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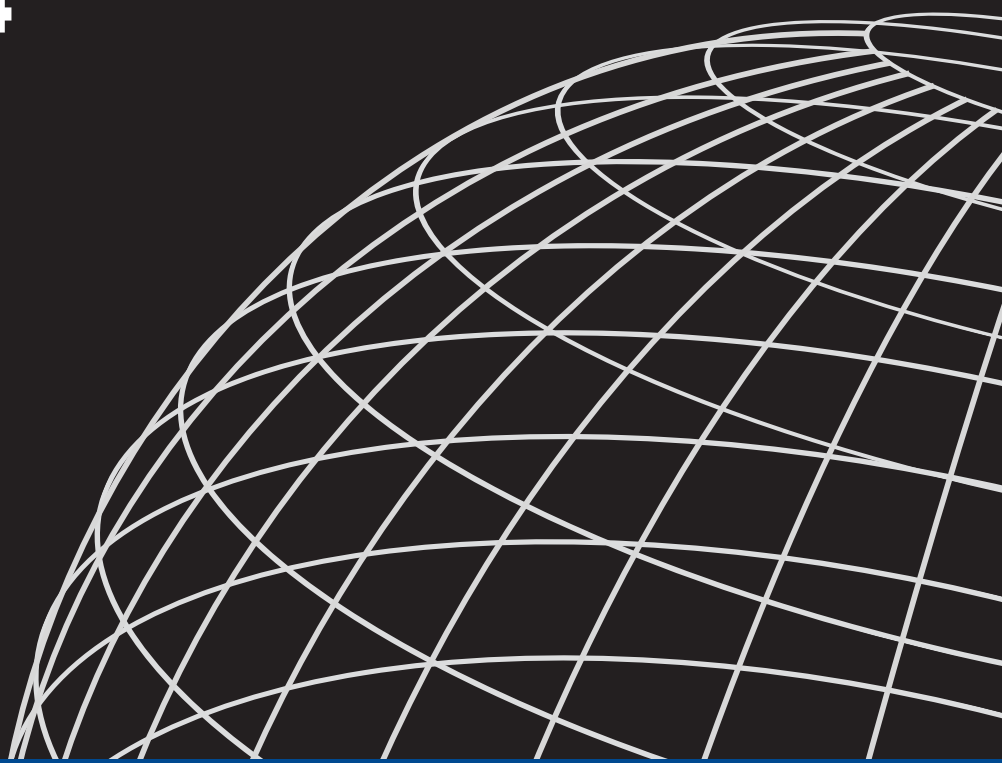
CONTRACEPTIVE USE, BREASTFEEDING, AMENORRHEA AND ABSTINENCE DURING THE POSTPARTUM PERIOD: AN ANALYSIS OF FOUR COUNTRIES

DHS ANALYTICAL STUDIES 14



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MEASURE DHS assists countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. Additional information about the MEASURE DHS project can be obtained by contacting Macro International Inc., Demographic and Health Research Division, 11785 Beltsville Drive, Suite 300, Calverton, MD 20705 (telephone: 301-572-0200; fax: 301-572-0999; e-mail: reports@macrointernational.com; internet: www.measuredhs.com).

The main objectives of the MEASURE DHS project are:

- to provide decisionmakers in survey countries with information useful for informed policy choices;
- to expand the international population and health database;
- to advance survey methodology; and
- to develop in participating countries the skills and resources necessary to conduct high-quality demographic and health surveys.

DHS Analytical Studies No.14

Contraceptive Use, Breastfeeding, Amenorrhea and Abstinence During the Postpartum Period: An Analysis of Four Countries

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Preface

One of the most significant contributions of the MEASURE DHS program is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries.

The *DHS Comparative Reports* series examines these data across countries in a comparative framework. The *DHS Analytical Studies* series focuses on analysis of specific topics. The principal objectives of both series are to provide information for policy formulation at the international level and to examine individual country results in an international context.

While *Comparative Reports* are primarily descriptive, *Analytical Studies* comprise in-depth, focused studies on a variety of substantive topics. The studies are based on a variable number of data sets, depending on the topic being examined. A range of methodologies is used in these studies including multivariate statistical techniques.

The topics covered in *Analytical Studies* are selected by MEASURE DHS staff in conjunction with the U.S. Agency for International Development.

It is anticipated that the *DHS Analytical Studies* will enhance the understanding of analysts and policymakers regarding significant issues in the fields of international population and health.

Ann Way
Project Director

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Executive Summary

Contraceptive use during the postpartum period has been of considerable interest to both demographers and family planning managers. The risk of unwanted pregnancy is high during the year following the birth of a child, and many women have unmet need for contraception during this period.

This study examines the determinants of time to first use of a contraceptive method after a birth, duration of breastfeeding, and postpartum amenorrhea. We use data from month-to-month detailed retrospective histories of contraceptive use by women age 15-49. The data come from recent Demographic and Health Surveys (DHS) in Kenya, Indonesia, the Dominican Republic, and Peru. Using life-table methods, we report cumulative percentages of women who initiated contraceptive use by 2, 6, 9, and 12 months, and the median duration until first use of contraception after a birth. We then investigate the independent effects of selected social, economic, and demographic factors on the time to first use of contraception, on durations of breastfeeding, and on postpartum amenorrhea during the first 12 months after a birth.

Our bivariate analyses show that in all four countries the likelihood of adopting contraception during the first 12 months postpartum increases with the level of education of the mother, her exposure to the media, the wealth status of the household, and whether delivery was at a public or private health facility. Additionally, we find that between 20 percent and 40 percent of women in the countries studied did not initiate contraceptive use postpartum before they became at risk for another pregnancy.

Our multivariate analyses suggest that in all four countries education and wealth status have a significant positive association with the adoption of any contraceptive method during the first 12 months postpartum. Also, in three of the countries mother's exposure to mass media has a significant positive association with adoption of a contraceptive method

The study also explores the determinants of adoption of hormonal contraception (specifically, the pill and injectables) and non-hormonal methods during the first 12 months postpartum. Mothers from wealthier households and with formal education are more likely to initiate use of non-hormonal and hormonal contraceptive methods, as well are mothers age 25 and older. Modernization (synonymous with urbanization and formal education) is linked to early termination of breastfeeding, our study shows. Older mothers (age 25 and above) are more likely than mothers age 15-24 to terminate breastfeeding early. In all four countries higher levels of maternal education and wealth are associated with a lower likelihood of remaining amenorrheic during the 12 months postpartum. Additionally, mothers with a preceding birth interval of 24-47 months are more likely to remain amenorrheic during this period.

Given that mothers delivering in a health service breastfeed for a shorter period and adopt contraception earlier and more, we recommend that prenatal programs include information on breastfeeding and on using contraception during the postpartum period, as well as the regular inclusion of a discussion of contraception during the postpartum check before discharge for mothers who deliver in health facilities and during postpartum home visits for all mothers.

1

Introduction

The risk of unwanted pregnancy is high during the year following the birth of a child. A study by Ross and Winfrey (2001) using data from 27 Demographic and Health Surveys (DHS) found that only 3 percent of postpartum women want a new baby within two years, yet only 40 percent on average are actually using a family planning method for birth spacing. The same study also reported that two-thirds of women who are within one year of their last birth have an unmet need for contraception.[1] A recent analysis of data from the 2004-5 Tanzania DHS found that 74 percent of women plan to use contraception during their first year postpartum (ACCESS-FP 2008). In summary, empirical studies have revealed that many women have an unmet need for contraception during the postpartum period (Ross and Frankenberg 1993; Ross and Winfrey 2001).

The length and intensity of breastfeeding varies widely among women and across societies and is an important factor in determining the need for contraception postpartum. Breastfeeding not only provides the baby with nourishment but also can postpone the return of menses for many months. In most developing countries breastfeeding is almost universal, and long durations of breastfeeding are common. In many traditional societies, where family planning is not practiced, breastfeeding patterns are important in explaining differences in fertility. In this context, postpartum contraceptive behavior is of considerable interest from both demographic and family planning perspectives.

In some countries the combined effects of postpartum sexual abstinence and amenorrhea (i.e., postpartum insusceptibility) account for birth spacing up to two years (Haggerty and Rutstein 1999). While breastfeeding and amenorrhea have a substantial impact on potential fertility, higher levels of breastfeeding alone are not an effective means to reduce high fertility, nor an alternative to contraception (Trussell and Santow 1991).

The purpose of this study is to explore postpartum contraceptive behavior and its relationship with breastfeeding, postpartum amenorrhea, and postpartum sexual abstinence, using data from Demographic and Health Surveys (DHS) in Kenya (sub-Saharan Africa), Indonesia (Asia), the Dominican Republic (the Caribbean), and Peru (Latin America).[2]

The primary objective is to examine the adoption of contraceptive use after a birth, using reproductive calendar data from these four surveys. Socioeconomic and demographic differentials of the probability of using contraception at 2, 6, 9, and 12 months after a birth are investigated. Further, the chance of conception after a birth at 6, 9, and 12 months for non-contracepting women is examined by socioeconomic and demographic characteristics. The Cox multivariate proportional hazards model is then

[1] The concept of unmet need for spacing births describes women who are not using family planning and say they want more children, but not for at least two or more years, or who are unsure whether they want to have another child, or who want to have another child but are unsure when. Pregnant women whose pregnancies were mistimed and non-menstruating women whose last births were mistimed also are included in the definition.

[2] Over the last 20 years, the DHS has conducted more than 200 surveys in about 80 developing countries. DHS are nationally-representative household surveys with large sample sizes (usually between 5,000 and 30,000 households).

used to investigate the independent effects that social, economic, and demographic variables have on duration between childbirth and first use of contraception in the first 12 months after a birth.

The secondary objective of this paper is to investigate the timing of contraceptive adoption relative to amenorrhea and abstinence, and their combined effect, insusceptibility. We also explore social, economic, and demographic factors associated with the risk of cessation of breastfeeding and the resumption of menstrual cycle during the first 12 months postpartum, using the Cox model.

Research findings indicate that birth intervals of three to five years reduce mortality, and provide substantial health benefits for new born babies, infants, children, and mothers more than the previously recommended two-year interval (Setty-Venugopal and Upadhyay 2002; Rutstein 2005). The results of this study are intended to provide information to achieve optimal birth spacing and improved health for women and children through the design and implementation of successful family planning and contraceptive interventions. In order to place optimal birth spacing on the global leadership priority agenda U.S. Agency for International Development (USAID) funded the Optimal Birth Spacing Initiative (OBSI). The goal of OBSI was to institute an optimal birth spacing recommendation of Three to Five Years at the policy, programmatic, and behavioral levels.

2

Literature Review

Most of the existing body of literature suggests that postpartum contraceptive use is inversely associated with breastfeeding (Jain and Bongaarts 1981; Pebley et al. 1985; Akin et al. 1986). Becker and Ahmed (2001), however, using DHS reproductive calendar data from Peru and Indonesia, found that in both countries postpartum contraceptive adoption is associated with the resumption of sexual activity. They also found no association between breastfeeding and the adoption of non-hormonal contraception, after controlling for the length of postpartum amenorrhea and other factors.

The literature identifies various behavioral responses following the death of a child. The death of a child causes the cessation of breastfeeding, thus increasing the probability of return to ovulation and the conception of the next child, resulting in shortened birth interval (Grummer-Strawn et al. 1998). Research findings also suggest that the death may adversely affect the adoption of a contraceptive method (van Ginneken 1978; Rahman 1998), or might lead a couple to postpone having another child to avoid re-exposing themselves to the risk of losing another infant (Preston 1978). In Ghana, Nyarko et al. (1999) found that among women whose child died early the median duration of postpartum amenorrhea dropped from 12 months to 4. Similarly, a study using DHS data from 46 countries found that the duration of postpartum sexual abstinence fell by as much as 47 percent following a child's death (Grummer-Strawn et al. 1998).

Several studies have found higher levels of maternal education, income, and employment to be associated with a reduction of breastfeeding duration (Rogers et al. 1997; Abada et al. 2001; Sabina et al. 2006). In contrast, DeRose (2007) reported that, in Ghana during 1988-98, percentage of women breastfeeding increased despite women's increased participation in paid labor force.

The positive association between breastfeeding and the length of postpartum amenorrhea is well documented (Chen et al. 1974; Knodel 1977; Van Ginneken 1978; Rutstein 1991; Pinto Aguirre et al. 1998; Haggerty and Rutstein 1999). Bongaarts and Potter (1983) found that changes in breastfeeding behavior during the 6 to 18 month period after a birth affect the duration of postpartum amenorrhea. In addition, the frequency and intensity of suckling, as well as the number of months an infant is fed, are important determinants of the length of postpartum amenorrhea (Labbok and Krasovec 1990). In the absence of breastfeeding, the average amenorrheic period may last between one and three months, but when nursing is initiated just after childbirth, the duration of amenorrhea increases with the duration of breastfeeding (Bongaarts and Potter 1983; Santow 1987). Using data from USA, Heinig et al. (1994) reported that the duration of postpartum amenorrhea among women who breastfed for 6 months or more was significantly longer than the durations of postpartum amenorrhea among a formula-feeding group. In developing countries the median duration of postpartum amenorrhea for mothers who did not breastfeed their children was 3 months, whereas for those who exclusively or fully breastfeed[3] their children the median duration was 14 months (Haggerty and Rutstein 1999). Furthermore, in Egypt El-Sahn and Darwish (1992) found that 31 percent of breastfeeding mothers were still amenorrheic at 6 months postpartum.

[3] Exclusive breastfeeding, based on WHO definition refers to the practice of feeding only breast milk for the first **six** months of life of the infant (WHO 2004).

Urbanization and social change are also changing traditional methods that women have used to control their fertility. In a study that examined the effect of social change on the length of postpartum sexual abstinence in three sub-Saharan African countries, Benefo (1995) found that modernization (synonymous with literacy and urbanization) adversely affected the duration of abstinence. In addition, using data from the 1994 Zimbabwe DHS, Sambisa and Curtis (1997) reported a negative association between contraceptive use and postpartum abstinence.

3

Conceptual Framework

In the conceptual framework (Figure 1), which depicts the relationship between birth, postpartum behaviors, and postpartum contraceptive adoption, we examine the trajectory from birth to adoption of contraception in a dynamic framework; after a woman gives birth, she decides (possibly as a couple) whether to adopt a method of contraception; and if she/they decide to adopt a method, then decide when to start using a method. The relationship is explored vis-à-vis: (1) breastfeeding; (2) postpartum amenorrhea; (3) postpartum abstinence, and (4) the combined effects of postpartum sexual abstinence and amenorrhea, namely insusceptibility. The process is not sequential as might appear in the figure, because, depending on the type of method selected, the decision to start using contraception may take place at any time after a birth.

The use of contraception, postpartum infecundability and insusceptibility due to breastfeeding, and sexual abstinence may increase the birth interval and as a result lower fertility for those who are sexually active. Contraceptive use prolongs the "time to conception" by reducing the probability of conception in each ovulatory cycle. Initiation of contraception can happen at various times after a birth, depending on the type of the method to be used and the postpartum situation of the mother. For instance, a mother may adopt a method immediately after a birth, such as a reversible method (IUD) or a permanent method (sterilization), in which case the timing of adoption precedes the resumption of menses, sexual relations, or weaning.

The adoption of contraception after a birth is not the only trajectory to prolong time to conception and increase the birth interval. Longer durations of breastfeeding tend to increase the average birth interval length and therefore reduce a woman's fertility over her lifespan, particularly in societies where the use of modern contraceptive methods is not widespread.

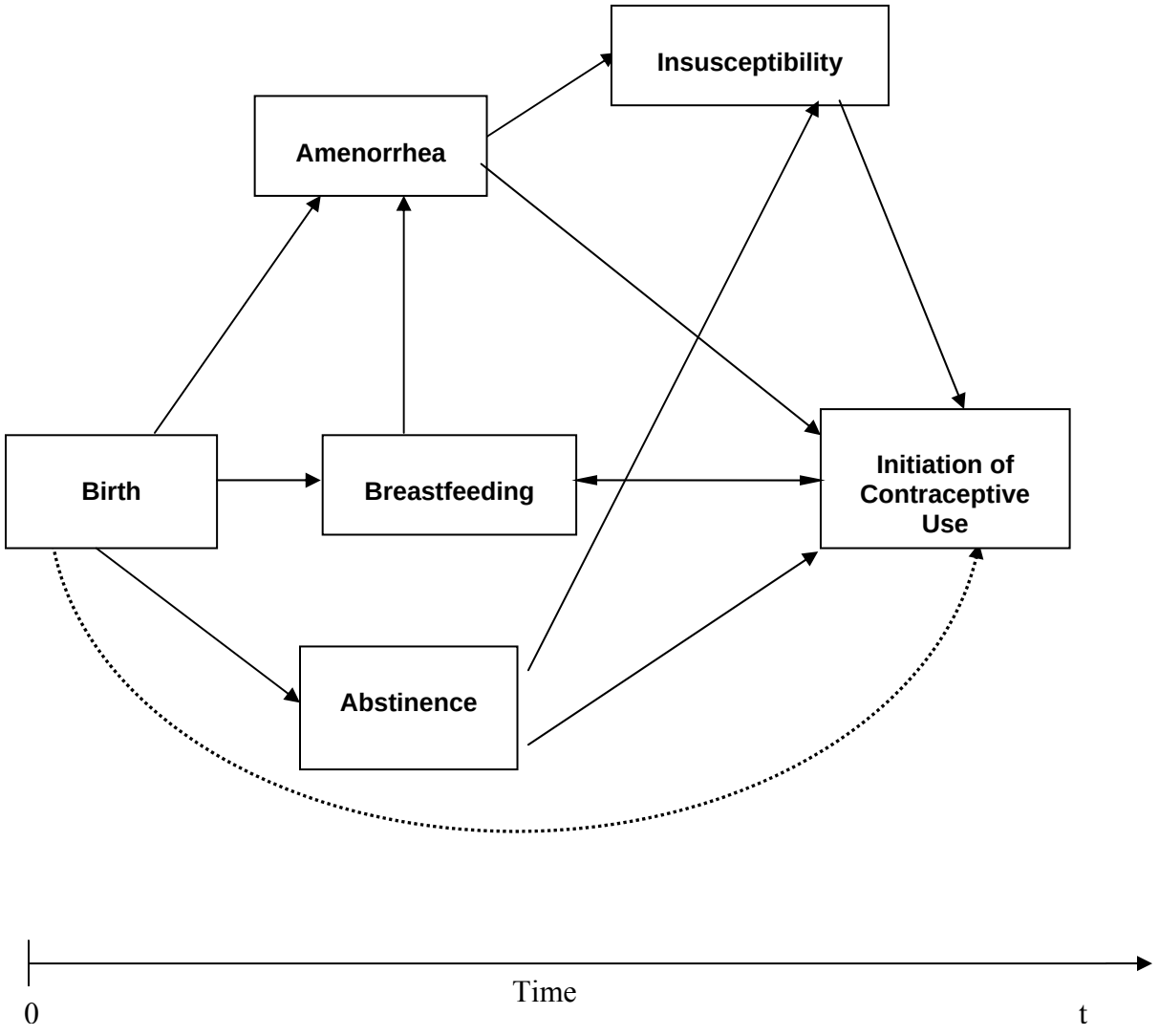
A consensus on the use of breastfeeding as a family planning method was developed during the Bellagio conference in 1988 (Kennedy et al. 1989). Concerning the effect of breastfeeding on fertility, the expert group concluded that "the maximum birth spacing effect of breastfeeding is achieved when a mother fully or nearly fully breastfeeds and remains amenorrheic. When these two conditions are fulfilled, breastfeeding provides more than 98 percent protection from pregnancy in the first 6 months." The rate of pregnancy during lactational amenorrhea remains low, about 3 percent at 9 months, and 4.5 percent at 12 months (FHI 1996). Although the variation in the durations of postpartum amenorrhea is explained to a large extent by differing breastfeeding patterns, the effect of lactation on ovarian activity may be mediated by other physiological factors, such as maternal nutrition, and other socioeconomic and demographic characteristics of the woman (Huffman 1978; Pinto Aguirre 1996; Peng et al. 1998).

In addition to contraception and breastfeeding, exposure to the risk of pregnancy in the postpartum period can be influenced by sexual abstinence. Postpartum sexual abstinence tends to have additional contraceptive benefits if the duration of abstinence exceeds that of postpartum amenorrhea. The length of postpartum abstinence is strongly influenced by cultural norms that vary across ethnic and religious groups regarding the appropriate waiting period before resuming sexual relations (Singarimbun and Meanning 1976; van De Walle and van De Walle 1993; Zulu 2001).

Postpartum insusceptibility lengthens the time until a next birth and thereby can reduce the number of births a woman eventually has. The timing of postpartum contraceptive adoption is central to meeting a couple's need for limiting or spacing births. Initiating contraceptive use during insusceptibility provides double protection against the risk of pregnancy, while initiating contraceptive use one or more months into susceptibility exposes the woman to the chance of conception because, once insusceptibility ends, she has no protection at all until she begins using contraception.

