper Egypt
4. Frontier Governates

Bangladesh:

1. Dhaka
2. Barisal
3. Chittagong
4. Khulna
5. Rajshahi
6. Sylhet

Indonesia:

1. Java
2. Sumatera
3. Bali and Nusa Tenggara
4. Kalimantan
5. Sulawesi

Colombia:

1. Bogotá
2. Atlántica
3. Oriental
4. Central
5. Pacífica
6. Orinoqyía y Amazonía

Dominican Republic:

1. Región de salud 0
2. Región de salud I
3. Región de salud II
4. Región de salud III
5. Región de salud IV
6. Región de salud V
7. Región de salud VI
8. Región de salud VII
9. Región de salud VIII

[10] In Kenya, the Northeastern and Coast regions were combined due to small sample sizes in the Northeastern region.

[11] In Armenia, all regions except the capital, Yerevan, were combined to preserve sample size.

Table 1: Competing risks estimates of contraceptive discontinuation in the first 12 months of contraceptive use by discontinuation type among married women 15-49, all methods except sterilization, DHS surveys 2002-2006

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month discontinuation rate	Number of episodes of contraceptive use
Kenya 2003	4.5	3.5	8.0	15.2	5.8	7.0	36.0	2,964
Zimbabwe 2005-06	2.7	1.9	4.6	5.0	2.1	6.0	17.7	4,692
Armenia 2005	3.3	1.5	4.7	2.4	14.8	8.7	30.6	2,386
Egypt 2005	7.7	4.6	12.3	8.2	3.3	8.2	32.0	15,025
Bangladesh 2004	12.2	12.6	24.7	6.5	4.6	13.5	49.3	10,359
Indonesia 2002-03	4.5	4.6	9.1	4.2	2.1	5.4	20.8	17,563
Colombia 2005	13.7	7.5	21.2	7.4	8.8	6.4	43.8	20,714
Dominican Republic 2002	9.8	6.4	16.2	19.9	7.6	11.0	54.6	11,935

Table 2: Competing risks estimates of switching in the first 12 months of contraceptive use among married women 15-49 by method, most common methods used, DHS surveys 2002-2006

Pills

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month pill discontinuation rate	Number of episodes
Kenya 2003	10.6	2.0	12.6	20.1	4.0	6.5	43.2	810
Zimbabwe 2005-06	2.1	0.5	2.7	3.4	2.1	5.4	13.6	3,339
Egypt 2005	15.6	1.2	16.7	10.2	6.7	16.4	50.1	3,840
Bangladesh 2004	7.8	11.3	19.1	7.5	4.0	15.5	46.0	5,222
Indonesia 2002-03	11.0	0.7	11.7	6.7	4.2	9.0	31.6	4,777
Colombia 2005	10.6	7.9	18.5	12.1	5.9	8.4	44.8	4,550
Dominican Republic 2002	3.7	4.5	8.2	20.6	6.8	13.6	49.1	5,325

Armenia supressed-less than 125 unweighted cases

Injectables

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month injectable discontinuation rate	Number of episodes
Kenya 2003	0.4	7.1	7.4	17.8	0.9	5.7	31.9	1,039
Zimbabwe 2005-06	0.4	8.4	8.8	8.8	1.5	5.4	24.4	752
Egypt 2005	6.5	10.8	17.3	15.9	1.1	10.7	45.0	2,430
Bangladesh 2004	0.7	28.0	28.7	11.3	0.4	7.8	48.2	1,773
Indonesia 2002-03	1.3	7.6	8.9	3.6	1.1	4.5	18.1	9,106
Colombia 2005	6.1	19.0	25.1	11.2	6.0	6.9	49.2	3,122
Dominican Republic 2002	2.6	18.6	21.1	33.2	5.0	8.5	67.8	913

Armenia supressed-less than 125 unweighted cases

IUD

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month IUD discontinuation rate	Number of episodes
Armenia 2005	0.0	3.3	3.3	1.9	0.6	1.2	7.0	305
Egypt 2005	0.2	5.3	5.5	4.4	1.3	4.2	15.3	6,820
Indonesia 2002-03	0.2	5.0	5.2	2.3	0.7	0.8	8.9	912
Colombia 2005	1.1	8.8	9.9	3.7	2.5	1.3	17.3	2,328
Dominican Republic 2002	1.9	7.0	8.9	15.1	2.4	2.5	28.9	566

Kenya, Zimbabwe, and Bangladesh supressed-less than 125 unweighted cases

continued

Table 2: Competing risks estimates of switching in the first 12 months of contraceptive use among married women 15-49 by method, most common methods used, DHS surveys 2002-2006

Male condoms

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month condom discontinuation rate	Number of episodes
Kenya 2003	10.2	4.3	14.5	27.2	6.7	13.5	61.9	156
Zimbabwe 2005-06	13.8	2.2	16.1	14.3	4.1	22.1	56.6	193
Armenia 2005	4.0	3.7	7.7	4.4	7.2	10.4	29.7	397
Egypt 2005	19.4	1.2	20.6	2.5	7.3	7.8	38.2	218
Bangladesh 2004	34.2	10.9	45.1	4.3	6.4	15.2	71.1	1,328
Indonesia 2002-03	18.2	2.4	20.7	6.5	4.4	7.2	38.7	253
Colombia 2005	23.2	4.8	28.0	7.4	6.0	9.2	50.5	2,794
Dominican Republic 2002	24.6	11.3	35.9	20.8	2.8	13.3	72.9	554

Traditional methods

	Switch to:							
	More effective method	Less effective method	All switches	Abandon in need	Failure	Abandon, not in need	Total 12-month traditional method discontinuation rate	Number of episodes
Kenya 2003	3.3	0.3	3.7	5.3	15.7	9.0	33.8	714
Zimbabwe 2005-06	4.5	0.0	4.5	9.2	5.0	4.3	23.0	179
Armenia 2005	3.4	0.0	3.4	1.3	19.8	9.4	33.9	1,531
Egypt 2005	24.1	0.0	24.1	9.9	6.8	2.4	43.2	1,414
Bangladesh 2004	21.6	1.9	23.5	1.0	10.0	13.3	47.7	1,727
Indonesia 2002-03	4.6	0.4	5.0	2.1	4.8	6.8	18.8	915
Colombia 2005	17.3	0.9	18.2	2.1	18.7	6.2	45.2	3,994
Dominican Republic 2002	24.2	1.6	25.8	11.2	14.5	9.5	61.0	1,871

Table 3: Distribution of reasons for discontinuation among episodes of switching by type of switch, married women 15-49, DHS surveys 2002-2006

	Reduced need	Health and side effects	Wanted more effective method	Method inconvenient to use	Cost/ access	Husband opposed	Other/ DK	Total	Number of episodes of switching
Switch to a more effective method									
Kenya 2003	0.5	34.1	27.8	19.9	2.1	3.3	12.3	100.0	170
Zimbabwe 2005-06	0.0	30.3	30.9	17.0	3.8	1.0	17.1	100.0	229
Armenia 2005	0.0	3.1	61.8	10.8	0.0	14.9	9.5	100.0	89
Egypt 2005	0.0	42.1	28.4	22.3	1.4	0.5	5.3	100.0	1,404
Bangladesh 2004	0.2	30.8	27.6	15.8	1.7	19.4	4.5	100.0	1,433
Indonesia 2002-03	0.0	35.4	41.3	4.1	4.8	0.4	14.0	100.0	1,058
Colombia 2005	1.0	17.9	61.0	7.1	2.6	4.4	6.0	100.0	3,216
Dominican Republic 2002	0.9	16.7	42.5	8.7	1.9	6.9	22.5	100.0	1,073
Switch to a less effective method									
Kenya 2003	0.6	76.3	3.4	2.6	1.5	5.6	10.0	100.0	117
Zimbabwe 2005-06	0.0	56.6	7.6	6.5	16.3	3.7	9.4	100.0	120
Armenia 2005	0.0	59.9	5.6	6.1	14.7	13.0	0.7	100.0	56
Egypt 2005	0.2	89.9	2.0	1.6	0.4	0.1	5.9	100.0	966
Bangladesh 2004	1.0	75.8	1.2	5.4	4.7	7.4	4.5	100.0	1,446
Indonesia 2002-03	0.4	68.0	9.0	4.7	5.8	0.3	11.8	100.0	1,452
Colombia 2005	1.0	68.5	4.1	7.8	9.9	2.8	5.8	100.0	1,832
Dominican Republic 2002	2.3	54.2	4.6	9.1	4.8	6.2	18.7	100.0	741