The relationship between postpartum contraceptive adoption and amenorrhea is complicated. The use of a particular contraceptive method, particularly hormonal methods, before the resumption of menses may have a direct influence on the duration of postpartum amenorrhea. Injectables may produce extended periods of amenorrhea in users and thus, if started before the resumption of fecund menstrual cycle, may lead to an abnormally long duration of postpartum amenorrhea. An amenorrheic woman who adopts the oral contraceptive pill before the resumption of menses, however, is likely to experience bleeding. Consequently, she will have a shorter duration of postpartum amenorrhea than if she had not adopted the method (Knodel et al. 1985; Laukaran and Winikoff 1985). Furthermore, the pill may decrease the amount of milk a lactating woman produces, and is not usually recommended during exclusive breastfeeding.

Figure 1. Contraceptive adoption after a birth and postpartum behaviors



4

Sources of Data

DHS surveys are one of the most comprehensive sources of information on contraceptive use, breastfeeding, postpartum amenorrhea, and postpartum abstinence. An individual core questionnaire is administered to a nationally representative sample of women age 15 to 49. Women who have given birth within five years preceding the interview are asked about breastfeeding practices and duration, and durations of postpartum amenorrhea and abstinence.

For duration of breastfeeding, for all births, women are asked,

"Did you ever breastfeed (NAME)?"

Then, only for living child (children), women are asked,

"For how many months did you breastfeed (NAME)?"

For the duration of amenorrhea, the DHS asks women about their first menstruation after giving birth. Women with children born in the last five years are asked,

"Has your period returned since the birth (NAME)?" (i.e., last birth).

Similarly, women with more than one birth in the last five years are asked,

"Did your period return between the birth of (NAME) and your next pregnancy?"

If the answer is yes, then the woman is asked,

"*For how many months after the birth of (NAME) did you not have a period?"*

To determine postpartum sexual abstinence, non-pregnant women are asked,

"Have you resumed sexual relations since the birth of (NAME)?" (i.e., last child).

If the answer is yes, then the woman is asked,

"For how many months after the birth of (NAME) did you not have sexual relations?"

The reproductive calendar section of the DHS collects retrospective information on contraceptive use. This section of the questionnaire asks women to recall month-by-month information about contraceptive adoption, discontinuation, or switching for a 5-year period before the survey.

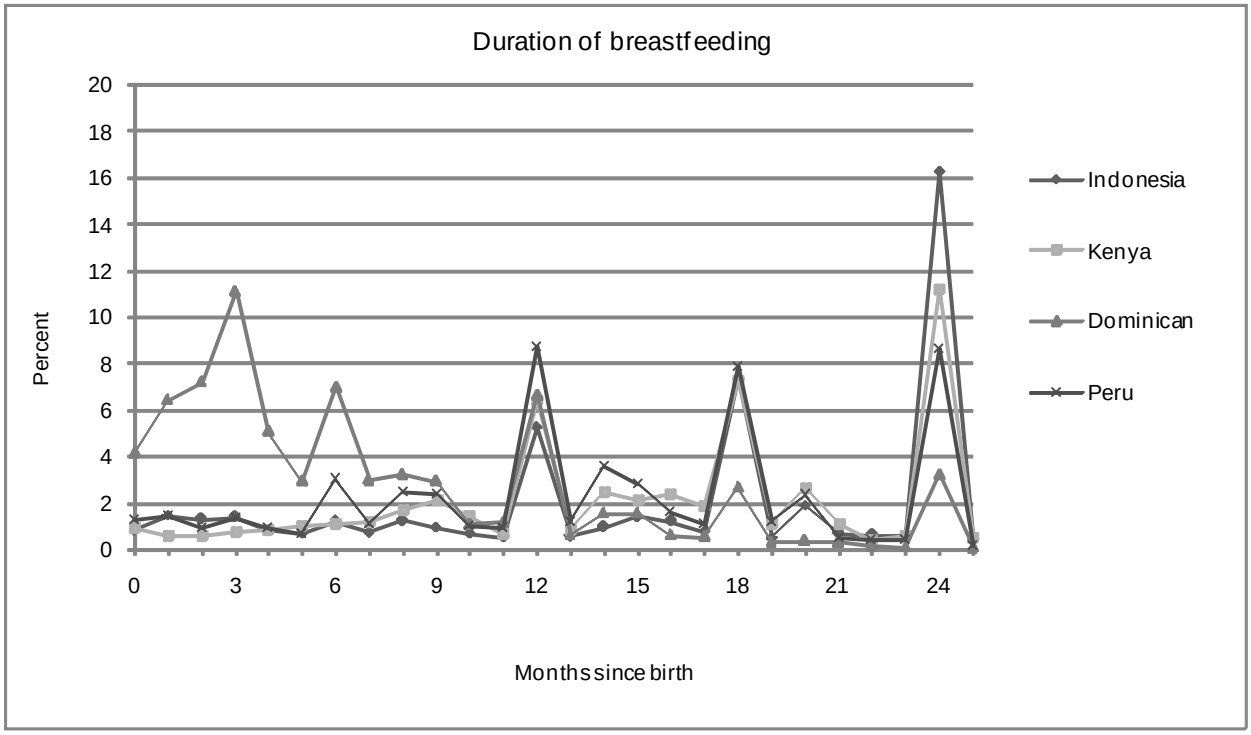
Based on the date of birth of a child, the information on postpartum contraceptive use from reproductive calendar section can be matched with the information from the individual core questionnaire.

4.1 Data Quality and Limitations

The information in the reproductive calendar and in the rest of the questionnaire on the duration of breastfeeding, postpartum amenorrhea, and postpartum abstinence relies on accurate reporting of the timing of each event by the respondent. However, many studies have reported that the events are subject to respondent recall errors (Sambisa and Curtis 1997; Haggerty and Rutstein 1999). Heaping of events on prominent durations such as 3, 6, 12, and 24 months are some of the symptoms of poor recall. Figures 2a-2d show the distribution of completed durations of breastfeeding, postpartum amenorrhea, postpartum abstinence, and time to first use of contraception after a birth by country.

In Kenya, Indonesia, and Peru, the duration of breastfeeding is severely heaped on 12, 18, and 24 months; particularly at 24 months in Kenya and Indonesia. In the Dominican Republic, however, the heaping occurs at 3, 6, 12, 18, and 24 months, particularly at 3 months. There is also a marked heaping of the duration of postpartum amenorrhea at 2, 6, and 12 months in all countries, particularly at 2 months. However, unlike durations of breastfeeding and postpartum amenorrhea, durations of postpartum abstinence and time to first use of contraception after a birth do not show severe heaping (Figures 2a-2d). A number of studies that have evaluated the quality of reproductive calendar data have found that information collected using the calendar is superior in quality to data collected using other retrospective data collection methods (Goldman et al. 1989; Westoff et al. 1990; Curtis 1996; Becker and Diop-Sidibé 2003).

Figure 2. Completed durations of breastfeeding, amenorrhea, abstinence, and time to first use of contraception in Kenya, Indonesia, the Dominican Republic, and Peru



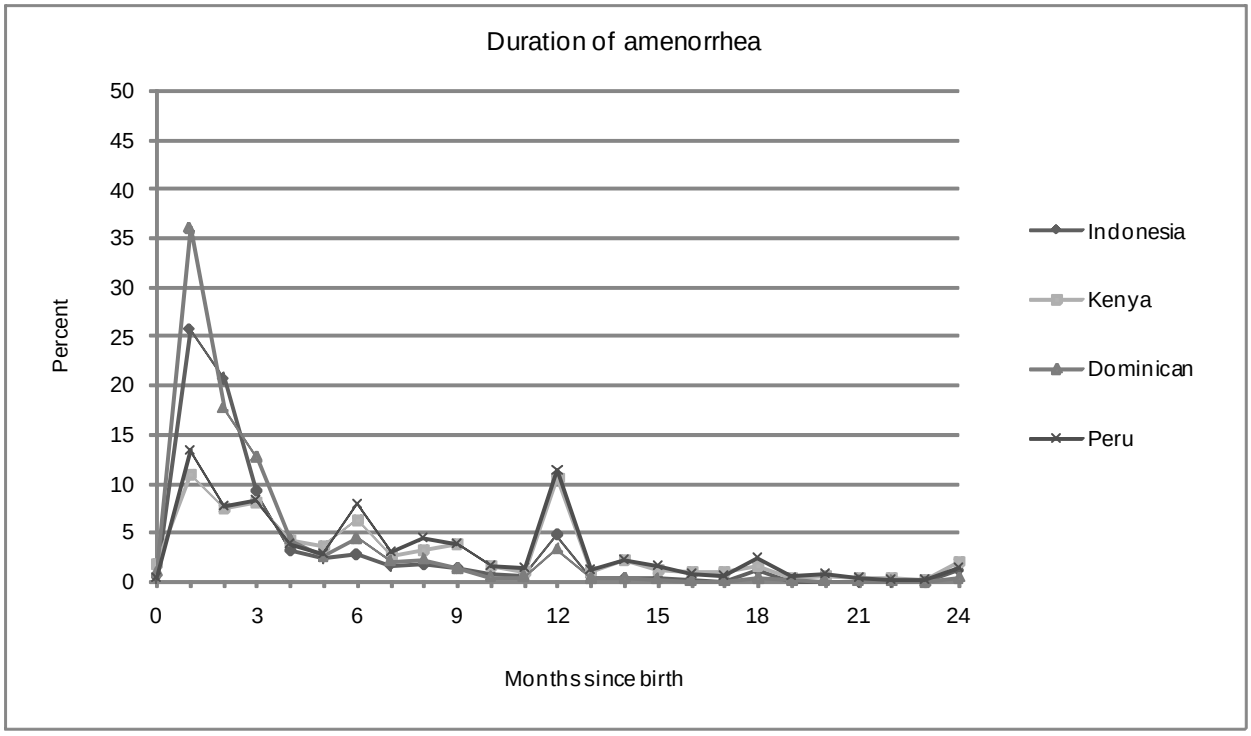
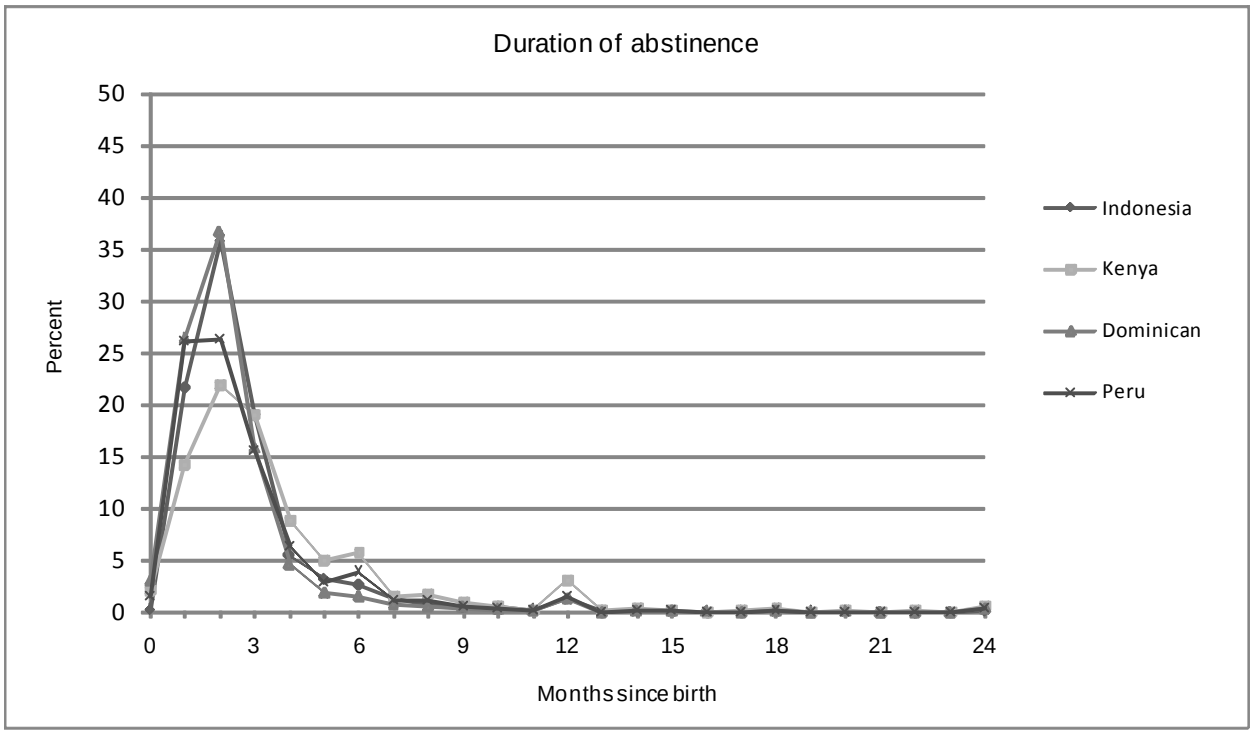
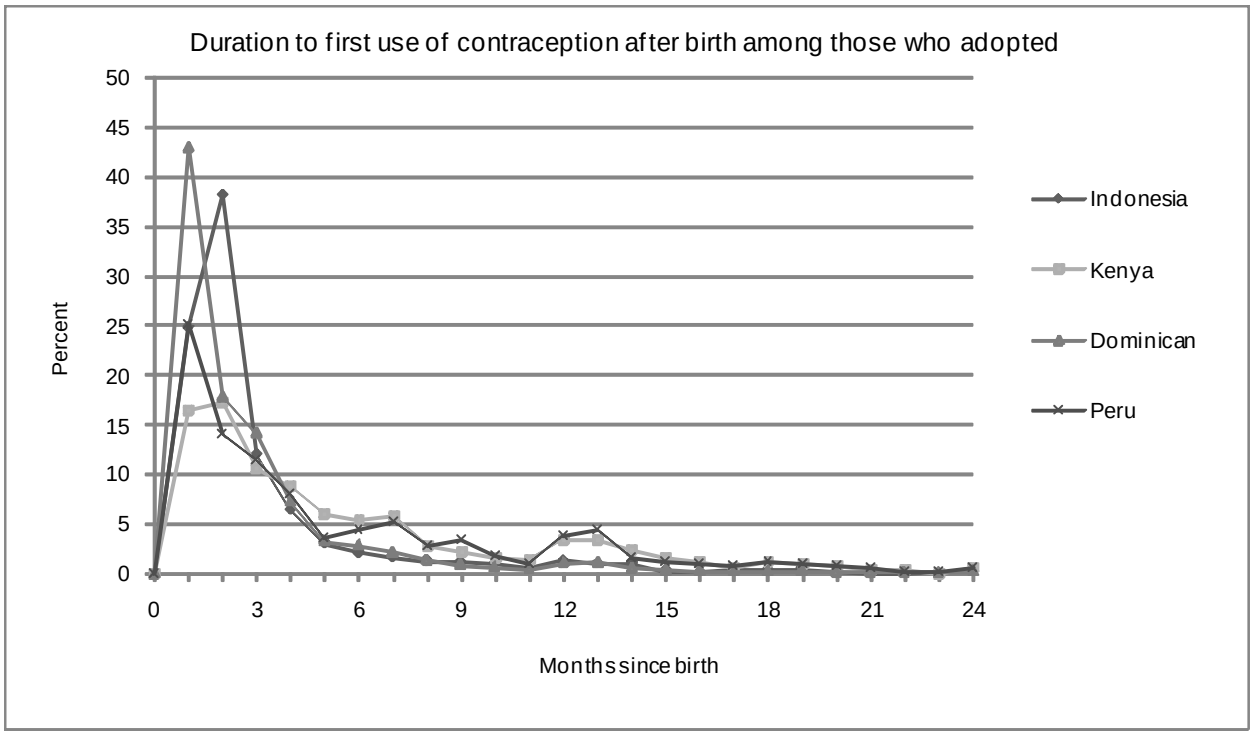


Figure 2—*Continued*





5

Analytical Method

Postpartum contraceptive initiation is defined as the first contraceptive use after a birth. The duration of the period from birth to adopting a contraceptive method and from birth to pregnancy is calculated based on the beginning and ending dates of each event.

In this study, births that occurred in the month before the survey and twin births are dropped from the analysis. Postpartum periods in which the mother did not adopt a contraceptive method or did not conceive before the date of the survey are censored (see Appendix). The duration to first use of a contraceptive method after a birth is calculated from the reproductive calendar data, whereas durations of breastfeeding, postpartum amenorrhea, and abstinence come from current-status data in the core questionnaire.

All births that occurred during the five calendar years before the interview are included in our analyses, except births that occurred in the month of the interview. The analyses are based on the number of births, and thus one mother may have contributed to more than one birth for the analysis. Haggerty and Rutstein (1999) argue that calculations for postpartum durations are less biased if the analysis uses child-based durations rather than women-based durations. Selection of a single episode of birth from the fertility history of the woman introduces bias in the calculations of postpartum duration. For instance, the duration of the postpartum period following last birth is longer than the average of all durations, while durations related to next-to-last births are shorter (Haggerty and Rutstein 1999).

Using life-table methods, we report the probability of initiating contraception at 2, 6, 9, and 12 months after a birth and median duration of time to first use of a contraceptive method after a birth, by socioeconomic and demographic characteristics. The cumulative percentages of those who initiated contraceptive use after a birth are obtained from a multiple decrement life table, with conception being the other decrement.[4]

Current-status medians are reported for durations of breastfeeding, postpartum amenorrhea, and postpartum abstinence. The medians are based on the proportion of women currently in each of these categories according to the current time since giving birth. The current-status medians are obtained by smoothing the distribution of duration using three-group moving averages. Moving averages are used instead of life-table methods to reduce (smooth) the fluctuations caused by sampling variation. Linear

[4] SAS® software is used to analyze the data used in this study. PROC PHREG in SAS® is used to obtain the percentages, and linear interpolation to obtain the median values. Copyright © 2004, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. For a detailed discussion of Survival Analysis using SAS see Allison, P. (1995)

interpolation[5] is then used to calculate the exact median month by locating the first duration where the proportions fall below 50 percent.

The median durations of breastfeeding, postpartum amenorrhea, abstinence, and postpartum contraceptive adoption are examined by a number of social, economic and demographic characteristics, including sex of the child, child survival, mother's age and education, location of residence (urban/rural), household wealth status,[6] preceding birth interval, delivery facility, employment, media exposure, and wantedness of the birth of the child. In our multivariate survival analysis, we investigate the independent effects of social, economic and demographic factors on durations of breastfeeding, postpartum amenorrhea, and time to adoption of contraception during the first 12 months after a birth.

[5] A mathematical method to find a value of a function between two known values assuming that the three values lie on a straight line.

[6] The DHS does not collect information on household income; instead DHS collects asset information through the DHS household questionnaire including information on household ownership of a number of consumer items ranging from a television to a bicycle or car, as well as dwelling characteristics such as type of drinking water available, sanitation facilities used, roofing and flooring. The wealth index is constructed from household asset data using principal components analysis (Rutstein and Johnson 2004). Based on the first factor loading, the wealth index score divides the population into five quintiles. In this paper, "poor" refers to the bottom two quintiles; "middle" refers to the middle quintile; and "rich" refers to the top two quintiles.

6

Background Characteristics and Postpartum Behavior

6.1 Background Characteristics

Table 1 presents background characteristics of all interviewed women in the four countries considered in this study. Kenya has the highest total fertility rate (TFR) among the four countries, at 4.9, while Indonesia, the Dominican Republic, and Peru have TFR of 3.0 or below. Contraceptive prevalence for currently married women is lowest in Kenya, at 39 percent and highest in the Dominican Republic, at 70 percent. Prevalence is 69 percent in Peru and 60 percent in Indonesia.

Forty-three percent of the women surveyed in Kenya, 16 percent of ever-married women in the survey in Indonesia,[7] and 37 percent of the women surveyed in the Dominican Republic and Peru, respectively, are age 15 to 24. Further, 13 percent in Kenya, 8 percent of ever-married women in Indonesia, 4 percent in the Dominican Republic, and 5 percent in Peru had no formal education.

The countries vary substantially in the type of marital union, whether formally married or in consensual union. For instance, in Kenya 55 percent of women surveyed are formally married and just 6 percent are in consensual union. In contrast, in the Dominican Republic 17 percent are married, while 43 percent are living together in union. Table 1 also shows that 22 percent of the households in Kenya, 18 percent in Indonesia, 3 percent in the Dominican Republic, and 17 percent in Peru had no access to mass media.[8]

The percentage of women aged 15 to 49 with at least one birth in the last five years before the interview is 72 percent in Kenya, 73 percent in the Dominican Republic, and 65 percent in Peru. In Indonesia, 92 percent of the ever-married women in the study had at least one birth in the last five years before the interview.

In Kenya, Indonesia, and Peru the median duration of breastfeeding is more than 20 months compared to only 6.6 months in the Dominican Republic. The median duration of amenorrhea is about 9 months in Kenya and Peru, but less than 4 months in Indonesia and the Dominican Republic.

[7] In Indonesia (IDHS 2003), the women's questionnaire was administered to ever-married women 15 to 49 years old.

[8] Exposure (access) to mass communication media was assessed by asking respondents how often they read a newspaper, watched television, or listened to a radio.