Table 4: Distribution of method types switched from and to among married women 15-49, DHS surveys 2002-2006

	Kenya 2003	Zimbabwe 2005-06	Armenia 2005	Egypt 2005	Bangladesh 2004	Indonesia 2002-03	Colombia 2005	Dominican Republic 2002
Less effective to more effective (3)	**59.3**	**65.5**	**61.3**	**59.2**	**49.8**	**42.2**	**63.7**	**59.2**
hormonal method to sterilization	0.5	0.2	-	0.0	0.4	0.8	6.4	4.3
barrier to sterilization	-	-	-	0.1	0.1	0.2	2.9	0.4
traditional to sterilization	0.3	-	-	-	0.1	-	2.7	1.7
less effective hormonal to more effective hormonal (1)	39.3	46.2	2.6	37.3	19.1	33.6	13.5	12.3
barrier to hormonal	7.0	8.0	11.0	2.0	15.8	1.9	13.5	7.1
traditional to hormonal	9.1	2.7	20.2	19.4	10.1	2.8	11.9	20.8
LAM to hormonal	-	7.1	4.9	-	-	1.7	6.0	6.1
traditional to barrier	2.2	0.3	8.5	0.3	3.1	0.5	3.2	2.5
More effective to less effective(3)	**40.7**	**34.5**	**38.7**	**40.8**	**50.2**	**57.8**	**36.3**	**40.8**
more effective hormonal to less effective hormonal (2)	22.0	23.1	2.0	36.1	16.7	50.1	12.8	11.0
hormonal to barrier	4.6	5.3	10.0	2.1	13.1	1.6	8.2	6.8
hormonal to traditional	11.3	3.0	11.4	2.5	14.3	5.4	10.8	13.4
barrier to traditional	2.1	0.8	13.4	0.1	5.0	0.3	2.8	4.0
Total	100	100	100	100	100	100	100	100
Number of episodes of switching(3)	288	349	145	2,370	2,878	2,510	5,048	1,814

(1) Less effective to more effective hormonal methods include switching from pills to injectables, IUD, or implant; injectables to IUD or
(2) More effective to less effective hormonal methods include switching from an implant to pills, injectables, or IUD; IUD to pills or injectables; or injectables to pills.
(3) Includes switches within traditional methods and within barrier methods not shown separately in table.

Table 5. Odds ratios from hazard models of switching methods within 3 years of use, using the most recent episode from married women 15-49, DHS surveys 2002-2006

	Kenya 2003	Zimbabwe 2005-06	Armenia 2005	Egypt 2005	Bangladesh 2004	Indonesia 2002-03	Colombia 2005	Dominican Republic 2002
Contraceptive goals								
Contraceptive Method								
Traditional (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pill	3.56**	0.20**		0.46**	0.69**	2.83**	0.97	0.22**
Injectable	1.10	0.78		0.39**	1.44**	1.89**	1.49**	0.80
Male Condom	4.55**	1.33	1.12	0.66*	2.09**	4.41**	1.33**	1.46*
IUD				0.06**		0.70	0.42**	0.23**
Other modern	0.16	0.59	1.34	0.24**	0.92	1.06	1.51**	1.48*
Age at discontinuation								
15-24 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25-34	0.33**	0.25**	0.24**	0.51**	0.48**	0.39**	0.44**	0.45**
35-49	0.10**	0.05**	0.17**	0.24**	0.30**	0.19**	0.19**	0.15**
Parity at discontinuation								
0-1 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2-3	2.42**	2.65**	2.09*	2.96**	1.80**	1.67**	2.10**	2.15**
4+	3.38**	6.01**	4.01	3.77**	2.17**	1.80**	3.45**	4.35**
Worked in past year (no=ref)	1.35	1.11	0.44*	1.07	1.09	1.05	1.02	1.43**
Contraceptive competence								
Years of education	1.02	1.01	0.99	1.00	1.02	1.02*	1.02**	1.05**
Contraceptive awareness	1.10	1.09**	1.15**	1.06**	1.12**	1.17**	1.11**	1.06**
Partner's desired fertility								
Same (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
More	1.40	0.65*	1.62	0.89	0.94	1.11	0.89*	1.04
Fewer	2.01**	1.12	2.09	1.32*	1.00	1.57**	0.73**	0.80
Don't know	1.23	0.85	0.09	0.94	0.73	1.23*	0.81	1.00
Contraceptive access								
Residence (urban=ref)	1.23	1.03	0.94	1.03	0.94	0.91	0.90	1.21*
Wealth status								
Lowest	0.73	0.82	0.81	0.96	0.86	0.75**	1.20**	0.90
Middle (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Highest	1.15	1.72	1.08	0.87	1.14	0.92	0.99	0.89
Region(1)								
Region 1 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Region 2	1.13	1.79	0.82	0.81	1.34*	1.34**	1.29**	1.18
Region 3	1.06	1.59		0.89	0.86	1.03	1.13	1.10
Region 4	1.32	1.09		0.64	1.16	1.44**	1.10	0.90
Region 5	0.41	1.53			1.19*	1.78**	1.25**	1.29
Region 6	0.46*	1.93			0.76		0.79	0.78
Region 7	0.48	1.12						0.98
Region 8		1.05						0.96
Region 9		2.05*						1.03
Region 10		0.48						
Contraceptive evaluation								
Media exposure	1.19	1.00	1.33	0.92	1.00	1.04		0.83**
Community CPR	2.63*	2.45	3.80*	4.10**	3.18**	2.20**	2.56**	2.88**
Interval (months)								
1-5 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
6-10	0.90	0.86	0.56	0.66**	0.57**	0.76**	0.80**	0.74**
11-15	0.53*	0.84	0.44*	0.70**	0.51**	0.96	0.80**	0.45**
16-20	0.31**	0.89	0.24**	0.39**	0.30**	0.51**	0.45**	0.36**
21-25	0.68	0.87	0.38*	0.47**	0.51**	0.95	0.50**	0.33**
26-30	0.52	0.65	0.01	0.24**	0.31**	0.36**	0.36**	0.27**
31-36	0.54	0.59	0.25*	0.37**	0.36**	0.57**	0.43**	0.47**
Cluster-level variance	0.00	0.01	0.14*	0.01	0.00	0.05**	0.02	0.03*
Number of episodes	1,483	2,855	1,203	7,946	4,982	12,105	7,534	3,445

Reference category for outcome is "did not abandon in need"

*p<0.05 **p<0.01

(1) Region names corresponding to each region number are shown in Appendix 1

Table 6. Odds ratios from hazard models of switching to a more or less effective method within 3 years of use, using the most recent episode from married women 15-49, DHS surveys 2002-2006