Table 1 Background characteristics of all interviewed women in four countries

Characteristic	Country			
	Kenya	Indonesia[a]	Dominican Republic	Peru
TFR[b]	4.9	2.6	3.0	2.9
Contraceptive prevalence for currently married women[b]	39.3	60.3	69.8	68.9
Mother's age (%)				
15-24	43.2	16.3	37.2	37.3
25-34	30.2	36.6	29.6	29.8
35-49	26.6	47.0	33.3	32.8
Education (%)				
No education	12.7	7.9	3.8	5.1
Primary	58.0	53.9	45.6	28.6
Secondary	29.3	38.1	50.7	66.3
Wealth status (%)				
Poor	34.2	40.7	33.8	32.6
Middle	19.3	19.8	20.8	21.0
Rich	46.6	39.7	45.4	46.5
Marital status (%)				
Never married	29.8		23.0	35.8
Married	54.5	94.5	17.3	31.3
Living together	5.6		42.5	24.8
Widowed	4.2	2.9	0.7	1.4
Divorced/Separated	7.0	2.6	16.6	6.3
No access to media (%)	21.8	18.1	3.4	17.3
Urban (%)	25.1	45.8	68.6	69.9
Mean				
Children ever born	3.8	2.7	2.9	3.3
Number of living children	3.4	2.4	2.7	3.0
% Women with at least one birth in the last five years	71.9	92.3	72.8	64.8
Median duration[b]				
Breastfeeding	20.1	22.3	6.6	21.9
Amenorrhea	9.7	3.8	3.2	9.0
Abstinence	2.9	2.2	2.0	2.5
Total women interviewed	8,195	29,483	23,384	27,843

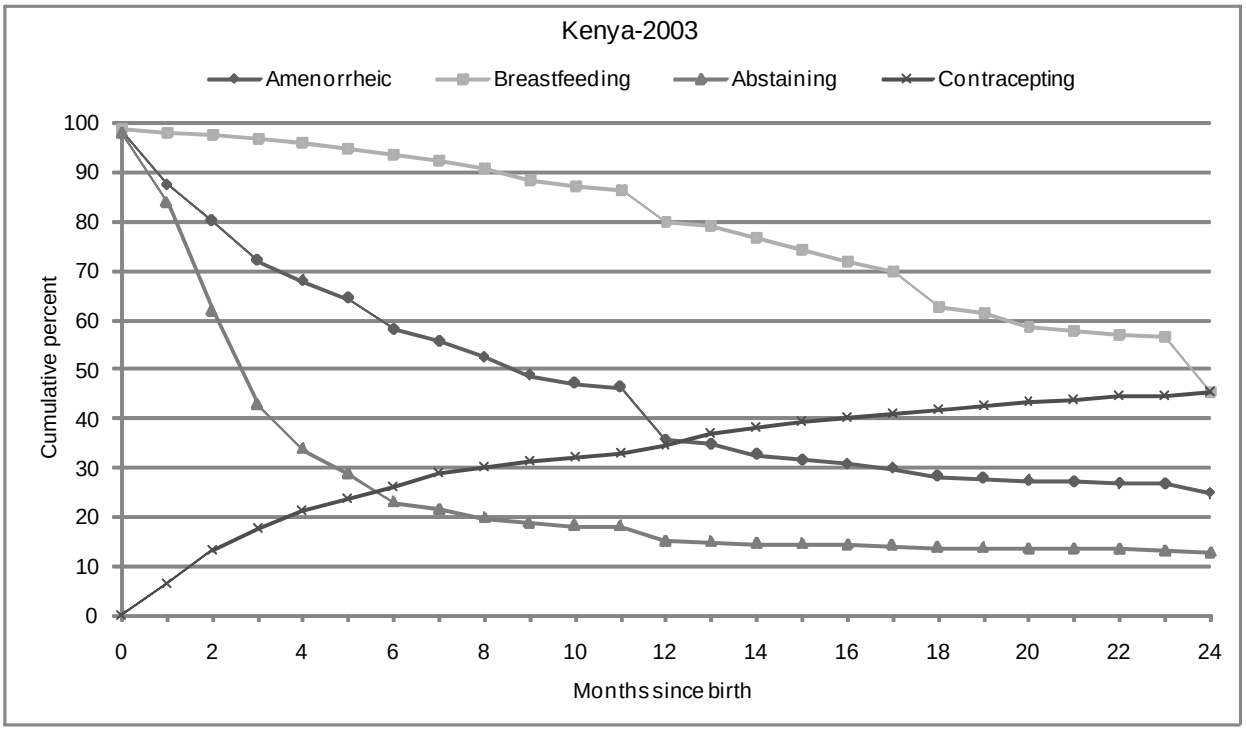
[a] The women's questionnaire was administered to ever-married women 15-49 years old
[b] Culled from DHS Reports for the respective countries

6.2 Postpartum Behavior

Figures 3a-3d present the cumulative percentage of mothers who initiated contraceptive use, the percentage who were still breastfeeding, still amenorrheic, and still abstaining at each duration after a birth, by country. Contraceptive adoption increases rapidly with time since birth in Indonesia, the Dominican Republic, and Peru, though not in Kenya. During the first 6 months after a birth, nearly 60 percent of mothers in Indonesia and the Dominican Republic adopted a contraceptive method, compared to 45 percent in Peru and 25 percent in Kenya.

In Kenya, Indonesia, and Peru more than 90 percent of children are still breastfed at 6 months postpartum. In the Dominican Republic, the proportion of mothers still breastfeeding at 6 months postpartum was about 60 percent. A majority of mothers in Kenya and Peru were still amenorrheic at 6 months postpartum (about 60 percent in Kenya and 55 percent in Peru). In contrast, 35 percent in Indonesia and 20 percent in the Dominican Republic were still amenorrheic at 6 months postpartum. In all four countries in this study, less than 25 percent of mothers were practicing sexual abstinence by 6 months after a birth.

Figure 3. Cumulative percent still breastfeeding, amenorrheic and abstaining, and cumulative percent initiating contraceptive use by duration postpartum



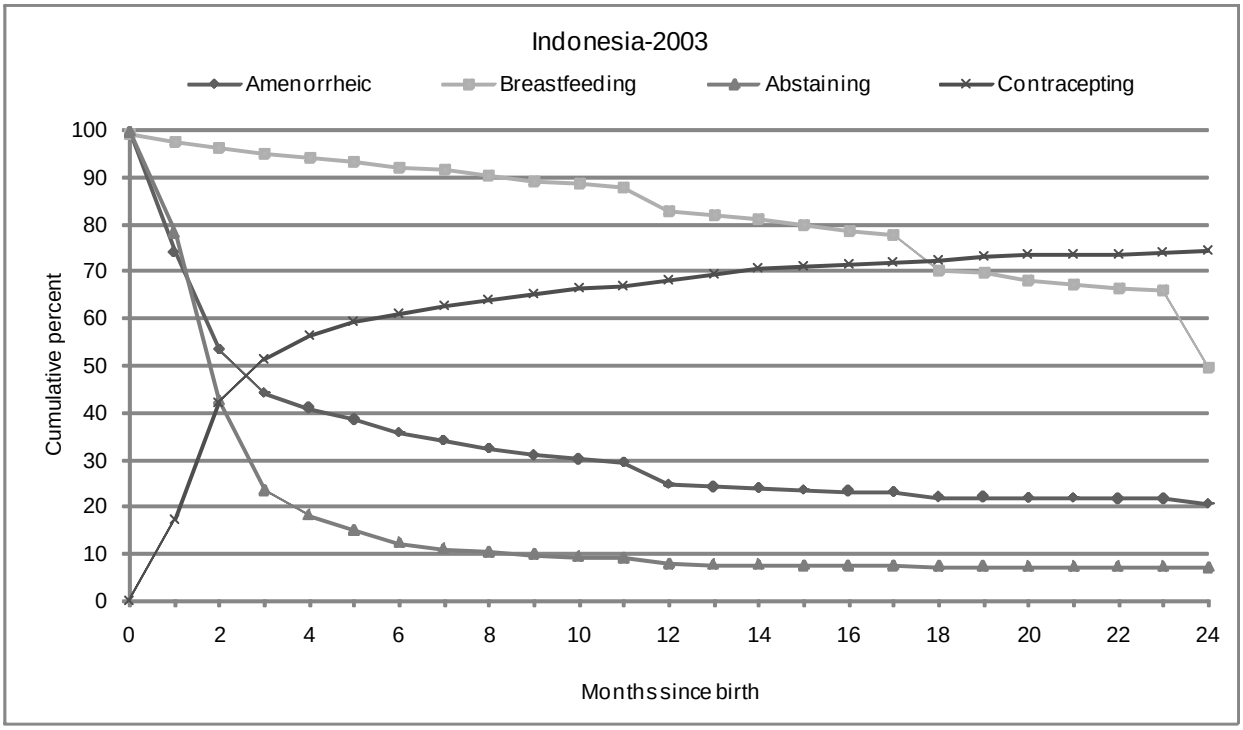
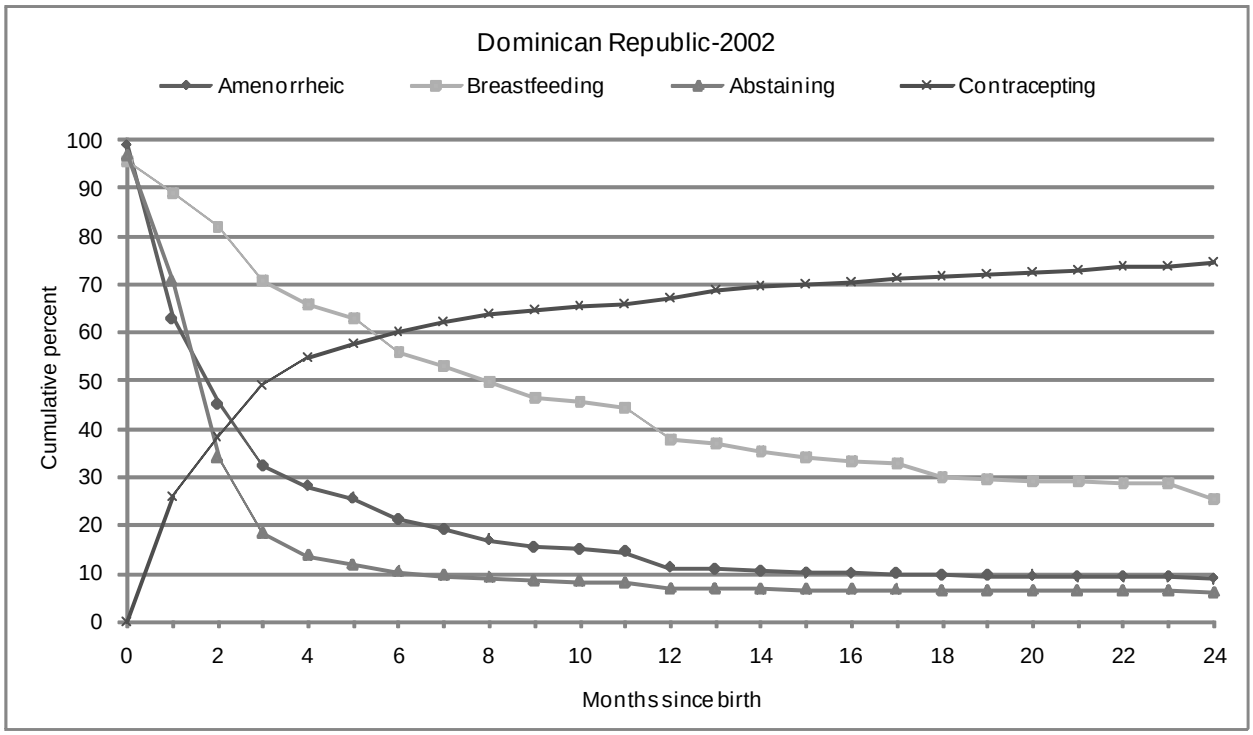
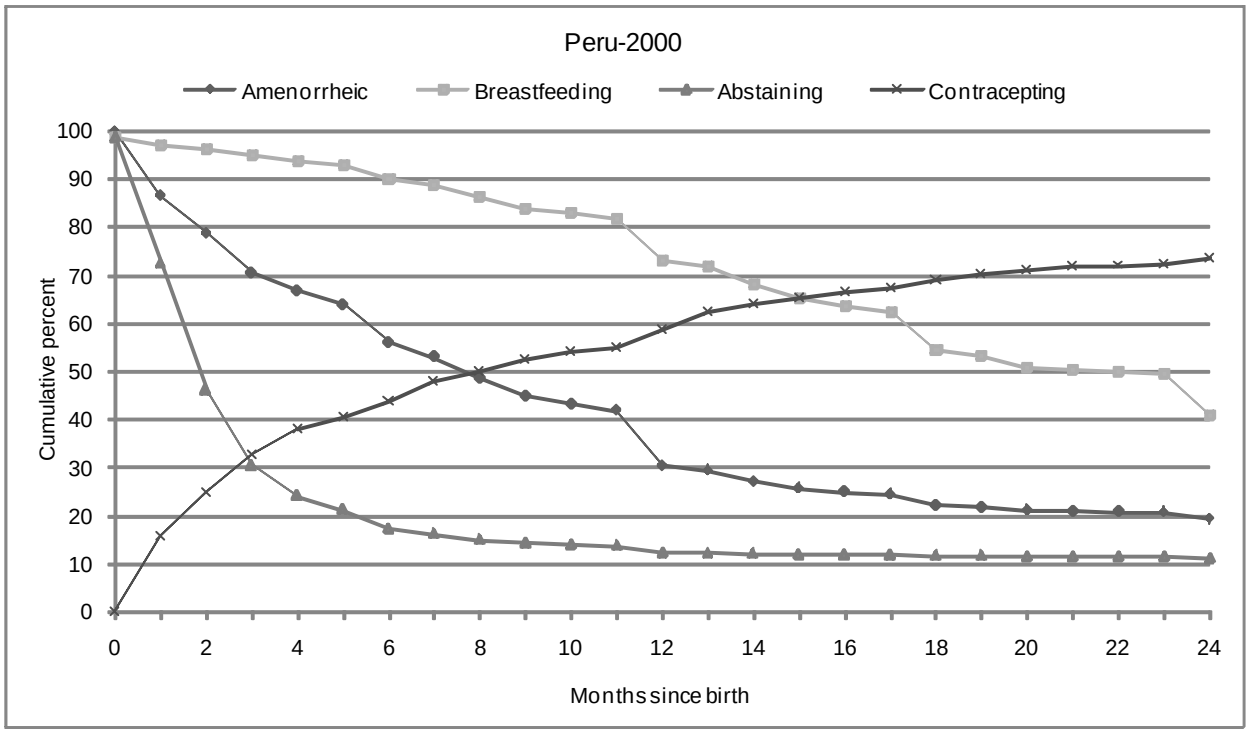


Figure 3—*Continued*





Based on the reproductive calendar data from each country, Table 2a presents the proportion of mothers who, during the five years before the interview, did not use contraception after a birth but remained non-pregnant, who did not use contraception after a birth and became pregnant, or who adopted a contraceptive method after a birth. The proportion of mothers who did not use contraception after a birth but remained non-pregnant ranges from 13 percent in the Dominican Republic to 29 percent in Kenya. The percentage of women who did not adopt a method and became pregnant is highest in Kenya (31 percent), and lowest in Indonesia (11 percent).

The proportion of mothers who adopted a contraceptive method after a birth (and thus avoided pregnancy) ranges from 41 percent in Kenya to 75 percent in Indonesia. In the Dominican Republic and Peru, 71 percent and 68 percent, respectively, adopted a contraceptive method after a birth to avoid another pregnancy.

Table 2b shows that, among those who started using contraception after a birth, injectables are the dominant contraceptive method adopted after a birth in Kenya (37 percent), Indonesia (62 percent), and Peru (34 percent). The pill is the second most popular method choice in Kenya (27 percent) and Indonesia (20 percent). In the Dominican Republic, the pill is the dominant contraceptive method adopted after a birth, with 43 percent of the women adopting the method. Also of note is the adoption of condom as a family planning method, which ranges from as low as 1.4 percent in Indonesia to 9.0 percent in Peru.

Table 2a Contraceptive use status after a birth in the last five years before the interview (percent)

	Country			
Contraceptive use status	Kenya	Indonesia	Dominican Republic	Peru
Did not use contraception after a birth, but remained non-pregnant	28.5	13.9	13.2	17.4
Did not use contraception after a birth and became pregnant	30.5	10.8	16.0	14.8
Adopted a contraceptive method after a birth	41.0	75.4	70.8	67.8
Total	100.0	100.0	100.0	100.0

Table 2b Type of method adopted following a birth (percent)

	Country			
Type of method	Kenya	Indonesia	Dominican Republic	Peru
Pill	26.9	19.5	42.6	10.3
Injectables	36.8	61.7	6.7	33.7
Norplant	1.9	4.2	0.8	0.2
IUD	2.3	5.6	4.7	10.6
Diaphragm	0.0	0.1	0.0	0.0
Condom	4.1	1.4	4.4	9.0
Female Sterilization	2.3	1.9	26.2	9.0
Male Sterilization	0.0	0.0	0.0	0.2
LAM	0.0	0.8	0.0	0.0
Periodic Abstinence	20.4	2.1	3.2	20.8
Withdrawal	2.6	2.0	4.4	4.7
Other Traditional	2.6	0.8	6.9	1.3
Total	100.0	100.0	100.0	100.0

7

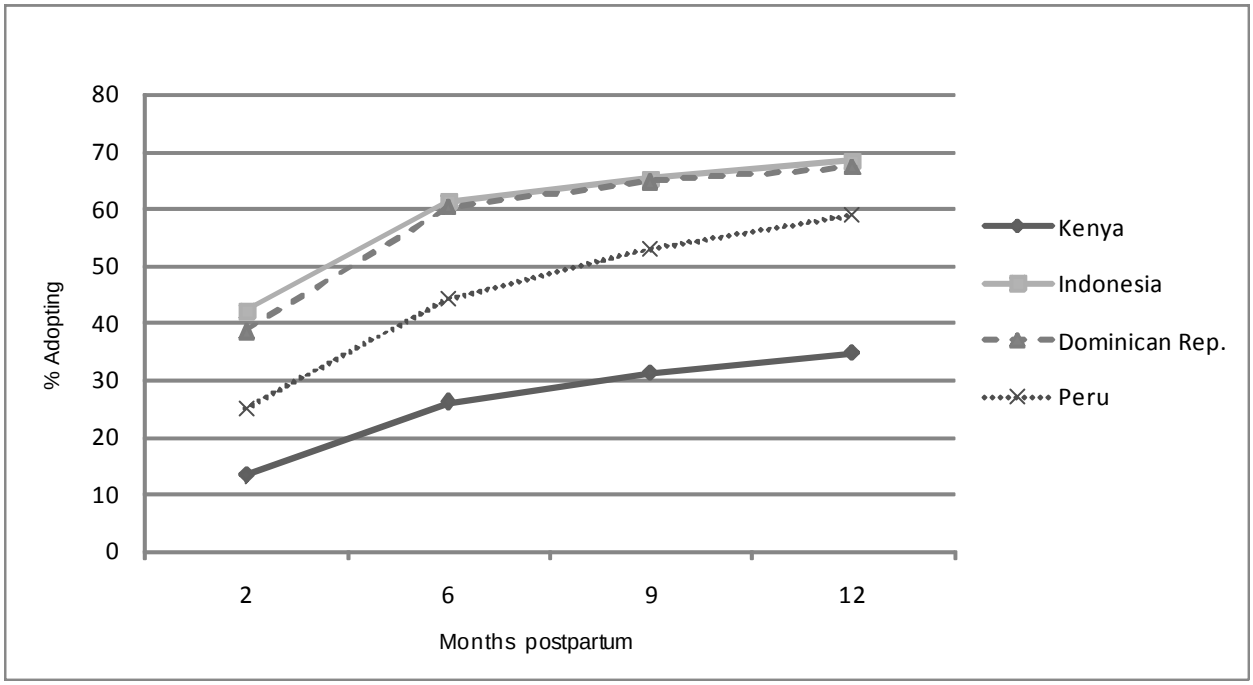
Differentials in Durations of Postpartum Contraceptive Adoption and Chance of Conception

A period of non-use of contraception during the postpartum period comes to an end either when a woman adopts a contraceptive method or when she becomes pregnant. In life table analysis, these two events are competing outcomes and hence require use of a multiple decrement life table to obtain the probabilities of adopting a contraceptive method and the chance of conception after a birth.

7.1 Differentials in Postpartum Contraceptive Adoption

Figure 4 presents the probability of adopting a contraceptive method by 2, 6, 9, and 12 months after a birth. By the second month after a birth, about 40 percent of women surveyed in Indonesia and the Dominican Republic, 25 percent in Peru, and 13 percent in Kenya started to use a contraceptive method. Over all, the proportion of women who initiated contraceptive use at each duration increases in all four countries.

Figure 4. Percentage of women adopting a contraceptive method after a birth by postpartum duration



Tables 3a to 3d report socioeconomic and demographic differentials of postpartum contraceptive adoption at 2, 6, 9, and 12 months after a birth. The median time to initiating contraception after a birth was 32 months in Kenya, 3 months in both Indonesia and the Dominican Republic, and 8 months in Peru. The likelihood of adopting contraception by 2, 6, 9, or 12 months does not appear to vary by sex of the child. In Kenya, Indonesia, and Peru the proportion of women who had initiated contraceptive use at each time period is lower if their child had died than if their child was alive. This trend does not hold for the Dominican Republic, however, the median time to contraceptive adoption is similar regardless of the child's survival status.