	Kenya 2003	Zimbabwe 2005-06		Armenia 2005	Egypt 2005		Bangladesh 2004		Indonesia 2002-03		Colombia 2005		Dominican Republic 2002	
	more effective	less effective	more effective	more effective	less effective	more effective	less effective	more effective	less effective	more effective	less effective	more effective	less effective	more effective
Contraceptive goals														
Age at discontinuation														
15-24 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25-34	0.28**	0.22**	0.26**	0.19**	0.45**	0.51**	0.55**	0.42**	0.39**	0.37**	0.36**	0.42**	0.42**	0.45**
35-49	0.09**	0.07**	0.06**	0.07**	0.26**	0.26**	0.41**	0.24**	0.18**	0.16**	0.15**	0.18**	0.33**	0.13**
Parity at discontinuation														
0-1 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2-3	2.13**	2.06*	3.17**	3.42**	3.58**	3.25**	2.07**	1.87**	1.85**	1.49**	1.56**	2.48**	1.45*	3.09**
4+	2.78**	12.62**	5.10**	6.56*	4.33**	4.93**	2.61**	2.35**	1.57*	2.07**	2.66**	4.44**	1.48	7.46**
Worked in past year (no=ref)	1.37	0.93	1.07	0.58	1.07	1.08	1.22	1.06	0.96	1.12	1.14	0.98	1.38*	1.47**
Contraceptive competence														
Years of education	1.04	1.11	1.02	0.97	1.02	0.99	1.05**	1.02	1.04**	0.99	1.01	1.03**	1.10**	1.05**
Contraceptive awareness	1.09	1.13*	1.12**	1.14*	1.05	1.09**	1.14**	1.13**	1.08**	1.27**	1.08**	1.13**	1.04	1.12**
Partner's desired fertility														
Same (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
More	1.49	0.38*	0.84	1.56	0.77	1.07	0.96	0.92	1.08	1.16	1.21*	0.67**	1.16	0.85
Fewer	1.79*	0.85	1.32	3.09*	1.11	1.44*	1.02	0.93	2.26**	0.87	0.87	0.62**	0.80	0.71
Don't know	1.07	1.97*	0.65	0.00	0.80	1.10	0.77	0.77	1.61**	0.96	1.39*	0.59**	1.16	1.02
Contraceptive access														
Residence (urban=ref)	1.17	4.75**	0.64	0.85	1.16	0.90	0.78*	1.01	0.68**	1.24*	0.76*	0.99	0.84	1.69**
Wealth status														
Lowest	0.79	0.55	1.10	0.91	1.10	1.07	1.05	0.79*	0.81	0.63**	1.18	1.16*	0.93	0.84
Middle (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Highest	1.17	5.72**	1.28	1.33	0.87	0.94	1.38**	1.09	0.83	0.98	1.00	1.05	1.14	0.83
Region(1)														
Region 1 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Region 2	1.18	1.71	2.09*	0.72	0.72	0.82	1.13	1.66**	1.19	1.54**	2.08**	1.22*	0.83	1.13
Region 3	0.85	4.10*	1.11		1.20	1.14	0.82	0.91	0.91	0.88	1.53**	0.98	0.85	0.84
Region 4	0.94	0.93	1.50		0.54	1.04	1.02	1.47**	1.56**	1.66**	1.57**	1.04	0.97	0.69
Region 5	0.45	2.49	1.25				1.01	1.37**	1.69**	1.91**	1.71**	1.15	1.21	1.32
Region 6	0.38*	5.86**	2.05				0.93	0.68			1.51	0.74	0.68	0.71
Region 7	0.46	2.12	1.96										2.12*	0.66
Region 8		2.19	0.90										1.05	0.74
Region 9		0.48	2.51**										1.21	0.85
Region 10		2.09	0.23*											
Contraceptive evaluation														
Media exposure	1.28	1.01	1.04	1.68**	0.86	0.87*	1.03	1.00	1.05	1.03			0.73**	0.82**
Community CPR	2.77*	4.89	1.51	5.08	6.51**	3.38**	4.15**	3.37**	2.00*	2.61**	2.13**	3.06**	4.42**	2.94**
Interval (months)														
1-5 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
6-10	0.72	0.73	0.86	0.62	0.73*	0.57**	0.98	0.30**	1.04	0.53**	0.65**	0.81**	0.56**	0.75*
11-15	0.38**	0.42*	1.00	0.37*	0.72*	0.54**	0.71*	0.33**	1.27*	0.66**	0.64**	0.75**	0.30**	0.43**
16-20	0.23**	0.43*	1.04	0.18**	0.33**	0.28**	0.27**	0.27**	0.59**	0.40**	0.32**	0.42**	0.32**	0.27**
21-25	0.61	0.21*	1.15	0.22*	0.47**	0.27**	0.64**	0.33**	1.42**	0.49**	0.35**	0.46**	0.43**	0.16**
26-30	0.47	0.44	0.62	0.02	0.36**	0.08**	0.26**	0.27**	0.41**	0.27**	0.23**	0.33**	0.16**	0.22**
31-36	0.47	0.37	0.59	0.02	0.52**	0.12**	0.43**	0.23**	0.76	0.34**	0.44**	0.30**	0.43*	0.28**
Cluster-level variance	0.00	0.00	0.00	0.13	0.01	0.02	0.00	0.03*	0.05*	0.05*	0.00	0.02	0.00	0.10**
Number of episodes	1,438	2,703	2,783	1,182	7,113	7,551	4,345	4,458	11,417	11,365	5,619	6,767	2,927	3,212

Reference category for outcome is "did not abandon in need"

*p<0.05 **p<0.01

(1) Region names corresponding to each region number are shown in Appendix 1

Models for switching to a less effective method are not included for Kenya nor Armenia due to small sample sizes