Postpartum contraceptive adoption also differs by urban-rural residence. The difference between urban and rural residents in the percentage of mothers adopting a contraceptive method at 2 months after a birth is approximately 20 percent in Peru, 10 percent in Kenya and Indonesia, but less than 2 percent in the Dominican Republic. The median time to contraceptive adoption for women in rural Kenya is 37 months postpartum compared to 12 months postpartum for urban women. In Peru the median duration to first use of contraception after a birth was 14 months for rural women compared to 4 months for urban women. The urban-rural difference in Indonesia and the Dominican Republic is small, however.

Mothers with higher levels of education have the shortest median time to initiation of postpartum contraception in all four countries. In Kenya, for example, at two months after birth only 2 percent of mothers with no education have started using contraception compared to 20 percent with at least secondary education. Similarly, in all four countries women from wealthier households have shorter median time to initiation of postpartum contraception than women from poorer households.

The length of the preceding birth interval influences the succeeding intervals. In all four countries, mothers have the shortest median time to initiating use when the child has longest preceding birth interval. These mothers probably are using contraception for spacing births.

Media exposure has a significant influence on initiating contraceptive use after a birth. In the four countries studied, there is more than a 10 percentage point difference at each duration postpartum between mothers who are exposed to at least one media source regularly and those who are not exposed at all (except for a smaller difference in Kenya at the 2-month duration). Further, the median duration to adopting contraception is more than twice as long for mothers who are not exposed at all compared to those who are regularly exposed to at least one media source.

Women who were not pregnant at the time of the interview but had had one or more births in the 5 years preceding the survey were asked whether each birth was wanted at the time, at a later time, or not at all. In all four countries there is no substantial difference in the median time to adoption of a contraceptive method among the three categories measuring wantedness of a pregnancy.

In all four countries mothers who delivered at home have a lower likelihood of adopting a contraceptive method at each duration after a birth compared to mothers who delivered at a health facility (whether private or public). The differences in the median durations to postpartum contraceptive adoption by place of delivery are substantial in Kenya (about 38 months), the Dominican Republic (about 22 months) and Peru (about 8 months). In contrast, in Indonesia the difference is small.

Table 3a Percentage initiating a contraceptive method at 2, 6, 9, and 12 months postpartum. Life table estimates from competing risk baseline hazard model: Kenya 2003

Differentials	% initiating a contraceptive method at month				Median (months)	n
	2	6	9	12		
Sex of the child						
Male	13.8	26.3	31.2	34.3	32.5	2,793
Female	12.8	26.0	31.2	35.2	31.5	2,669
Child survival						
Alive	13.8	27.1	32.5	36.1	28.4	5,015
Died	8.1	15.7	16.8	18.4	> 58	447
Residence						
Urban	20.7	40.0	45.7	49.5	12.3	1,398
Rural	11.6	22.9	27.9	31.3	37.0	4,064
Mother's education						
No education	1.9	6.3	8.5	10.2	> 58	1,094
Primary	13.6	25.8	30.3	33.8	32.3	3,189
At least secondary	20.3	40.9	49.6	54.8	9.3	1,179
Wealth						
Poor	7.3	15.0	19.2	22.0	> 58	2,408
Middle	13.2	27.5	32.5	37.9	21.6	982
Rich	20.9	39.5	45.7	49.2	12.4	2,072
Mother's age at birth						
15-24 years	11.6	24.1	29.8	32.9	31.9	1,844
25-34 years	14.4	28.2	33.2	36.9	28.3	2,614
35-49 years	13.7	24.5	28.8	32.5	37.4	1,004
Preceding birth interval						
1st Birth	12.9	27.5	33.6	36.3	26.9	1,403
< 24 months	12.4	23.9	28.8	33.6	35.5	956
24-47 months	11.7	22.3	27.0	30.4	38.4	2,155
48+ months	18.3	34.7	39.3	43.1	17.1	948
Delivery facility						
Home	8.2	17.4	21.1	24.7	50.8	3,157
Public health facility	21.5	39.0	45.4	49.0	11.8	801
Private health facility	20.2	38.9	46.9	50.3	12.5	1,367
Employment						
Does not work for cash	12.9	24.5	28.5	31.2	45.4	2,225
Work for cash	13.6	27.1	32.8	36.8	26.0	3,226
Media exposure						
No exposure	9.3	18.2	21.7	24.7	> 58	2,305
To at least one regularly	16.1	31.4	37.6	41.5	18.3	3,157
Wantedness of child						
Wanted then	14.0	28.0	32.8	35.8	36.1	2,888
Wanted later	11.2	23.3	29.6	33.7	29.4	1,462
Wanted no more	14.6	25.8	29.9	33.8	29.8	1,108
All	13.3	26.1	31.2	34.7	31.9	5,462

Table 3b Percentage initiating a contraceptive method at 2, 6, 9, and 12 months postpartum. Life table estimates from competing risk baseline hazard model: Indonesia 2003

Differentials	% initiating a contraceptive method at month				Median (months)	n
	2	6	9	12		
Sex of the child						
Male	42.4	61.9	65.7	68.4	2.8	7,933
Female	41.2	60.3	64.7	68.3	2.9	7,390
Child survival						
Alive	42.4	62.0	66.1	69.3	2.8	14,679
Died	28.1	39.3	40.8	42.6	41.8	644
Residence						
Urban	47.6	65.4	68.7	71.1	2.3	6,206
Rural	36.6	57.3	62.0	65.7	3.7	9,117
Mother's education						
No education	25.3	37.6	42.4	45.5	22.7	725
Primary	39.2	57.4	61.4	65.3	3.5	7,009
At least secondary	46.0	67.5	71.5	73.9	2.4	7,589
Wealth						
Poor	33.1	52.0	56.5	60.1	5.1	8,057
Middle	45.6	66.8	70.9	73.7	2.4	2,473
Rich	49.5	68.8	72.3	75.1	2.0	4,793
Mother's age at birth						
15-24 years	45.0	66.5	71.1	74.1	2.5	3,855
25-34 years	42.5	63.0	67.0	70.3	2.8	8,250
35-49 years	36.4	50.7	54.4	57.6	5.5	3,218
Preceding birth interval						
1st Birth	43.3	65.6	70.1	72.6	2.6	5,268
< 24 months	36.5	52.0	55.3	57.5	4.8	1,393
24-47 months	38.2	53.3	56.4	59.6	4.3	3,413
48+ months	43.6	63.4	67.7	71.8	2.7	5,249
Delivery facility						
Home	38.4	57.0	60.8	63.9	3.5	4,012
Public health facility	48.1	68.3	72.5	75.8	2.5	1,620
Private health facility	44.7	67.4	72.1	76.2	2.2	9,471
Employment						
Does not work for cash	43.7	63.2	67.2	70.2	2.6	8,691
Work for cash	39.0	58.1	62.2	65.5	3.4	6,602
Media exposure						
No exposure	32.9	49.4	53.0	56.7	6.5	4,882
To at least one regularly	45.1	65.6	69.9	72.9	2.5	10,441
Wantedness of child						
Wanted then	42.2	62.3	66.5	69.5	2.6	12,325
Wanted later	41.4	58.9	63.3	66.6	3.0	1,883
Wanted no more	39.4	53.5	55.6	60.4	3.9	1,053
All	41.9	61.2	65.2	68.3	2.9	15,323

Table 3c Percentage initiating any contraceptive method at 2, 6, 9, and 12 months postpartum. Life table estimates from competing risk baseline hazard model: Dominican Republic 2002

Differentials	% initiating a contraceptive method at month 2	6	9	12	Median (months)	n
Sex of the child						
Male	38.4	59.8	64.8	67.7	3.2	5,358
Female	38.7	60.6	64.5	66.8	3.1	5,197
Child survival						
Alive	38.5	60.2	64.7	67.3	3.2	10,244
Died	39.5	60.4	62.7	64.6	3.4	311
Residence						
Urban	39.1	61.6	66.1	68.4	3.1	6,181
Rural	37.5	57.5	61.7	65.1	3.4	4,374
Mother's education						
No education	27.9	44.1	47.8	50.4	11.7	656
Primary	36.5	56.5	60.5	63.5	3.7	5,819
At least secondary	41.7	65.9	71.0	73.2	2.7	4,080
Wealth						
Poor	34.4	55.0	58.9	62.3	4.1	6,166
Middle	40.2	62.8	67.5	69.3	2.9	1,992
Rich	43.1	65.8	70.7	72.8	2.6	2,397
Mother's age at birth						
15-24 years	32.7	56.7	61.9	65.7	3.9	4,630
25-34 years	41.8	63.5	67.6	69.5	2.8	4,712
35-49 years	44.3	57.9	60.9	62.6	2.9	1,213
Preceding birth interval						
1st Birth	29.9	56.0	61.8	64.4	4.2	3,321
< 24 months	40.9	60.3	63.7	67.3	3.0	2,146
24-47 months	41.0	61.0	65.3	67.6	2.9	3,060
48+ months	45.2	64.7	68.0	70.2	2.5	2,028
Delivery facility						
Home	21.6	37.0	38.1	40.9	26.5	285
Public health facility	36.2	58.0	62.6	65.6	3.6	8,282
Private health facility	47.3	69.9	74.0	75.1	2.2	1,907
Employment						
Does not work for cash	37.2	57.9	62.5	65.2	3.5	7,345
Work for cash	41.1	64.5	68.5	71.0	2.8	3,176
Media exposure						
No exposure	29.5	47.0	51.2	53.7	8.2	1,015
To at least one regularly	39.2	61.2	65.6	68.2	3.0	9,540
Wantedness of child						
Wanted then	38.6	61.2	65.8	68.2	3.1	5,015
Wanted later	37.3	59.1	64.1	67.7	3.4	3,532
Wanted no more	40.3	59.1	61.9	63.6	3.1	1,976
All	38.5	60.2	64.6	67.2	3.2	10,555

Table 3d Percentage initiating any contraceptive method at 2, 6, 9, and 12 months postpartum. Life table estimates from competing risk baseline hazard model: Peru 2000

Differentials	% initiating a contraceptive method at month				Median (months)	n
	2	6	9	12		
Sex of the child						
Male	24.8	43.9	53.2	59.2	7.8	6,390
Female	25.1	44.1	52.3	58.1	8.1	6,158
Child survival						
Alive	25.1	44.1	52.9	58.9	7.9	12,042
Died	20.9	40.9	47.6	50.4	11.8	533
Residence						
Urban	34.9	57.7	66.6	71.5	3.8	5,636
Rural	12.4	27.5	36.3	43.5	13.6	6,939
Mother's education						
No education	11.9	20.7	27.5	32.7	24.2	1,209
Primary	16.1	30.7	39.0	46.5	12.7	5,683
At least secondary	33.3	57.6	67.3	72.1	3.9	5,683
Wealth						
Poor	15.6	30.1	38.3	45.4	12.9	7,828
Middle	30.8	52.4	63.0	69.0	5.3	2,284
Rich	37.0	63.3	72.3	76.0	3.2	2,463
Mother's age at birth						
15-24 years	25.3	44.1	53.3	59.2	8.0	3,768
25-34 years	25.3	46.4	55.2	61.2	6.9	5,785
35-49 years	23.7	39.1	47.5	53.2	11.1	3,022
Preceding birth interval						
1st Birth	25.4	47.4	57.3	61.6	6.6	3,662
< 24 months	23.2	42.6	51.8	59.4	8.4	1,879
24-47 months	21.1	36.7	44.5	51.1	11.7	4,133
48+ months	29.8	49.3	57.8	63.7	6.2	2,901
Delivery facility[a]						
Home	15.4	31.7	41.6	49.8	12.0	4,485
Public health facility	37.9	61.8	70.4	75.5	3.5	4,554
Private health facility	33.8	62.7	74.4	78.0	3.3	456
Employment						
Does not work for cash	27.7	47.4	56.3	61.6	6.7	5,494
Work for cash	22.6	41.1	49.9	56.2	9.1	7,071
Media exposure						
No exposure	15.8	28.9	36.4	43.6	13.9	4,604
To at least one regularly	28.7	50.4	59.8	65.2	5.9	7,971
Wantedness of child						
Wanted then	26.4	48.1	57.3	63.3	6.4	4,799
Wanted later	26.7	49.3	59.0	64.2	6.2	2,956
Wanted no more	21.9	35.8	43.6	49.8	12.0	4,815
All	24.9	44.0	52.8	58.6	8.0	12,575

[a] Information on place of delivery was available only for last birth

7.2 Differentials in the Chance of Conception following a Birth

After a birth, women who delay using contraception face a chance of becoming pregnant before they begin use. The median time to conception, in the absence of contraceptive adoption, is 21 months in the Dominican Republic, 24 months in Kenya, 29 months in Peru and 36 months in Indonesia. Early use of contraception lessens the chance that a woman becomes pregnant at each duration postpartum.

Tables 4a to 4d present the probability of conception for those mothers who have not adopted contraception after a birth. By 6 months after a birth, among non-contracepting women, in Kenya, 4 percent became pregnant, in Indonesia and Peru, 3 percent, and in the Dominican Republic, 10 percent. By 9 months after a birth, 8 percent in Kenya and Indonesia became pregnant, as did 18 percent in the Dominican Republic, and 6 percent in Peru. Similarly, by 12 months after a birth, 14 percent of non-contracepting women in Kenya became pregnant, 12 percent in Indonesia and Peru, and 26 percent in the Dominican Republic.

The chance of conception is higher in the Dominican Republic than the other three countries in the study possibly because the duration of breastfeeding is shorter (the median duration of breastfeeding in the Dominican Republic is about 7 months compared to 21 months in Kenya, for example).

The proportion of non-contracepting women who became pregnant at 6, 9, and 12 months after a birth more than doubles in Kenya, Indonesia, and Peru if a child died—and nearly doubles in the Dominican Republic. The median time to conception after the death of a child is 15 months in Kenya and Peru, 32 months in Indonesia, and 13 months in the Dominican Republic. Also, in all four countries the chance of conception is consistently higher for young mothers.

The proportion of non-contracepting women who became pregnant by 12 months postpartum varies with mother's education. In Indonesia and the Dominican Republic, mothers with at least secondary education have a higher probability of conception by 12 months postpartum than mothers with no formal education. In Indonesia women with at least secondary education have the shortest median time to conception (30 months). In contrast, in the remaining three countries women with at least secondary education have the longest median time to conception (35 months in Kenya, 27 months in the Dominican Republic, and ≥ 48 months in Peru).

In all four countries, the probability of conception by wealth status of the household has no consistent pattern at any of the postpartum durations studied. However, the median duration to conception is longer among women in wealthier households than poorer households. The difference is about 4 months in Kenya, 5 months in Indonesia, 12 months in the Dominican Republic, and more than 23 months in Peru.

Women who are not working for cash have a higher median time to conception compared to women working for cash—ranging from a difference of less than 1 month in Kenya to 15 months in Indonesia. Similarly, mothers who have some exposure to the media have a longer duration to conception than mothers who have no exposure.

Table 4a Chance of conception at 6, 9, and 12 months postpartum for women not adopting contraception. Life table estimates from competing risk baseline hazard model: Kenya 2003

Differentials	Probability of conception (%) at month			Median (months)	n
	6	9	12		
Sex of the child					
Male	4.5	7.9	14.3	23.6	1,683
Female	3.6	7.1	13.5	24.3	1,616
Child survival					
Alive	2.6	5.4	10.7	24.8	2,645
Died	17.8	26.3	40.9	14.9	354
Residence					
Urban	4.5	7.9	14.3	27.5	677
Rural	3.6	7.1	13.5	23.5	2,622
Mother's education					
No education	5.2	7.7	12.8	24.8	989
Primary	4.2	7.8	14.4	22.9	1,897
At least secondary	2.4	6.7	14.0	34.5	413
Wealth					
Poor	4.3	7.2	13.0	22.9	1,826
Middle	2.9	7.8	16.0	24.6	554
Rich	4.3	8.1	14.3	27.0	919
Mother's age at birth					
15-24 years	4.2	8.2	15.7	21.2	1,173
25-34 years	3.6	7.1	13.6	22.9	1,502
35-49 years	4.9	7.5	12.0	32.7	624
Preceding birth interval					
1st birth	4.3	7.8	15.8	24.4	792
< 24 months	5.8	10.5	20.5	19.5	621
24-47 months	3.6	6.3	10.9	23.8	1,405
48+ months	2.9	7.2	11.8	49.6	481
Delivery facility					
Home	4.0	7.3	14.3	24.0	2,279
Public health facility	4.5	8.6	12.9	23.5	341
Private health facility	3.0	7.0	14.2	25.2	613
Employment					
Does not work for cash	4.9	8.1	14.3	23.5	1,485
Work for cash	3.6	7.2	13.7	24.0	1,807
Media exposure					
No exposure	4.7	7.7	14.1	24.5	1,707
To at least one regularly	3.6	7.4	13.8	23.4	1,592
Wantedness of child					
Wanted then	4.0	7.2	13.1	24.4	1,796
Wanted later	5.0	9.5	18.0	20.7	868
Wanted no more	2.8	5.7	10.5	26.6	631
All	4.1	7.5	13.9	23.8	3,299

Table 4b Chance of conception at 6, 9, and 12 months postpartum for women not adopting contraception. Life table estimates from competing risk baseline hazard model: Indonesia 2003

Differentials	Probability of conception (%) at month 6	9	12	Median (months)	n
Sex of the child					
Male	2.9	6.9	11.0	37.5	2,100
Female	3.7	8.5	13.1	34.0	1,978
Child survival					
Alive	2.3	6.2	10.3	37.8	3,711
Died	19.5	31.0	38.4	31.5	367
Residence					
Urban	3.6	9.6	14.8	37.9	1,239
Rural	3.1	6.5	10.2	35.5	2,839
Mother's education					
No education	3.5	10.8	12.7	44.3	361
Primary	2.5	6.2	9.6	37.1	2,157
At least secondary	4.4	9.2	15.5	30.1	1,560
Wealth					
Poor	3.2	7.0	11.3	33.7	2,758
Middle	2.9	7.7	10.9	36.7	481
Rich	3.7	9.1	14.3	38.9	839
Mother's age at birth					
15-24 years	5.1	11.1	16.5	25.6	896
25-34 years	3.7	7.2	11.8	33.6	2,056
35-49 years	1.3	6.0	9.3	> 50	1,126
Preceding birth interval					
1st Birth	5.3	11.4	16.1	29.0	1,294
< 24 months	3.4	10.3	15.9	28.2	454
24-47 months	1.9	5.1	10.2	35.3	1,130
48+ months	2.3	5.3	8.1	> 50	1,200
Delivery facility					
Home	2.8	6.7	10.6	36.5	316
Public health facility	2.8	7.4	10.8	36.9	2,924
Private health facility	3.6	9.0	13.7	32.8	736
Employment					
Does not work for cash	4.1	8.8	13.9	30.9	2,191
Work for cash	2.3	6.4	9.7	45.9	1,883
Media exposure					
No exposure	3.3	7.5	12.1	32.3	1,889
To at least one regularly	3.3	7.9	12.0	38.1	2,189
Wantedness of child					
Wanted then	2.8	5.9	10.3	37.6	3,217
Wanted later	6.6	17.9	23.1	22.7	513
Wanted no more	2.2	9.0	11.3	35.5	318
All	3.3	7.7	12.0	36.0	4,078

Table 4c Chance of conception at 6, 9, and 12 months postpartum for women not adopting contraception. Life table estimates from competing risk baseline hazard model: Dominican Republic 2002

Differentials	Probability of conception (%) at month 6	9	12	Median (months)	n
Sex of the child					
Male	10.2	18.6	27.0	20.3	1,671
Female	8.8	17.1	25.0	21.6	1,600
Child survival					
Alive	9.1	17.2	25.3	20.9	3,145
Died	23.2	38.1	47.5	13.0	126
Residence					
Urban	8.1	15.3	23.5	23.0	1,726
Rural	12.0	22.3	30.5	18.1	1,545
Mother's education					
No education	6.2	12.3	20.0	20.3	330
Primary	10.1	19.1	27.4	18.6	1,974
At least secondary	9.1	16.9	24.8	27.4	967
Wealth					
Poor	10.6	19.6	28.8	17.3	2,208
Middle	6.4	14.2	24.4	24.1	509
Rich	9.7	17.1	21.7	28.5	554
Mother's age at birth					
15-24 years	10.6	18.9	27.9	18.7	1,615
25-34 years	9.0	17.4	24.8	21.0	1,258
35-49 years	7.4	15.7	23.7	33.3	398
Preceding birth interval					
1st Birth	11.6	19.3	27.2	23.2	1,124
< 24 months	9.1	18.4	28.7	17.8	669
24-47 months	7.3	17.0	23.7	19.2	919
48+ months	8.7	15.3	23.9	27.4	558
Delivery facility					
Home	10.7	13.7	24.7	16.8	181
Public health facility	9.5	18.3	26.6	19.5	2,653
Private health facility	9.5	15.9	22.9	31.1	404
Employment					
Does not work for cash	10.2	19.7	28.6	18.5	2,453
Work for cash	8.0	14.0	20.5	27.9	808
Media exposure					
No exposure	8.3	16.4	25.9	17.7	470
To at least one regularly	9.6	18.0	26.0	21.3	2,801
Wantedness of child					
Wanted then	7.6	13.7	21.7	26.6	1,457
Wanted later	11.8	21.8	30.1	18.0	1,126
Wanted no more	10.8	22.3	30.7	16.7	680
All	9.5	17.9	26.0	20.7	3,271

Table 4d Chance of conception at 6, 9, and 12 months postpartum for women not adopting contraception. Life table estimates from competing risk baseline hazard model: Peru 2000

Differentials	Probability of conception (%) at month 6	9	12	Median (months)	n
Sex of the child					
Male	3.1	6.7	11.7	28.8	2,556
Female	2.7	6.1	11.4	29.4	2,501
Child survival					
Alive	2.0	5.1	10.2	29.8	4,739
Died	21.8	35.5	41.1	15.2	318
Residence					
Urban	2.6	6.4	11.6	45.8	1,470
Rural	3.1	6.5	11.6	25.4	3,587
Mother's education					
No education	3.1	5.8	11.1	27.8	805
Primary	3.1	6.6	11.9	25.1	2,788
At least secondary	2.7	6.5	11.4	> 48	1,464
Wealth					
Poor	3.0	6.6	11.6	25.4	3,910
Middle	3.0	6.0	11.7	44.9	628
Rich	2.4	6.3	11.5	> 48	519
Mother's age at birth					
15-24 years	3.1	7.9	14.2	26.1	1,537
25-34 years	3.2	6.3	11.6	26.6	2,209
35-49 years	2.1	5.1	9.0	40.3	1,311
Preceding birth interval					
1st Birth	3.2	8.8	15.5	31.4	1,336
< 24 months	4.5	7.8	15.1	20.8	646
24-47 months	2.3	4.8	9.0	26.6	1,561
48+ months	2.3	5.1	8.1	49.9	830
Delivery facility[a]					
Home	0.3	1.0	1.7	> 55	1,549
Public health facility	0.4	1.1	1.8	> 40	885
Private health facility	--	1.7	--	--	91
Employment					
Does not work for cash	2.9	7.5	13.3	26.2	2,127
Work for cash	2.9	5.7	10.3	31.8	2,921
Media exposure					
No exposure	3.1	6.2	12.0	25.7	2,506
To at least one regularly	2.7	6.6	11.3	32.4	2,551
Wantedness of child					
Wanted then	2.1	5.4	9.3	34.2	1,687
Wanted later	2.7	6.8	13.7	29.9	1,050
Wanted no more	3.7	7.2	12.4	25.6	2,253
All	2.9	6.4	11.6	29.1	5,057

-- Too few cases
[a] Information on place of delivery was available only for last birth

8

Differentials in Durations of Breastfeeding, Postpartum Amenorrhea, and Abstinence

Tables 5, 6, and 7 show median durations of breastfeeding, postpartum amenorrhea, and postpartum abstinence, respectively, by selected socioeconomic and demographic characteristics for the four countries studied—Kenya, Indonesia, the Dominican Republic, and Peru.

8.1 Duration of Breastfeeding

The Dominican Republic has by far the lowest median duration of breastfeeding overall, at 7.1 months. The other three countries are all between 21 and 23 months (see Table 5). In all four countries rural children are breastfed one to two months longer, on average, than urban children. Similarly, in all four countries mothers with no formal education breastfed longer than mothers with formal education. In the Dominican Republic mothers with no education breastfeed about 11 months longer than those with at least secondary education (17 months and 6 months, respectively). In Kenya, Indonesia, and Peru the difference is about four months.

The median duration of breastfeeding declines with increasing mother's age in three of the countries—Kenya, Indonesia, and the Dominican Republic—but in Peru there is no substantial variation by mother's age. In Kenya and Peru household wealth is associated inversely with duration of breastfeeding. In Kenya, mothers from poorer households breastfed about 6 months longer than mothers from wealthier households, and in Peru the difference is about four months. In the Dominican Republic mothers from poorer households breastfed only about 1 month longer than wealthier mothers, and in Indonesia household wealth is not associated at all with duration of breastfeeding.

Mothers who were regularly exposed to at least one form of media breastfed for shorter durations than their counterparts with no media exposure. The difference in the median duration of breastfeeding between mothers exposed to media and those who were not is greatest in the Dominican Republic, at four months, and is about 2 months in Kenya, Indonesia, and Peru.

Table 5 Median duration of breastfeeding (in months) by socioeconomic and demographic characteristics in four countries

Differentials	Country			
	Kenya	Indonesia	Dominican Republic	Peru[a]
Sex of the child				
Male	19.6	22.5	7.4	22.0
Female	21.6	23.3	6.7	21.6
Residence				
Urban	19.4	21.8	6.5	21.2
Rural	21.0	23.7	8.8	22.4
Mother's education				
No education	24.1	25.0	17.0	25.0
Primary	20.3	24.4	9.1	22.2
At least secondary	19.5	21.2	5.6	21.0
Wealth				
Poor	25.1	23.1	7.7	23.7
Middle	21.1	22.7	7.0	21.3
Rich	19.3	22.9	6.4	20.1
Mother's age at birth				
15-24 years	22.1	24.5	10.7	21.7
25-34 years	20.8	23.1	6.6	20.2
35-49 years	18.8	22.2	4.9	21.0
Preceding birth interval				
1st Birth	18.7	22.1	6.8	19.5
< 24 months	17.0	22.7	7.5	21.3
24-47 months	21.0	23.2	7.8	21.8
48+ months	23.5	24.1	6.6	22.1
Delivery facility				
Home	21.2	23.8	--	22.3
Public health facility	18.7	20.3	8.4	21.9
Private health facility	20.8	21.4	4.8	19.6
Employment				
Does not work for cash	21.4	23.4	8.3	22.0
Work for cash	20.3	22.2	4.7	21.9
Media exposure				
No exposure	22.2	24.2	11.0	23.0
To at least one regularly	19.8	22.6	7.0	21.4
Wantedness of child				
Wanted then	21.7	23.2	6.4	20.7
Wanted later	18.7	20.8	7.3	20.3
Wanted no more	21.2	22.9	11.4	22.0
All median	20.6	23.0	7.1	21.9

-- Too few cases
[a] Information on place of delivery was available only for last birth

8.2 Duration of Postpartum Amenorrhea

Overall, the countries in this study divide into two groups in the median duration of amenorrhea: about 4 months in Indonesia and the Dominican Republic, and about 10 months in Kenya and Peru. In all four countries differences in the durations of amenorrhea by the sex of the child are small, at less than one month. In rural areas mothers have longer durations of amenorrhea than mothers in urban areas, except in the Dominican Republic (see Table 6).

The median duration of amenorrhea appears to decline as mother's level of education increases. For example, the difference between mothers with no formal education and those with at least secondary education is about 6 months in Indonesia and 2 months in the Dominican Republic. Nonetheless, in Kenya and Peru mothers with primary education have a slightly longer median duration of amenorrhea than those with no education.

In all four countries, older mothers have shorter median durations of amenorrhea than younger mothers. The difference between mothers age 15 to 24 and mothers age 35 to 49 is about 3 months in Kenya and Peru, and 1 month in the Dominican Republic and Indonesia.

In Indonesia and the Dominican Republic, mothers from wealthier households have longer duration of amenorrhea than mothers from poorer households. In contrast, in Kenya mothers from poorer households have longer duration of amenorrhea than mothers from wealthier households. The difference in the median duration of amenorrhea between mothers from poorer households and mothers from wealthier households is about 1 month in Indonesia and the Dominican Republic, and 6 months in Kenya. In Peru the women from the middle wealth households have the longest durations of amenorrhea.

Mothers who delivered at home have a longer median duration of amenorrhea than mothers who delivered at a health facility—public or private. The differences are about 6 months in Peru, 4 months in Kenya, and 2 months in Indonesia.

In Kenya, the Dominican Republic, and Peru mothers who wanted no more children have a longer median duration of amenorrhea than either women who wanted the birth right away, or later (mistimed birth). In Indonesia, however, mothers who wanted the child later have a longer duration of amenorrhea than mothers in either of the other two groups, but the difference is small, at less than 1 month.

Table 6 Median duration of postpartum amenorrhea (in months) by socioeconomic and demographic characteristics in four countries

Differentials	Country			
	Kenya	Indonesia	Dominican Republic	Peru[a]
Sex of the child				
Male	8.7	4.6	3.6	9.1
Female	9.7	4.1	3.9	9.5
Residence				
Urban	6.7	3.7	3.7	7.8
Rural	9.7	5.0	3.7	10.2
Mother's education				
No education	10.1	9.2	5.3	10.7
Primary	11.3	5.0	3.7	11.0
At least secondary	8.2	3.5	3.4	7.8
Wealth				
Poor	13.3	4.0	3.3	8.9
Middle	10.3	4.4	4.1	10.6
Rich	7.8	5.4	4.6	8.6
Mother's age at birth				
15-24 years	9.5	5.2	4.2	10.2
25-34 years	9.0	4.4	3.9	8.2
35-49 years	6.9	3.7	2.9	6.8
Preceding birth interval				
1st birth	6.8	3.7	2.7	7.4
< 24 months	9.4	3.1	4.3	11.3
24-47 months	13.9	6.9	4.3	11.4
48+ months	8.5	4.5	3.8	8.7
Delivery facility				
Home	12.6	5.5	--	12.5
Public health facility	8.4	2.9	3.9	7.8
Private health facility	8.2	3.3	3.2	6.1
Employment				
Does not work for cash	8.4	4.5	4.3	9.7
Work for cash	10.4	4.0	1.9	9.5
Media exposure				
No exposure	9.7	5.9	5.2	10.9
To at least one regularly	8.3	4.1	3.6	8.8
Wantedness of child				
Wanted then	8.6	4.3	3.4	8.2
Wanted later	9.9	5.1	3.5	8.7
Wanted no more	13.4	4.2	5.2	11.7
All median	10.3	4.4	3.7	9.6

-- Too few cases
[a] Information on place of delivery was available only for last birth

8.3 Duration of Postpartum Abstinence

The median duration of postpartum abstinence is 3.4 months in Kenya, 2.0 months in Indonesia, 2.1 months in the Dominican Republic, and 2.9 months in Peru. In Kenya, Indonesia, and the Dominican Republic the difference in duration of postpartum abstinence by sex of the child is negligible. In Peru, however, giving birth to a baby boy is associated with a 1-month increase in the duration of abstinence. In all four countries the urban-rural and educational level differences in median duration of abstinence are 1 month or less (see Table 7).

Mothers with first births have a longer duration of postpartum sexual abstinence than mothers with more than one birth (and hence accompanying preceding birth intervals). For instance, in Kenya mothers abstained for at least 2 months more after a first birth than did mothers with the longest preceding birth interval (≥ 48 months).

The differences in median durations of abstinence by mother's age, household wealth, delivery facility, and media exposure are small.

Table 7 Median duration of postpartum abstinence (in months) by socioeconomic and demographic characteristics in four countries

Differentials	Country			
	Kenya	Indonesia	Dominican Republic[a]	Peru[b]
Sex of the child				
Male	3.4	2.0	2.1	3.3
Female	3.4	2.0	2.2	2.3
Residence				
Urban	3.8	2.1	2.2	2.8
Rural	3.3	1.9	2.1	3.0
Mother's education				
No education	4.8	1.3	2.2	3.6
Primary	3.1	2.2	2.1	2.9
At least secondary	3.7	1.9	2.2	2.9
Wealth				
Poor	4.1	2.8	2.1	3.2
Middle	2.5	1.2	2.2	2.5
Rich	3.9	2.2	2.4	3.1
Mother's age at birth				
15-24 years	3.7	1.9	2.2	3.2
25-34 years	2.1	1.6	2.0	2.3
35-49 years	3.5	2.4	2.1	2.7
Preceding birth interval				
1st Birth	5.5	2.7	2.5	3.5
< 24 months	2.8	1.0	1.7	2.5
24-47 months	2.5	1.9	2.2	2.4
48+ months	3.7	1.8	2.1	2.6
Delivery facility				
Home	3.6	1.9	3.0	2.9
Public health facility	3.3	1.9	2.2	2.6
Private health facility	3.7	2.2	1.9	3.4
Employment				
Does not work for cash	3.8	2.0	2.1	2.8
Work for cash	3.0	1.9	2.2	3.1
Media exposure				
No exposure	3.6	1.8	2.3	3.3
To at least one regularly	3.3	2.1	2.1	2.7
Wantedness of child				
Wanted then	3.3	2.0	2.1	3.0
Wanted later	3.4	2.8	2.1	2.0
Wanted no more	4.5	1.2	2.4	3.3
All median	3.4	2.0	2.1	2.9

[a] Used 2-month moving average
[b] Information on place of delivery was available only for last birth

9

Timing of Contraceptive Adoption

Non-hormonal contraceptive methods and some hormonal methods can complement breastfeeding to avoid the risk of pregnancy during the postpartum period. WHO (1998) advises that breastfeeding women need to be counseled regarding the choice of a contraceptive method after a birth.

In this study we group contraceptive methods adopted after a birth into three categories: hormonal, non-hormonal, and traditional methods. Hormonal contraceptive methods include the pill, implants, injectables, and vaginal rings. Non-hormonal methods include condoms, diaphragm, the IUD, spermicides, and sterilization. Traditional methods include periodic abstinence, withdrawal, and other country-specific traditional methods.

9.1 Use of Hormonal and Non-Hormonal Contraceptives after a Birth

Table 8 (a-d) presents the percentage distribution, among women adopting contraception after a birth for each type of method—hormonal, non-hormonal, or traditional contraception—at various durations postpartum.

In Indonesia (Table 8b), among women adopting hormonal contraception after a birth, the majority (62 percent) initiated use before 3 months postpartum. Elsewhere, fewer than half who adopted a hormonal method did so before 3 months postpartum—43 percent in Peru (Table 8d), 42 percent in the Dominican Republic (Table 8c), and 32 percent in Kenya (Table 8a).

Among women who adopted a non-hormonal contraceptive method, in three of the four countries studied the majority did so before 3 months postpartum—the Dominican Republic (81 percent), Indonesia (72 percent), and Peru (56 percent). In Kenya the comparable figure is 38 percent.

Among women who adopted traditional methods, 75 percent of women in the Dominican Republic, 64 percent in Indonesia, 35 percent in Kenya, and 16 percent in Peru initiated use before 3 months postpartum.

Table 8a Among women using contraception after a birth, the percent distribution of use by time postpartum: Kenya 2003

Postpartum months	Hormonal		Non-hormonal		Traditional		Total	
	%	n	%	n	%	n	%	n
0-2	32.2	487	37.9	75	35.4	208	33.5	770
3-5	25.0	378	23.0	46	26.6	156	25.2	579
6-8	13.5	203	13.8	27	14.7	87	13.8	317
9-11	5.1	77	7.1	14	5.9	34	5.4	125
12-15	11.4	173	9.4	19	9.8	58	10.8	249
16-19	5.4	82	0.2	0	2.5	14	4.2	97
20-23	2.4	36	0.7	1	0.6	3	1.8	41
24+	5.0	75	8.0	16	4.7	27	5.1	118
Total	100.0	1,510	100.0	198	100.0	588	100.0	2,295

Table 8b Among women using contraception after a birth, the percent distribution of use by time postpartum: Indonesia 2003

Postpartum months	Hormonal		Non-hormonal		Traditional		Total	
	%	n	%	n	%	n	%	n
0-2	61.8	5,666	72.0	691	64.1	333	62.8	6,690
3-5	22.1	2,025	17.4	167	25.7	134	21.8	2,325
6-8	5.1	472	5.4	52	5.6	29	5.2	553
9-11	3.0	279	2.0	19	0.7	4	2.8	302
12-15	4.1	377	1.3	13	2.5	13	3.8	403
16-19	1.5	135	0.8	7	0.4	2	1.4	145
20-23	0.5	46	0.3	3	0.3	1	0.5	51
24+	1.9	174	0.8	8	0.8	4	1.8	187
Total	100.0	9,175	100.0	960	100.0	520	100.0	10,655

Table 8c Among women using contraception after a birth, the percent distribution of use by time postpartum: Dominican Republic 2002

Postpartum months	Hormonal		Non-hormonal		Traditional		Total	
	%	n	%	n	%	n	%	n
0-2	41.7	1,499	81.0	2,044	75.1	776	60.4	4,319
3-5	36.4	1,307	11.3	285	18.2	188	24.9	1,781
6-8	10.1	363	2.8	71	2.8	29	6.5	463
9-11	3.0	106	1.1	27	0.4	4	1.9	137
12-15	4.3	152	2.1	54	1.7	18	3.1	224
16-19	1.6	56	0.6	16	0.5	6	1.1	77
20-23	1.1	39	0.3	8	0.4	4	0.7	51
24+	1.9	69	0.8	21	0.8	9	1.4	99
Total	100.0	3,592	100.0	2,526	100.0	1,034	100.0	7,151

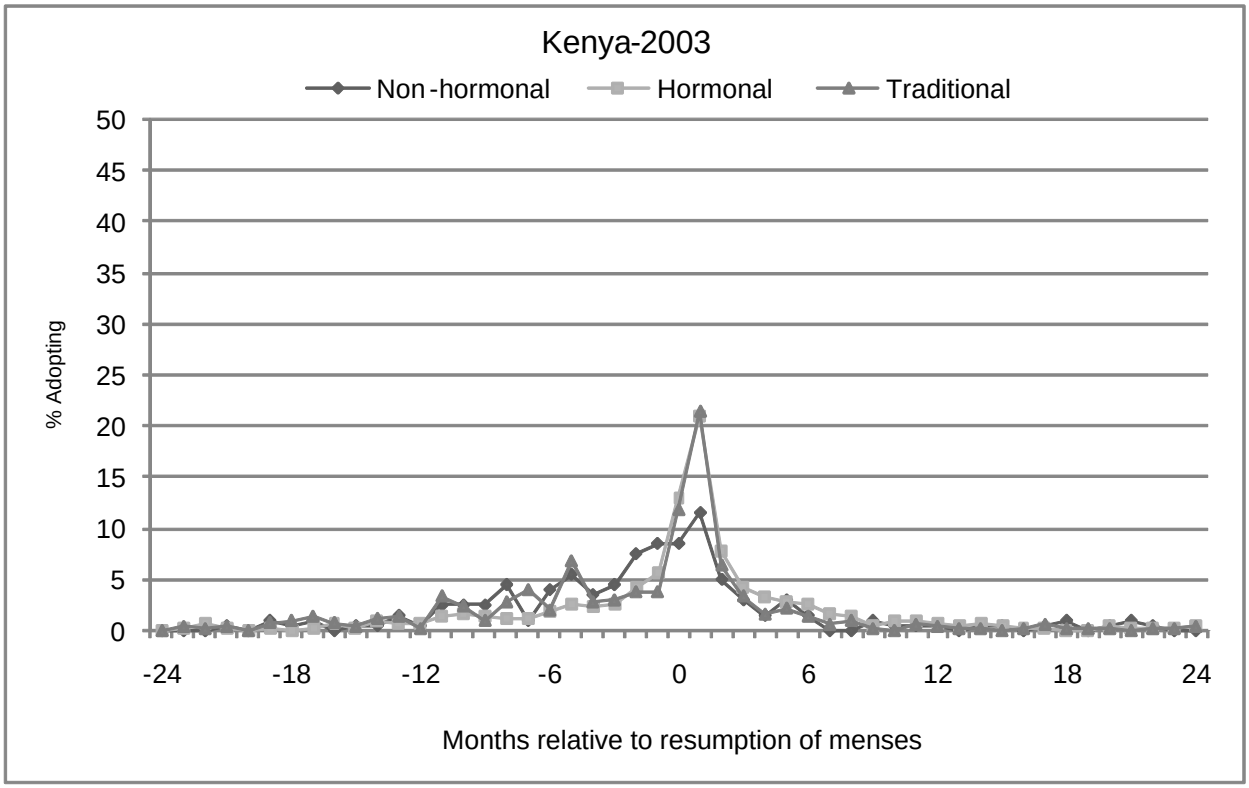
Table 8d Among women using contraception after a birth, the percent distribution of use by time postpartum: Peru 2000

Postpartum months	Hormonal		Non-hormonal		Traditional		Total	
	%	n	%	n	%	n	%	n
0-2	42.6	1,441	55.6	1,229	16.2	332	39.3	3,002
3-5	20.1	681	23.6	522	27.1	556	23.0	1,759
6-8	12.7	429	10.0	221	14.6	299	12.4	948
9-11	5.9	201	3.2	70	10.0	205	6.2	476
12-15	10.1	342	4.3	95	19.8	406	11.0	843
16-19	3.6	123	1.8	39	6.4	132	3.9	294
20-23	2.0	67	0.4	9	2.3	46	1.6	122
24+	3.0	103	1.2	26	3.6	74	2.7	203
Total	100.0	3,387	100.0	2,211	100.0	2,050	100.0	7,648

9.2 Initiating Contraceptive Use Relative to the Resumption of Menses

Figures 5a to 5d present the percentage of mothers who initiated contraceptive use, by type of method, in relation to the month that menstruation resumed. In Indonesia, the Dominican Republic, and Peru initiation of a non-hormonal contraceptive method peaks in the month that menstruation resumed, at 24 percent in Indonesia, 29 percent in the Dominican Republic, and 17 percent in Peru. In Kenya non-hormonal method adoption peaked at 12 percent one month after the resumption of menstruation.

Figure 5. Percentage of mothers who initiated contraceptive use relative to resumption of menses



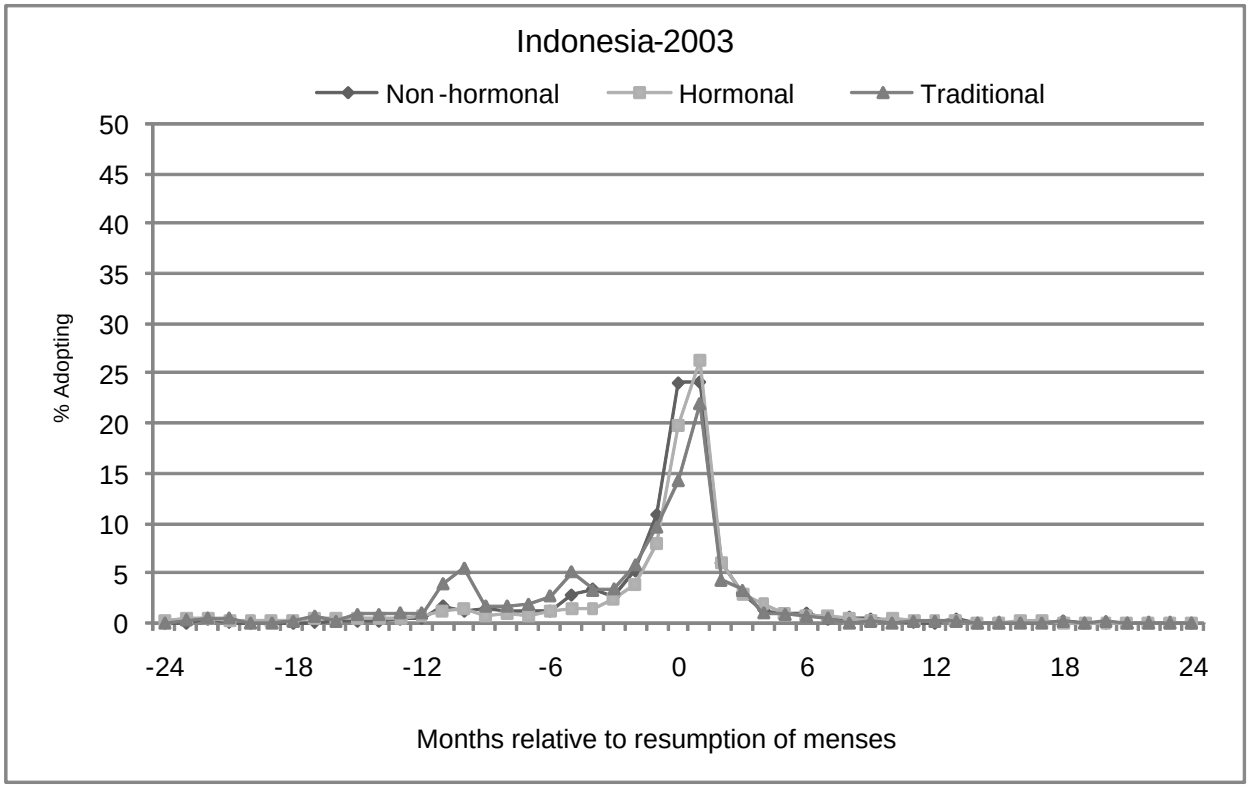
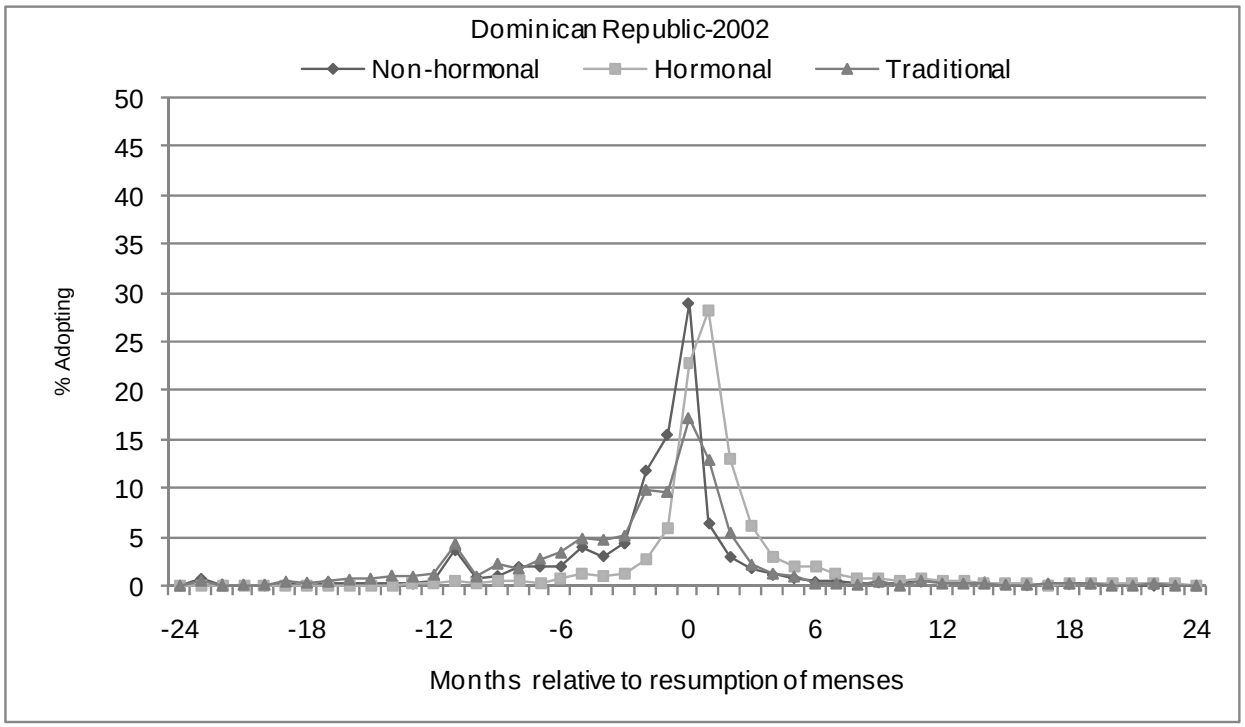
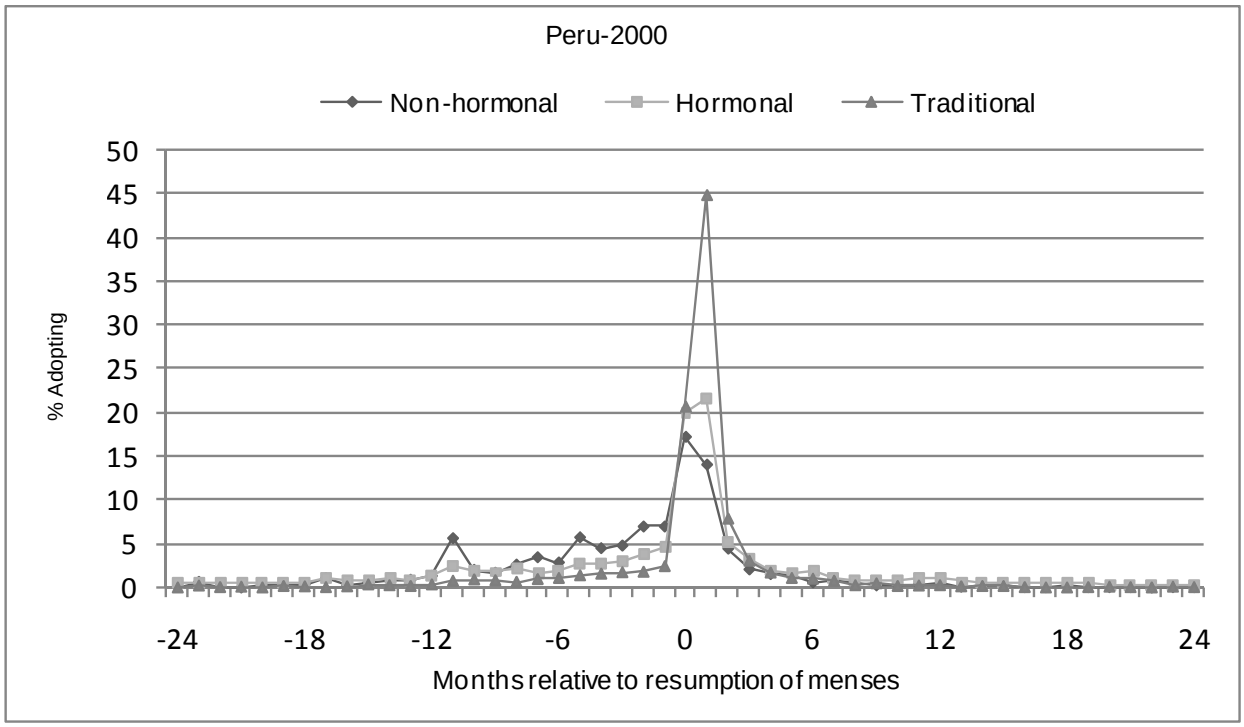


Figure 5—*Continued*





9.3 Initiating Contraceptive Use Before and After Susceptibility

Women are considered insusceptible if they are not exposed to the risk of pregnancy because they are either amenorrheic or abstaining from sexual intercourse after a birth. The duration of postpartum insusceptibility is the longer of the two.

In this analysis, postpartum women who use contraception during insusceptibility (that is, before they again face the risk of pregnancy) are considered to be those who reported using a method while they were either amenorrheic or abstaining at the time of the interview. Women who use contraception after they became susceptible are those who reported using a method while they were neither amenorrheic nor abstaining at the time of the interview.

Table 9 shows the percentage of mothers in the four countries studied adopting any method of contraception relative to resumption of menses and resumption of sex after a birth, and during insusceptibility. The percentage of mothers who started contraceptive use during insusceptibility is 17 percent in Kenya, 32 percent in Indonesia, 23 percent in the Dominican Republic, and 26 percent in Peru. About 20 percent of mothers in Kenya, 13 percent in Peru, and less than 7 percent in Indonesia and the Dominican Republic were insusceptible and had not started using contraception after a birth at the time of the interview.

The percentage of mothers who adopted contraception after they became susceptible is 24 percent in Kenya, 44 percent in Indonesia, 48 percent in the Dominican Republic, and 42 percent in Peru. In Kenya nearly two in five mothers (39 percent), however, had not started using contraceptives after they became susceptible. In the Dominican Republic the comparable figure is 23 percent, and 19 percent in both Indonesia and Peru.

Table 9 Percentage adopting contraception relative to postpartum amenorrhea, abstinence, and insusceptibility at the time of the interview, by country

Contraceptive adoption relative to	Country			
	Kenya	Indonesia	Dominican Republic	Peru
Amenorrhea				
Adopt before return of menses	14.1	25.3	17.8	23.5
Adopt after return of menses	27.0	50.2	53.0	44.3
Didn't adopt and not amenorrheic at the time of the interview	42.8	19.9	24.9	23.5
Didn't adopt and amenorrheic at the time of the interview	16.1	4.6	4.3	8.7
Abstinence				
Adopt before resuming sex	6.9	13.4	11.2	9.2
Adopt after resuming sex	34.4	62.2	59.7	59.0
Didn't adopt and not abstaining at the time of the interview	50.8	22.5	25.2	25.2
Didn't adopt and abstaining at the time of the interview	7.9	1.9	4.0	6.7
Insusceptibility				
Adopt before becoming susceptible	16.9	31.8	23.4	26.3
Adopt after becoming susceptible	24.3	43.8	47.5	41.8
Didn't adopt and susceptible at the time of the interview	39.0	18.8	22.5	18.7
Didn't adopt and insusceptible at the time of the interview	19.8	5.7	6.7	13.2

Table 10 shows that, of mothers who adopted postpartum contraception, 24 percent in Kenya, 34 percent in Indonesia, 7 percent in the Dominican Republic, and 18 percent in Peru adopted hormonal methods before they became susceptible. In comparison, 42 percent of the mothers in Kenya, 51 in Indonesia, 43 percent in the Dominican Republic, and 26 percent in Peru adopted hormonal methods after they became susceptible.

Similarly, the percentage of mothers who initiated non-hormonal methods before becoming susceptible is less than 5 percent in Kenya and Indonesia, 18 percent in the Dominican Republic, and 16 percent in Peru. Further, less than 5 percent of mothers in Kenya and Indonesia, 17 percent in the Dominican Republic, and 13 percent in Peru adopted non-hormonal methods after becoming susceptible.

Table 10 Percentage of mothers who started using hormonal, non-hormonal, and traditional contraceptives relative to postpartum insusceptibility, by country

	Before susceptibility			After susceptibility			
Country	Hormonal	Non-hormonal	Traditional	Hormonal	Non-hormonal	Traditional	Total
Kenya	23.5	5.0	12.4	42.1	3.6	13.3	100.0
Indonesia	34.4	4.0	3.6	51.0	4.9	2.1	100.0
Dominican Republic	7.1	18.1	7.7	43.1	17.3	6.6	100.0
Peru	18.3	16.0	4.4	26.0	12.9	22.4	100.0

Among those adopting hormonal methods postpartum, only 14 percent of women in the Dominican Republic did so before becoming susceptible, while in the other three countries between 36 percent and 41 percent did so. In Kenya, the Dominican Republic, and Peru over half the women who adopted non-hormonal methods did so while insusceptible, and slightly less than half in Indonesia.

Table 11 (a-d) reports method-specific initiation of contraception before and after becoming susceptible to pregnancy, and the median duration to initiation of a contraceptive method after a birth, for each of the four countries. Among mothers who initiated contraceptive use after a birth, 34 percent in Kenya (Table 11a), 63 percent in Indonesia (Table 11b), 4 percent in the Dominican Republic (Table 11c), and 41 percent in Peru (Table 11d) adopted injectables before they became susceptible. In all four countries the median duration to initiate use of injectables among this group of mothers was about two months.

Among mothers who initiated contraceptive use after a birth, 40 percent in Kenya, 61 percent in Indonesia, 8 percent in the Dominican Republic, and 30 percent in Peru adopted injectables after they became susceptible. The median duration to initiate the use of injectables was about 7 months in Kenya, 2 months in Indonesia, 3 months in the Dominican Republic, and 6 months in Peru.

Among those who initiated contraceptive use, 21 percent in Kenya, 14 percent in Indonesia, 17 in the Dominican Republic, and 7 percent in Peru adopted the pill before they became susceptible. The median duration to adopt was about two months in all four countries. In comparison, among mothers who initiated contraceptive use after susceptibility, 30 percent in Kenya, 24 percent in Indonesia, 55 percent in the Dominican Republic, and 13 percent in Peru adopted the pill. The median duration to adopt the pill ranges from less than 3 months in Indonesia and the Dominican Republic to more than 6 months in Peru.

Nearly 50 percent of mothers in the Dominican Republic and 18 percent in Peru adopted female sterilization before they became susceptible. In contrast, less than 5 percent of mothers did so in Kenya and Indonesia. In all countries in this study, those who initiated female sterilization before becoming susceptible adopted the method within 1 month after a birth.

In Kenya and Indonesia, the extent of redundant protection (i.e., those who initiated contraceptive use during insusceptibility) is greater for hormonal methods compared to non-hormonal methods. This is perhaps linked to the wide use of injectables in both countries. In comparison, in the Dominican Republic and Peru, the extent of redundant protection is greater for non-hormonal methods due to the use of female sterilization, and insertion of IUDs, or periodic abstinence in these countries.

Tables 11a-11d also shows that the percentage of mothers who initiated condom use after a birth, either before or after becoming susceptible, ranges from a high of about 10 percent in Peru to a low of about 1 percent in Indonesia. In Kenya and the Dominican Republic, about 5 percent or fewer mothers reported adoption of condom use, either before or after becoming susceptible.

Table 11a Percentage of mothers who started using contraceptives relative to postpartum insusceptibility by type of method and median duration to adopt a method: Kenya 2003

	Before susceptibility		After susceptibility	
Contraceptive method	Percent	Median duration (months)	Percent	Median duration (months)
Pill	21.2	2.2	30.2	5.5
Injectables	33.5	2.3	39.5	7.1
Norplant	2.5	2.1	1.5	5.6
IUD	2.7	2.2	1.9	4.8
Condom	5.1	3.5	3.5	10.3
Female Sterilization	4.6	1.2	*	*
Periodic Abstinence	22.6	2.4	19.2	6.4
Withdrawal	3.9	2.9	1.8	8.8
LAM	*	*	*	*
Other Traditional	3.8	< 1m	1.6	6.2

* Number of cases < 20; m = month

Table 11b Percentage of mothers who started using contraceptives relative to postpartum insusceptibility by type of method and median duration to adopt a method: Indonesia 2003

	Before susceptibility		After susceptibility	
Contraceptive method	Percent	Median duration (months)	Percent	Median duration (months)
Pill	14.1	1.7	23.6	2.5
Injectables	62.7	1.6	60.7	2.2
Norplant	4.9	2.0	3.6	4.5
IUD	5.1	1.5	5.8	1.9
Condom	1.3	1.5	1.4	2.0
Female Sterilization	2.9	< 1m	1.2	1.6
Periodic Abstinence	2.7	1.5	1.7	2.6
Withdrawal	2.8	1.7	1.5	2.6
LAM	1.7	1.1	*	*
Other Traditional	1.3	1.1	*	*

* Number of cases < 20; m = month

Table 11c Percentage of mothers who started using contraceptives relative to postpartum insusceptibility by type of method and median duration to adopt a method: Dominican Republic 2002

	Before susceptibility		After susceptibility	
Contraceptive method	Percent	Median duration (months)	Percent	Median duration (months)
Pill	17.2	1.8	55.1	2.8
Injectables	3.7	1.7	8.3	2.9
Norplant	*	*	0.9	2.6
IUD	2.1	1.6	5.9	2.6
Condom	4.4	1.5	4.5	3.6
Female Sterilization	48.2	< 1m	15.3	< 1m
Periodic Abstinence	1.9	1.3	3.8	2.4
Withdrawal	4.4	1.4	4.3	2.4
LAM	*	*	*	*
Other Traditional	17.1	<1m	1.8	1.2

* Number of cases < 20; m = month

Table 11d Percentage of mothers who started using contraceptives relative to postpartum insusceptibility by type of method and median duration to adopt a method: Peru 2000

	Before susceptibility		After susceptibility	
Contraceptive method	Percent	Median duration (months)	Percent	Median duration (months)
Pill	6.7	2.0	12.7	6.5
Injectables	40.5	1.5	29.6	5.6
Norplant	*	*	*	*
IUD	13.9	1.5	8.5	2.8
Condom	9.5	2.6	8.8	5.6
Female Sterilization	17.6	< 1m	3.6	1.5
Periodic Abstinence	4.0	2.4	31.4	8.2
Withdrawal	5.7	3.0	4.1	5.5
LAM	*	*	*	*
Other Traditional	1.6	1.4	1.1	11.4

* Number of cases < 20; m = month

10

Contraceptive Adoption during the First 12 Months Postpartum

In this section, we examine factors associated with the adoption of any contraceptive method, non-hormonal methods, and two of the hormonal methods—the pill and injectables—during the 12 months postpartum. Results come from Cox multivariate proportional hazards regressions (see Appendix).

10.1 All Contraceptive Methods

Table 12 presents the likelihood of adopting any contraceptive method during the first 12 months postpartum, reporting the hazard ratios (HR) and the corresponding 95 percent confidence intervals. The analyses include child survival status, breastfeeding (time to cessation of breastfeeding), and postpartum abstinence (time to resumption of sex) as time-varying covariates. Postpartum amenorrhea is not included as a time-varying covariate in this model.[9]

Among socioeconomic and demographic variables, education, wealth status, and age of mother at birth are statistically significantly associated with postpartum contraceptive adoption in all four countries studied. Education and wealth are positively associated with initiating contraceptive use during the first 12 months postpartum. For instance, during the first 12 months postpartum mothers in Kenya with at least secondary education are 2.7 times more likely than mothers with no formal education to adopt contraception. In Indonesia they are 1.2 times more likely, in the Dominican Republic 1.4 times, and in Peru, 1.6 times.

Household wealth is also positively associated with contraceptive adoption during the first 12 months postpartum. In Kenya, women from wealthier households are 49 percent more likely to initiate contraceptive use during the first year postpartum than women from poorer households. In Indonesia the likelihood of initiating contraceptive use for women from wealthier households is 17 percent higher, and in Peru 22 percent higher, than for women from poorer households.

In Kenya and the Dominican Republic, mothers age 25 years and above are significantly more likely to adopt a contraceptive method during the first year postpartum than mothers age 15 to 24. In contrast, in Indonesia, mothers age 25 years and above are less likely to initiate contraception compared to mothers age 15 to 24. In Peru, however, maternal age is not a significant predictor of the use of any contraceptive method during the 12 months postpartum.

The length of the preceding birth interval is significantly associated with contraceptive adoption in Kenya, the Dominican Republic, and Peru, but in different directions. In Kenya mothers with the longest preceding birth intervals (≥ 48 months) are 24 percent more likely to adopt contraception in the first year after a birth compared to mothers with the shortest birth interval (< 24 months). In the Dominican Republic and Peru, however, mothers with a first birth (and thus no preceding birth interval) have a lower

[9] Injectables may produce extended periods of amenorrhea, while the pill may result in a shorter duration of amenorrhea.

likelihood of initiating contraceptive use than mothers with the shortest preceding birth interval (< 24 months).

Exposure to media appears to have a significant positive influence on the adoption of contraception during the first 12 months after a birth in Indonesia, the Dominican Republic, and Peru, but not in Kenya. The likelihood of initiating contraceptive use during the year after a birth for mothers who were regularly exposed to mass media is 1.2 times greater in Indonesia and in the Dominican Republic, and 1.1 times greater in Peru, compared to mothers who were not exposed to the mass media.

In Kenya and the Dominican Republic, giving birth at a health facility (public or private) increases the likelihood of initiating postpartum contraceptive use compared to delivery at home. In Indonesia only delivery at a private health facility has a positive association with initiating contraceptive use during the 12 months postpartum.

Breastfeeding is significantly negatively associated with the adoption of contraception during the first 12 months postpartum in all the countries in this study.[10] Child survival is not a significant predictor of postpartum contraceptive use in three of the four countries in this study. Only in Kenya is a mother whose child survived the first birthday significantly more likely to initiate contraceptive use than a mother whose child died before the first birthday (HR = 1.47). Also, in all four countries mothers who are abstaining from sex are less likely to adopt a contraceptive method during the 12 month postpartum period.

[10] Since this is a time-varying covariate, the hazard risk represents the overall effect for breastfeeding at each month postpartum.

Table 12 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regressions for contraceptive adoption during the first 12 months after a birth for any contraceptive method

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	0.95	(0.86, 1.05)	0.98	(0.94, 1.02)	0.98	(0.93, 1.03)	0.99	(0.94, 1.04)
Rural (vs. Urban)	0.99	(0.87, 1.13)	0.96	(0.92, 1.01)	1.00	(0.95, 1.05)	0.77**	(0.72, 0.83)
Mother's education (vs. No education)								
Primary	2.62**	(2.04, 3.37)	1.16*	(1.03, 1.31)	1.24**	(1.10, 1.41)	1.22**	(1.09, 1.37)
At least secondary	2.69**	(2.05, 3.52)	1.22**	(1.08, 1.38)	1.36**	(1.19, 1.55)	1.60**	(1.41,1.81)
Wealth status (vs. Poor)								
Middle	1.31**	(1.13, 1.52)	1.13**	(1.07, 1.20)	1.16**	(1.08, 1.24)	1.11**	(1.03, 1.20)
Rich	1.49**	(1.28, 1.72)	1.17**	(1.10, 1.24)	1.06	(0.98, 1.13)	1.22**	(1.13, 1.33)
Mother's age in years (vs. 15-24)								
25-34 years	1.29**	(1.13, 1.47)	0.90**	(0.85, 0.95)	1.16**	(1.10, 1.23)	0.96	(0.90, 1.02)
35-49 years	1.28**	(1.07, 1.53)	0.85**	(0.79, 0.92)	1.13**	(1.03, 1.24)	1.08	(0.99, 1.17)
Preceding birth interval (vs. < 24 months)								
1st birth (No preceding birth interval)	1.14	(0.97, 1.35)	0.94	(0.87, 1.02)	0.86**	(0.80, 0.93)	0.83**	(0.77, 0.91)
24-47 months	1.08	(0.93, 1.25)	0.97	(0.89, 1.05)	0.99	(0.92, 1.06)	0.90**	(0.83, 0.97)
48+ months	1.24*	(1.05, 1.46)	1.04	(0.97, 1.13)	0.96	(0.89, 1.04)	0.98	(0.90, 1.06)
Media exposure (vs. No exposure)								
To at least one regularly	1.07	(0.94, 1.20)	1.17**	(1.11, 1.23)	1.18**	(1.08, 1.30)	1.11**	(1.04, 1.18)
Employment status (vs. Not working for cash)								
Work for cash	0.96	(0.87, 1.07)	1.02	(0.98, 1.07)	0.94*	(0.89, 0.99)	1.01	(0.96, 1.06)
Wantedness of child (vs. Wanted then)								
Wanted later	0.87*	(0.78, 0.98)	0.94*	(0.88, 1.00)	0.96	(0.91, 1.02)	1.00	(0.94, 1.06)
Wanted no more	1.04	(0.91, 1.18)	1.00	(0.92, 1.09)	0.98	(0.91, 1.05)	0.94	(0.89, 1.00)
Delivery institution (vs. Home)								
Public health facility	1.58**	(1.40, 1.78)	1.01	(0.95, 1.08)	1.52**	(1.22, 1.89)	-- [a]	--
Private health facility	1.37**	(1.19, 1.58)	1.06*	(1.01, 1.12)	1.76**	(1.40, 2.21)	--	--
Time-varying								
Child surviving	1.47**	(1.07, 2.03)	1.20	(0.99, 1.45)	1.00	(0.74, 1.35)	0.91	(0.73, 1.14)
Breastfeeding	0.47**	(0.42, 0.53)	0.77**	(0.74, 0.80)	0.60**	(0.57, 0.63)	0.72**	(0.68, 0.75)
Abstaining	0.51**	(0.46, 0.56)	0.50**	(0.48, 0.52)	0.41**	(0.39, 0.43)	0.46**	(0.44, 0.49)
Total number of cases	2,602		11,255		8,059		7,937	
Censored	949		1,217		1,437		1,422	
Likelihood ratio Chi-square	725.8**		1,492.0**		2,024.3**		1,542.3**	

Significance level: * p < .05; ** p < .01

[a] Information on place of delivery was available only for last birth

10.2 Non-Hormonal Methods

Table 13 presents our findings for the initiation of non-hormonal contraceptive methods during the first 12 months after a birth. Child survival status, breastfeeding (time to cessation of breastfeeding), postpartum amenorrhea (time to resumption of menstrual cycle), and postpartum abstinence (time to resumption of sex) are included as time-varying covariates in the analyses.

Mothers in rural Peru are significantly less likely to adopt non-hormonal contraception compared to their counterparts in urban Peru (HR=0.66). Higher level of maternal education is significantly and positively correlated with adopting non-hormonal contraceptive methods in three countries—Kenya, the Dominican Republic, and Peru. For instance, in Kenya mothers with at least secondary education are seven times more likely to adopt non-hormonal contraceptive methods than mothers with no schooling. In Indonesia and Peru higher household wealth status also significantly increases the likelihood of a mother adopting a non-hormonal contraceptive method during the first 12 months postpartum.

Maternal age is significantly positively associated with postpartum adoption of non-hormonal contraceptives in Indonesia, the Dominican Republic, and Peru. In all three countries mothers age 35 to 49 have a higher likelihood of adopting non-hormonal methods than mothers 15 to 24 years old. Preceding birth interval is significantly associated with the adoption of non-hormonal contraceptive methods in all four countries studied. In Kenya, mothers with preceding birth interval of 24 to 47 months are nearly twice as likely to adopt non-hormonal methods as mothers with preceding birth interval of < 24 months. In Indonesia, the Dominican Republic, and Peru, mothers with a first birth have a lower likelihood of adopting non-hormonal methods compared to mothers with preceding birth interval of < 24 months. In Kenya, Indonesia, and the Dominican Republic, the likelihood of adopting non-hormonal contraceptive methods is positively associated with delivery at a health facility compared to delivery at home.

Child survival significantly increases the likelihood of adopting non-hormonal contraceptives only in Kenya (HR = 15.11). However, these results may be affected by collinearity between child death and the resumption of menses, as child death ends breastfeeding and induces resumption of the menstrual cycle.

In all four countries studied, breastfeeding mothers are less likely to adopt non-hormonal contraceptives postpartum. Amenorrheic women have a significantly lower likelihood of initiating use of non-hormonal methods than non-amenorrheic women in all countries (HR = 0.39 for Kenya, HR = 0.52 for Peru, HR = 0.61 for the Dominican Republic, and HR = 0.71 for Indonesia). Women who abstained the first 12 months after a birth are significantly less likely to adopt non-hormonal methods in all countries.

Table 13 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regressions for the adoption non-hormonal contraceptive methods during the first 12 months after a birth

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	0.97	(0.68, 1.38)	1.01	(0.88, 1.15)	0.98	(0.90, 1.07)	0.99	(0.90, 1.09)
Rural (vs. Urban)	0.78	(0.49, 1.23)	0.98	(0.82, 1.16)	0.94	(0.85, 1.03)	0.66**	(0.56, 0.76)
Mother's education (vs. No education)								
Primary	3.63*	(1.25, 10.6)	0.87	(0.54, 1.38)	1.29*	(1.04, 1.60)	1.21	(0.95, 1.55)
At least secondary	7.01**	(2.31, 21.32)	0.98	(0.61, 1.57)	1.38**	(1.09, 1.73)	1.61**	(1.25, 2.09)
Wealth status (vs. Poor)								
Middle	1.72	(0.96, 3.05)	1.57**	(1.19, 2.07)	1.11	(0.98, 1.25)	1.09	(0.93, 1.28)
Rich	1.05	(0.59, 1.87)	1.86**	(1.45, 2.39)	1.06	(0.94, 1.20)	1.21*	(1.02, 1.42)
Mother's age in years (vs. 15-24)								
25-34 years	1.46	(0.85, 2.53)	1.14	(0.90, 1.44)	1.50**	(1.33, 1.69)	1.28**	(1.10, 1.48)
35-49 years	1.82	(0.96, 3.45)	1.32*	(1.00, 1.74)	1.47**	(1.27, 1.71)	1.41**	(1.19, 1.67)
Preceding birth interval (vs. < 24 months)								
1st birth (No preceding birth interval)	1.23	(0.65, 2.34)	0.66**	(0.52, 0.85)	0.52**	(0.44, 0.62)	0.63**	(0.53, 0.75)
24-47 months	1.82*	(1.02, 3.26)	0.92	(0.72, 1.17)	0.97	(0.86, 1.08)	0.90	(0.77, 1.05)
48+ months	1.69	(0.93, 3.05)	0.87	(0.68, 1.10)	0.88*	(0.78, 1.00)	0.97	(0.83, 1.14)
Media exposure (vs. No exposure)								
To at least one regularly	1.25	(0.74, 2.11)	1.56**	(1.24, 1.96)	1.16	(0.98, 1.38)	1.30**	(1.13, 1.49)
Employment status (vs. Not working for cash)								
Work for cash	0.50**	(0.33, 0.78)	0.81**	(0.70, 0.92)	0.92	(0.84, 1.00)	1.03	(0.94, 1.14)
Wantedness of child (vs. Wanted then)								
Wanted later	0.73	(0.45, 1.19)	0.82	(0.66, 1.02)	0.92	(0.83, 1.02)	1.01	(0.89, 1.15)
Wanted no more	0.90	(0.57, 1.42)	1.14	(0.91, 1.43)	1.01	(0.91, 1.13)	0.97	(0.86, 1.09)
Delivery institution (vs. Home)								
Public health facility	4.23**	(2.50, 7.17)	2.12**	(1.70, 2.65)	2.42**	(1.39, 4.20)	-- [a]	--
Private health facility	2.70**	(1.52, 4.78)	1.90**	(1.55, 2.33)	2.72**	(1.55, 4.78)	--	--
Time-varying								
Child surviving	15.11**	(2.02, 113.24)	1.55	(0.80, 3.02)	0.91	(0.54, 1.51)	1.11	(0.72, 1.69)
Breastfeeding	0.22**	(0.14, 0.34)	0.53**	(0.46, 0.61)	0.65**	(0.59, 0.71)	0.64**	(0.58, 0.71)
Abstaining	0.36**	(0.23, 0.58)	0.50**	(0.42, 0.60)	0.37**	(0.32, 0.43)	0.48**	(0.43, 0.54)
Amenorrheic	0.39**	(0.24, 0.63)	0.71**	(0.59, 0.84)	0.61**	(0.53, 0.71)	0.52**	(0.46, 0.59)
Total number of cases	733		1,762		3,411		2,565	
Censored	603		863		1,267		869	
Likelihood ratio Chi-square	290.3**		723.4**		1,320.4**		1,049.1**	

Significance level: * p < .05; ** p < .01

[a] Information on place of delivery was available only for last birth

10.3 Determinants of Choice of a Specific Method

This section examines factors associated with the choice of a specific method during the first 12 months of the postpartum period. We analyze use of the pill and injectables only, because they are among the most widely used methods in the four countries studied. The pill is the dominant postpartum contraceptive method in the Dominican Republic, and is a close second in Kenya and Indonesia, after injectables. In Peru, the pill is the third in popularity after injectables and periodic abstinence. Child survival status, breastfeeding (time to cessation of breastfeeding), postpartum amenorrhea (time to resumption of menstrual cycle), and postpartum abstinence (time to resumption of sex) are included as time-varying covariates in the analyses.

10.3.1 The Pill

Table 14 shows that in Kenya, the Dominican Republic, and Peru women with formal education are more likely to adopt the pill during the first 12 months postpartum than women with no education. Mother's age is associated with initiating pill use in all four countries in this study. Exposure to the media is positively associated with pill use in Indonesia (HR = 1.36) and the Dominican Republic (HR = 1.18).

In the Dominican Republic, women working for cash have a lower likelihood of adopting pill during the first 12 months postpartum than those who are not working for cash (HR= 0.91). In Kenya and the Dominican Republic, delivery in a health facility is significantly associated with adopting pill during the postpartum period, compared to women who delivered at home.

In all four countries pill use is significantly associated with breastfeeding and postpartum abstinence. Breastfeeding women have a lower likelihood of adopting pill, compared to women who are not breastfeeding. Also as expected, women who are abstaining from sex are less likely to start using pill postpartum.

Table 14 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regression analyses for the adoption of pill during the first 12 months after a birth

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	0.98	(0.81, 1.18)	1.01	(0.93, 1.09)	1.01	(0.94, 1.09)	1.00	(0.86, 1.17)
Rural (vs. Urban)	0.94	(0.74, 1.20)	0.98	(0.88, 1.08)	0.94	(0.87, 1.02)	0.56**	(0.45, 0.70)
Mother's education (vs. No education)								
Primary	5.08**	(2.63, 9.78)	1.20	(0.93, 1.55)	1.28**	(1.05, 1.56)	1.67*	(1.11, 2.51)
At least secondary	5.41**	(2.74, 10.66)	1.20	(0.92, 1.56)	1.45**	(1.17, 1.78)	2.29**	(1.49, 3.52)
Wealth status (vs. Poor)								
Middle	1.26	(0.92, 1.74)	1.10	(0.97, 1.26)	1.14**	(1.04, 1.26)	0.94	(0.74, 1.19)
Rich	1.66**	(1.23, 2.25)	1.06	(0.93, 1.20)	1.00	(0.90, 1.12)	1.01	(0.78, 1.30)
Mother's age in years (vs. 15-24)								
25-34 years	1.52**	(1.16, 1.98)	0.91	(0.82, 1.02)	1.02	(0.93, 1.10)	0.91	(0.76, 1.10)
35-49 years	1.37	(0.95, 1.98)	0.79**	(0.68, 0.93)	0.62**	(0.51, 0.75)	0.67**	(0.51, 0.88)
Preceding birth interval (vs. < 24 months)								
1st birth (No preceding birth interval)	1.38	(0.97, 1.96)	0.91	(0.77, 1.08)	0.97	(0.87, 1.09)	0.55**	(0.43, 0.71)
24-47 months	1.36	(0.98, 1.90)	0.93	(0.78, 1.10)	0.98	(0.87, 1.10)	0.86	(0.67, 1.10)
48+ months	1.65**	(1.16, 2.35)	1.15	(0.98, 1.35)	0.91	(0.80, 1.04)	1.02	(0.78, 1.32)
Media exposure (vs. No exposure)								
To at least one regularly	1.01	(0.79, 1.29)	1.36**	(1.23, 1.51)	1.18*	(1.02, 1.37)	1.22	(1.00, 1.48)
Employment status (vs. Not working for cash)								
Work for cash	0.87	(0.71, 1.07)	1.01	(0.92, 1.10)	0.91*	(0.84, 0.98)	1.04	(0.89, 1.21)
Wantedness of child (vs. Wanted then)								
Wanted later	0.85	(0.68, 1.06)	0.94	(0.83, 1.06)	0.90**	(0.83, 0.97)	0.83	(0.68, 1.00)
Wanted no more	0.96	(0.73, 1.28)	0.97	(0.81, 1.16)	0.86*	(0.77, 0.97)	0.67**	(0.56, 0.81)
Delivery institution (vs. Home)								
Public health facility	1.95**	(1.51, 2.51)	0.96	(0.83, 1.11)	1.37	(0.97, 1.92)	-- [a]	--
Private health facility	1.52**	(1.14, 2.02)	0.94	(0.84, 1.06)	1.46*	(1.02, 2.08)	--	--
Time-varying								
Child surviving	3.92**	(1.83, 8.39)	1.80**	(1.25, 2.57)	0.93	(0.58, 1.48)	1.51	(0.78, 2.95)
Breastfeeding	0.32**	(0.26, 0.40)	0.56**	(0.51, 0.61)	0.59**	(0.55, 0.63)	0.53**	(0.45, 0.63)
Abstaining	0.34**	(0.27, 0.43)	0.54**	(0.48, 0.60)	0.48**	(0.44, 0.52)	0.45**	(0.37, 0.54)
Amenorrheic	0.83	(0.67, 1.05)	0.81**	(0.73, 0.90)	1.01	(0.93, 1.10)	0.82*	(0.68, 0.98)
Total number of cases	1,045		3083		4,207		1,549	
Censored	603		863		1,267		869	
Likelihood ratio Chi-square	494.3**		4,91.3**		7,51.9**		371.2**	

Significance level: * p < .05, ** p < .01

[a] Information on place of delivery was available only for last birth

10.3.2 Injectables

Table 15 presents our multivariate analysis for the adoption of injectables. In Kenya, education, wealth status, giving birth in a health facility and child survival are all significantly positively associated with the adoption of injectables during the first 12 months postpartum. In Indonesia, higher wealth status, exposure to mass media and child survival are all significantly positively associated with adoption of injectables during the first 12 months postpartum.

In the Dominican Republic higher wealth status and postpartum amenorrhea are positively associated with adoption of injectables. Mothers from wealthier households are 35 percent more likely to adopt injectables than mothers from poorer households. Higher maternal age, breastfeeding, and postpartum abstinence are significantly negatively associated with adopting injectables. Mothers age 35-49 are 66 percent less likely than mothers age 15-24 to adopt injectables during the first 12 months postpartum.

In Peru, rural residence, higher age, no preceding birth interval, wanting no more children, breastfeeding, postpartum abstinence, and amenorrhea are significantly negatively associated with lower likelihood of adopting injectables. In contrast, higher levels of mother's education and media exposure are associated with increased likelihoods of starting the use of injectables during the first 12 months postpartum. Mothers exposed to mass media are 1.2 times more likely to adopt injectables than those with no media exposure.

Table 15 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regression analyses for the adoption of Injectables during the first 12 months after a birth

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	1.00	(0.84, 1.20)	1.00	(0.94, 1.05)	0.99	(0.81, 1.21)	0.99	(0.90, 1.09)
Rural (vs. Urban)	0.92	(0.73, 1.16)	0.99	(0.92, 1.06)	0.99	(0.80, 1.24)	0.82**	(0.72, 0.93)
Mother;s education (vs. No education)								
Primary	3.52**	(2.22, 5.58)	1.15	(0.96, 1.37)	1.13	(0.69, 1.84)	1.55**	(1.22, 1.97)
At least secondary	3.64**	(2.23, 5.96)	1.17	(0.98, 1.40)	1.58	(0.94, 2.67)	1.89**	(1.47, 2.45)
Wealth status (vs. Poor)								
Middle	1.46**	(1.11, 1.92)	1.27**	(1.17, 1.38)	1.26	(0.95, 1.68)	1.03	(0.90, 1.18)
Rich	1.71**	(1.30, 2.23)	1.20**	(1.10, 1.31)	1.35*	(1.01, 1.79)	1.03	(0.88, 1.21)
Mother's age in years (vs. 15-24)								
25-34 years	0.96	(0.76, 1.21)	0.85**	(0.79, 0.92)	0.87	(0.69, 1.10)	0.87*	(0.77, 0.97)
35-49 years	0.67*	(0.47, 0.97)	0.78**	(0.70, 0.87)	0.34**	(0.19, 0.59)	0.78**	(0.66, 0.92)
Preceding birth interval (vs. < 24 months)								
1st birth (No preceding birth interval)	0.75*	(0.56, 0.99)	0.93	(0.83, 1.05)	0.83	(0.63, 1.11)	0.67**	(0.58, 0.77)
24-47 months	0.99	(0.76, 1.28)	0.93	(0.83, 1.05)	0.99	(0.73, 1.34)	0.83*	(0.72, 0.96)
48+ months	1.36*	(1.02, 1.80)	1.07	(0.95, 1.20)	0.92	(0.65, 1.31)	0.82*	(0.69, 0.96)
Media exposure (vs. No exposure)								
To at least one regularly	1.03	(0.83, 1.28)	1.22**	(1.14, 1.32)	1.47	(0.96, 2.27)	1.22**	(1.09, 1.37)
Employment status (vs. Not working for cash)								
Work for cash	0.88	(0.73, 1.07)	1.04	(0.98, 1.11)	0.90	(0.72, 1.13)	1.09	(0.99, 1.19)
Wantedness of child (vs. Wanted then)								
Wanted later	0.93	(0.75, 1.15)	0.94	(0.85, 1.03)	0.92	(0.74, 1.15)	0.93	(0.82, 1.04)
Wanted no more	1.12	(0.87, 1.43)	0.93	(0.81, 1.07)	0.77	(0.56, 1.07)	0.82**	(0.73, 0.92)
Delivery institution (vs. Home)								
Public health facility	1.80**	(1.45, 2.24)	0.97	(0.88, 1.07)	0.77	(0.41, 1.46)	-- [a]	--
Private health facility	1.39*	(1.07, 1.80)	1.06	(0.98, 1.14)	1.04	(0.53, 2.07)	--	--
Time-varying								
Child surviving	1.84*	(1.11, 3.04)	1.68**	(1.25, 2.25)	0.57	(0.23, 1.42)	1.18	(0.79, 1.77)
Breastfeeding	0.38**	(0.31, 0.47)	0.76**	(0.71, 0.80)	0.51**	(0.42, 0.63)	0.76**	(0.69, 0.83)
Abstaining	0.32**	(0.26, 0.41)	0.55**	(0.52, 0.59)	0.32**	(0.25, 0.42)	0.41**	(0.36, 0.45)
Amenorrheic	0.99	(0.79, 1.23)	0.77**	(0.72, 0.82)	1.97**	(1.51, 2.56)	0.74**	(0.67, 0.82)
Total number of cases	1,099		5,624		1,665		2,664	
Censored	603		863		1,267		869	
Likelihood ratio Chi-square	381.4**		866.8**		209.8**		659.9**	

Significance level: * p < .05; ** p < .01

[a] Information on place of delivery was available only for last birth

11

Determinants of Breastfeeding and Amenorrhea

11.1 Determinants of Breastfeeding

Table 16 the factors related to cessation of breastfeeding during the 12 months after a birth—that is, whether women in a particular category were more or less likely to stop breastfeeding before one full year compared to women in the reference group. In Kenya, Indonesia, and Peru mothers living in rural areas are less likely than urban mothers to cease breastfeeding during the first year postpartum. Mother's education is significantly associated with duration of breastfeeding in Kenya, the Dominican Republic, and Peru, but no always in the same direction.

In Kenya mothers with formal education have a lower likelihood of ceasing breastfeeding during the first 12 months postpartum than mothers with no education. In contrast, in the Dominican Republic and Peru mothers with formal education are more likely to cease breastfeeding compared to mothers with no education.

Household wealth is significantly associated with the duration of breastfeeding in Indonesia, the Dominican Republic, and Peru. In these countries, the probability of ceasing breastfeeding before the end of the first 12 months postpartum is higher for mothers from wealthier households compared to mothers from poorer households.

Mother's age is significantly associated with of duration of breastfeeding in all four countries studied. The likelihood of stopping breastfeeding increases with mother's age. For instance, in Kenya, mothers age 35 to 49 are 1.4 times more likely to stop breastfeeding during the first 12 months postpartum than mothers age 15 to 24.

The length of preceding birth interval is also significantly associated with the duration of breastfeeding in all four of the countries. The likelihood of stopping breastfeeding before the end of the first year declines with increases in birth interval—that is, children with a long preceding birth interval are more likely to be breastfed for at least 12 months than those with shorter birth intervals. This pattern may represent mothers continuing their breastfeeding patterns from one child to the next. In Indonesia and the Dominican Republic, mothers with first births are significantly more likely than women who have already a child to terminate breastfeeding before the end of the first year.

In Indonesia, the Dominican Republic, and Peru, mothers working for cash have a lower likelihood than mothers not working for cash of stopping breastfeeding before the end of the first year postpartum. For instance, in Indonesia, the risk of discontinuing breastfeeding is 21 percent lower for working mothers compared to mothers not working for cash.

In Kenya and Indonesia, the likelihood of stopping breastfeeding is higher if the mother wanted to delay having a child compared to wanting to have a child at the time of conception. In Kenya, cessation during the first year is 25 percent more likely for a child wanted later compared to a child wanted right away, and in Indonesia, 35 percent more likely.

Of particular note is that in two of the three countries (information on place of delivery was not collected for all birth in Peru DHS) giving birth at a private health facility is positively significantly associated compared to delivery at home with the likelihood of stopping breastfeeding—in Indonesia (HR = 1.11) and the Dominican Republic (HR = 1.21). In contrast, place of delivery has no significant influence on cessation of breastfeeding in Kenya.

Table 16 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regressions of ceasing breastfeeding in the first 12 months after a birth

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	0.96	(0.86, 1.08)	0.90**	(0.84, 0.97)	0.96	(0.92, 1.01)	0.99	(0.92, 1.06)
Rural (vs. Urban)	0.77**	(0.66, 0.90)	0.82**	(0.75, 0.90)	0.95	(0.90, 1.00)	0.85**	(0.77, 0.94)
Mother's education (vs. No education)								
Primary	0.77**	(0.65, 0.91)	0.99	(0.82, 1.19)	1.29**	(1.14, 1.46)	1.15	(1.00, 1.33)
At least secondary	0.75**	(0.60, 0.93)	1.07	(0.88, 1.30)	1.29**	(1.13, 1.47)	1.20*	(1.02, 1.41)
Wealth status (vs. Poor)								
Middle	1.07	(0.90, 1.28)	0.98	(0.86, 1.11)	1.19**	(1.11, 1.27)	1.17**	(1.04, 1.31)
Rich	1.10	(0.92, 1.31)	1.21**	(1.08, 1.36)	1.26**	(1.17, 1.36)	1.33**	(1.18, 1.51)
Mother's age in years (vs. 15-24)								
25-34 years	1.48**	(1.28, 1.72)	1.43**	(1.29, 1.58)	1.11**	(1.04, 1.18)	1.52**	(1.38, 1.67)
35-49 years	1.40**	(1.14, 1.73)	1.65**	(1.44, 1.88)	1.16**	(1.06, 1.28)	1.72**	(1.53, 1.93)
Preceding birth interval (vs. < 24 months)								
1st birth (No preceding birth interval)	1.02	(0.85, 1.22)	1.24**	(1.09, 1.42)	1.21**	(1.13, 1.31)	1.07	(0.95, 1.20)
24-47 months	0.58**	(0.50, 0.68)	0.83**	(0.72, 0.95)	0.90**	(0.83, 0.97)	0.67**	(0.60, 0.75)
48+ months	0.56**	(0.46, 0.68)	0.59**	(0.52, 0.68)	0.93	(0.85, 1.01)	0.60**	(0.53, 0.68)
Media exposure (vs. No exposure)								
To at least one regularly	1.00	(0.87, 1.14)	0.92	(0.84, 1.01)	1.06	(0.97, 1.17)	0.98	(0.90, 1.07)
Employment status (vs. Not working for cash)								
Work for cash	0.95	(0.84, 1.07)	0.79**	(0.73, 0.85)	0.87**	(0.83, 0.92)	0.87**	(0.81, 0.93)
Wantedness of child (vs. Wanted then)								
Wanted later	1.25**	(1.08, 1.43)	1.35**	(1.21, 1.50)	0.98	(0.92, 1.04)	0.97	(0.88, 1.06)
Wanted no more	1.07	(0.91, 1.26)	1.06	(0.91, 1.23)	0.99	(0.92, 1.07)	1.03	(0.95, 1.13)
Delivery institution (vs. Home)								
Public health facility	1.08	(0.93, 1.27)	1.09	(0.96, 1.24)	1.00	(0.85, 1.19)	-- [a]	--
Private health facility	1.05	(0.88, 1.26)	1.11*	(1.01, 1.23)	1.21*	(1.01, 1.45)	--	--
Total number of cases	2,927		8,505		7,963		7,199	
Censored	1,777		2,847		1,819		4,042	
Likelihood ratio Chi-square	133.3**		447.5**		388.8**		360.4**	

Significance level: * p < .05; ** p < .01

[a] Information on place of delivery was available only for last birth

11.2 Determinants of Postpartum Amenorrhea

Amenorrhea is affected by the duration and intensity of breastfeeding but it can also be affected by use of hormonal contraceptive methods. In addition, breakthrough bleeding may occur with the use of IUD after a birth.

Table 17 analyzes the predictors of the cessation of amenorrhea (resumption of menses) during the 12 months after a birth. We examine two time-varying covariates (survival status of the child and breastfeeding) and show the independent effect of each one on the likelihood of resumption of the menstrual cycle.

In Kenya, rural residence, higher mother's age, preceding birth interval of 24 to 47 months, and wanting no more children are associated with a decrease in the likelihood of the resumption of menses during the 12 months after a birth. Mothers who said the pregnancy was unwanted (wanted no more children) are less likely to resume menses during the first 12 months postpartum than mothers who said the pregnancy was wanted then (wanted birth).

In the Dominican Republic and Peru, mother's education is significantly associated with the duration of amenorrhea. In Peru, for instance, the likelihood of resumption of the menstrual cycle is 1.3 times greater in mothers with at least a secondary education than in mothers with no education. In the Dominican Republic, mothers with at least secondary education have nearly 1.2 times greater likelihood of the resumption of menses during the first 12 months postpartum than mothers with no education. Also, in Kenya and the Dominican Republic, the likelihood of resumption of the menstrual cycle during the first 12 months postpartum is lower for mothers age 35 to 49 than it is for mothers age 15 to 24.

In all four countries studied, increased household wealth is positively and significantly associated with the resumption of menses. Also, the likelihood of resumption of menses within the first year after a birth declines with increasing birth interval.

In Kenya and the Dominican Republic, the risk of resumption of the menses within the first 12 months postpartum is lower if a mother wanted no more children compared to a mother who wanted the child then. In the Dominican Republic and Indonesia mothers who delivered in a health facility have a higher likelihood than women who delivered at home of resuming menstruation in the 12 months after the birth.

Table 17 Hazard ratios (and 95% confidence intervals) from multivariate Cox hazards regression of ceasing amenorrhea in the first 12 months after a birth

	Kenya		Indonesia		Dominican Republic		Peru	
Characteristics	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits	Hazard Ratio	95% Confidence Limits
Female child (vs. Male)	1.01	(0.94, 1.10)	1.01	(0.96, 1.06)	0.99	(0.95, 1.04)	1.00	(0.95, 1.05)
Rural (vs. Urban)	0.90*	(0.81, 1.00)	0.91**	(0.86, 0.96)	0.96	(0.91, 1.01)	0.97	(0.91, 1.05)
Mother's education (vs. No education)								
Primary	0.90	(0.80, 1.02)	0.98	(0.88, 1.11)	1.09	(0.98, 1.22)	1.12*	(1.02, 1.24)
At least secondary	1.04	(0.90, 1.21)	1.10	(0.97, 1.24)	1.15*	(1.02, 1.29)	1.32**	(1.19, 1.47)
Wealth status (vs. Poor)								
Middle	1.09	(0.97, 1.22)	1.05	(0.98, 1.13)	1.10**	(1.03, 1.17)	1.11*	(1.03, 1.21)
Rich	1.15*	(1.02, 1.28)	1.15**	(1.07, 1.23)	1.12**	(1.04, 1.20)	1.28**	(1.17, 1.39)
Mother's Age in Years (vs. 15-24)								
25-34	0.96	(0.87, 1.07)	1.01	(0.94, 1.07)	0.93**	(0.88, 0.98)	0.97	(0.91, 1.04)
35-49	0.83*	(0.72, 0.96)	0.99	(0.91, 1.08)	0.90*	(0.83, 0.98)	1.02	(0.94, 1.11)
Preceding birth interval (vs. < 24 months)								
1st Birth (No Preceding birth interval)	1.09	(0.96, 1.24)	1.05	(0.97, 1.15)	1.01	(0.94, 1.08)	1.04	(0.96, 1.13)
24-47 months	0.86**	(0.77, 0.96)	0.98	(0.90, 1.07)	0.91**	(0.85, 0.97)	0.88**	(0.82, 0.95)
48+ months	0.94	(0.82, 1.07)	0.91*	(0.84, 0.99)	0.99	(0.92, 1.07)	0.97	(0.89, 1.06)
Media exposure (vs. No exposure)								
To at least one regularly	0.95	(0.87, 1.03)	1.06	(1.00, 1.12)	1.12*	(1.03, 1.22)	1.04	(0.98, 1.11)
Employment status (vs. Not working for cash)								
Work for cash	1.01	(0.93, 1.10)	0.98	(0.94, 1.03)	0.96	(0.91, 1.01)	1.00	(0.95, 1.05)
Wantedness of child (vs. wanted then)								
Wanted later	0.94	(0.85, 1.03)	1.02	(0.95, 1.09)	0.96	(0.91, 1.01)	0.94	(0.88, 1.01)
Wanted no more	0.86**	(0.78, 0.96)	1.00	(0.91, 1.10)	0.90**	(0.84, 0.96)	0.94	(0.89, 1.00)
Delivery institution (vs. Home)								
Public health facility	0.99	(0.90, 1.10)	1.11*	(1.02, 1.20)	1.35**	(1.16, 1.57)	-- [a]	--
Private health facility	1.09	(0.96, 1.23)	1.09**	(1.03, 1.16)	1.55**	(1.31, 1.82)	--	--
Time-varying								
Child surviving	1.09	(0.92, 1.29)	1.00	(0.87, 1.16)	1.11	(0.87, 1.41)	0.85*	(0.73, 0.99)
Breastfeeding	1.00	(0.85, 1.17)	1.06	(0.96, 1.17)	0.85*	(0.80, 0.91)	1.07	(0.98, 1.18)
Total number of cases	2,788		8,177		7,379		6,807	
Censored	241		709		170		476	
Likelihood ratio Chi-square	114.9**		254.2**		241.6**		306.9**	

Significance level: * p < .05; ** p < .01

[a] Information on place of delivery was available only for last birth

12

Discussion and Conclusions

There has been a renewed interest in the effects of spacing and the optimal duration between births because new evidence from several studies suggests there could be additional gains to child health by increasing the spacing between births to a minimum of 3 years (DaVanzo et al. 2004; Rutstein 2002; Setty-Venugopal and Upadhyay 2002; Conde-Agudelo and Belizan 2000).

Many studies have shown that the demand for contraception may be high immediately after delivery (Ross and Frankenberg 1993; Ross and Winfrey 2001; ACCESS-FP 2008). For instance, data from 27 Demographic and Health Surveys (DHS) found that only 3 percent of postpartum women want a new baby within two years, yet only 40 percent on average are actually using a family planning method for birth spacing (Ross and Winfrey 2001). The postpartum period is particularly important because appropriate birth spacing can improve maternal and infant health (WHO 2006; Rutstein 2005). To ensure access to family planning beyond the traditional end of the postpartum period, family planning programs need to focus on the "extended postpartum period." For instance, ACCESS-FP (USAID sponsored global program) promotes the "extended postpartum period" to be a full year post-birth in order to help women transition from the use of breastfeeding as contraception to other modern contraceptive methods, and to support adoption and continuation of family planning (McKaig and Chase 2006).

Research shows that differences in birth interval lengths are explained by varying breastfeeding patterns, frequency of intercourse, incidence of abortion, fecundity, and contraceptive use (Trussell et al. 1985). Of these, use of contraception plays by far the most important role in effective birth spacing, as in avoiding childbearing altogether. In light of this fact, our study investigated the determinants of contraceptive adoption during the 12 months postpartum—the "extended postpartum period."

Our study shows that a substantial proportion of mothers in the postpartum period did not use any contraceptive method after they became susceptible—two in five women in Kenya, one in four in the Dominican Republic, and one in five in Indonesia and Peru. The proportion who did adopt contraception before they became susceptible varies from a high of one in three women in Indonesia to a low of only one in five in Kenya. Of particular note is that in Kenya more women are at risk of pregnancy than are not at risk in the postpartum period compared to the other three countries in this study.

In our multivariate models we used breastfeeding, postpartum amenorrhea, and sexual abstinence as time-varying covariates to explore their role in mothers' contraceptive adoption behavior after a birth. Overall, we find that breastfeeding and postpartum abstinence have significant negative effects on the adoption of any contraceptive method during the first 12 months postpartum. This strong relationship exists in all four countries in this study. In other words, women who become sexually active and who stop breastfeeding are more likely to adopt contraception than women who continue to remain abstinent or to breastfeed during the first 12 months after a birth.

Further, our analyses document the importance of mother's education and household wealth in the adoption of a contraceptive method postpartum—a significant relationship in all four countries. This result is consistent with earlier analysis of birth intervals in 38 of 51 countries with DHS data that found

that women with no education were more likely than educated women to have shorter intervals (Setty-Venugopal and Upadhyay 2002).

Contraceptive adoption during the 12 month postpartum also is positively associated with giving birth at a health facility. The results of this study suggest that it is beneficial to integrate postpartum family planning programs with maternal and child health service delivery. Also, our finding that a large majority of women who started using contraception after a birth adopted hormonal methods suggests that contraceptive counseling should insure that the contraceptive method adopted should be appropriate to the breastfeeding status of the mother.

Breastfeeding duration is also a major determinant of the length of birth intervals postpartum. Our analyses show that mothers from wealthier households and those living in urban areas have shorter durations of breastfeeding than poorer or rural women. Probably related to this, we find that mothers who gave birth in a health facility are more likely than mothers who delivered at home to have terminated breastfeeding and resumed menstruation during the 12 months postpartum (since wealthier and better educated women are more likely to have access to a health facility).

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Policy Implications

The findings of this study suggest that expanding skilled delivery care and improving accessibility and provision of family planning services would help more postpartum mother adopt contraceptive use and therefore avoid unintended pregnancies. Professional assistance during delivery is associated with an increased likelihood of adopting contraception during the first 12 months postpartum.

However, delivery in a health facility and modernization (indicated by education and urbanization) also are associated with early termination of breastfeeding and with shorter duration of remaining amenorrheic. These results demonstrate that the attitudes and practices of medical personnel can affect mothers' reproductive and childcare practices adversely.

Health facilities and health care providers must encourage mothers to breastfeed longer, both for birth spacing and health to the mother and child. At the same time, consistent with our expectations, breastfeeding mothers are less likely to adopt use of contraception. This finding suggests both that maternal and child health services have an opportunity to counsel breastfeeding women about the family planning and that postpartum counseling should do more to counsel women on contraceptive choices for breastfeeding women.

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Appendix

Analytical Method

We use survival analysis techniques to analyze the timing of contraceptive adoption after a birth. There are at least two advantages of using survival methods for this analysis. First, survival analysis accounts for timing of the event (in our case contraceptive adoption after a birth) and the occurrence; second, survival methods account for 'censoring'. Censoring occurs when the data end before the event occurs. In this study, postpartum periods in which the mother did not adopt a contraceptive method or did not conceive before the date of the survey are censored. Censoring can be handled only with survival methods.

In survival analysis, the time until the event occurs is assumed to be a realization of a random process. The survival function measures the probability of surviving longer than a given time; the cumulative survival function is defined as:

$$S(t) = \Pr\{T > t\}$$

S(t) measures the cumulative probability that the event time T is greater than t. For example, it indicates the cumulative probability that a woman adopted a contraceptive method after a month t.

The hazard function or the hazard rate is used to describe the probability distribution of event times. It measures the risk (probability) of the event occurring in month t given than it did not occur in month t-1.

The hazard function, h(t) is defined as:

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr[(t \leq T < t+\Delta t) | T \geq t]}{\Delta t}$$

Which is the same as:

$$h(t) = f(t) / S(t) \quad \text{where } f(t) = dS(t)/dt$$

We use Cox's proportional hazards modeling to investigate the timing of contraceptive adoption. The Cox proportional hazards model has attractive features, such as, the relative risk type measure of association, no parametric assumptions, the use of the partial likelihood function, and the creation of survival function estimates.

The technique used in multivariate analyses in this paper is the Cox proportional hazards model with time-varying covariates. The hazards function is expressed as:

$$h_i(t, z_i, x_t) = h_0(t) \exp(Z_i'\beta + X_t'\alpha)$$

Where $h_i(t, z_i, x_t)$ is the hazard rate at time t; $h_0(t)$ is the unspecified baseline hazard function of t; Z_i is the vector of covariates that are not time dependent where β is the vector of unknown parameters associated

with Z_i; X_t is the vector of time dependent explanatory variables where is the α vector of unknown parameters associated with X_t.

The hazard rate is the key concept of the proportional hazards model. The hazard rate measures the risk of making a transition from the absence of state (event) to the presence of state. The rate is measured by the ratio of number of cases experiencing change in state (event) by the end of a time interval to the total number of cases exposed to the risk of experiencing the event at the beginning of the time interval. A lower hazard rate indicates a longer duration of waiting time for the event to occur. In this paper, the coefficients of the covariates will be transformed by exponentiation and interpreted as hazard ratios. The hazard ratio of the reference category is one (1.0). If the hazard ratio of a different category is greater than 1.0, this indicates a higher likelihood of initiating a contraceptive method at some point within the specified time period (i.e. during the first 12 months postpartum) and when the hazard ratio is less than 1.0, it indicates a lower likelihood of use of contraception within the specified time period after a birth, among women in a particular category as compared to women in the reference category.

In the multivariate hazard analyses for the durations of contraceptive adoption, child survival status (died vs. alive), statuses for breastfeeding, amenorrhea and abstinence are included in the model as time-dependent indicators. The time-dependent indicators are defined as follows: survival of the child is defined as 1 if the date of death is prior to the date of contraceptive adoption and 0 otherwise. The breastfeeding variable takes the value 1 if the cessation of breastfeeding (date at start of weaning) is prior to the date at start of contraceptive use, and 0 otherwise. Similarly, an amenorrheic woman takes the value 1 if the resumption of menses (date at start of menstrual cycle after a birth) is prior to the date at start of contraceptive use, and 0 otherwise. The abstinence variable takes the value 1 if the resumption of sexual activity (date at start of sex after a birth) is prior to the date at start of contraceptive use, and 0 otherwise.

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