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CONSISTENCY OF REPORTING OF TERMINATED PREGNANCIES IN DHS CALENDARS

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Consistency of Reporting of Terminated Pregnancies in DHS Calendars

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PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to continually assess and improve the methodology and procedures used to carry out national-level surveys as well as to offer additional tools for analysis. Improvements in methods used will enhance the accuracy and depth of information collected by The DHS Program and relied on by policymakers and program managers in low- and middle-income countries.

While data quality is a main topic of the DHS Methodological Reports series, the reports also examine issues of sampling, questionnaire comparability, survey procedures, and methodological approaches. The topics explored in this series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Methodological Reports will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries, and will be used to enhance the quality and analysis of survey data.

Sunita Kishor
Director, The DHS Program

ABSTRACT

This study examines the consistency of reporting of terminated pregnancies in DHS reproductive calendars. We examine two measures of consistency: within-survey consistency and between-survey consistency. We find that 70-80% of surveys are inconsistent by either or both of these measures. Reporting of terminated pregnancies deteriorates in earlier periods of the calendar. Africa has a higher proportion of inconsistent surveys (78%), whereas in the other regions about two-thirds of surveys are classified as inconsistent. Consistency appears to vary with type of history (pregnancy or birth), direction of the history, and the inclusion of questions that distinguish between miscarriage and induced abortion. Survey length and mode of data collection appear unrelated to either consistency or inconsistency of reporting terminated pregnancies. While previous studies have assessed DHS calendar data related to contraception, perinatal mortality, age displacement, and birth intervals, this study is believed to be the first to undertake a focused assessment of reporting of terminated pregnancies. Our findings suggest the need for more experimentation with modifications to the calendar and modes of data collection. Such modifications should be randomly assigned within or across surveys and accompanied by rigorous assessment.

KEY WORDS: data quality, reproductive calendar, contraceptive calendar, terminated pregnancies, termination ratio, birth history

1 INTRODUCTION

Retrospective inquiry in household or population-based surveys is a common way of gathering data on women's reproductive behavior and experiences, including terminated pregnancies. This is particularly the case for experiences that are not well captured through service statistics, sentinel surveillance, or vital registration statistics. For example, it is estimated that only 2% of stillbirths globally—just one type of terminated pregnancy—are counted through vital registration (Lawn et al. 2010). Primary among household surveys are the Demographic Health Surveys (DHS), which have collected population and health data in more than 400 surveys in over 90 countries since the mid-1980s. The DHS has employed a reproductive calendar since 1986 to collect data on births, pregnancies, and episodes of contraceptive use. Although numerous studies have evaluated such a calendar with regard to the quality and consistency of numerous types of data, this is believed to be the first study examining the consistency of calendar data on terminated pregnancies.

1.1 Background

This study encompasses three types of terminated pregnancies: miscarriages, induced abortions, and stillbirths. The International Classification of Diseases defines a fetal death as "death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles." Stillbirth refers to a fetus that dies before birth but at or after 28 weeks of gestation or of greater than 1000 gms (WHO 2016). Miscarriage[1] is fetal death that occurs spontaneously prior to the 28th week of gestation. As a practical matter, stillbirths are frequently differentiated from miscarriages based on their occurrence at or after 7 months of pregnancy. Induced abortion, meanwhile, refers to any conceptus that does not result in a live birth as the result of direct action taken with the intent to terminate the pregnancy. This study addresses such terminated pregnancies without differentiating among types of termination.

Household surveys remain a common method to collect data on terminated pregnancies (miscarriages, induced abortions, and stillbirths) and other reproductive events. Surveys relying on retrospective reporting from the respondent, however, face a variety of obstacles when trying to accurately estimate the incidence and prevalence of terminated pregnancies. These include difficulties associated with accurate recall and willingness to report not only the occurrence of termination events, but also their timing. Incorporation of data collection techniques such as a reproductive events calendar into traditional survey instruments is designed to overcome some of these challenges, though further analysis of the quality and consistency of such instruments is warranted.

1.1.1 Recalling terminated pregnancies

Women's diverse experiences of pregnancy termination affect whether women will recognize them, remember them, and report them in a survey. Events that set off other events are more likely to be

[1] Miscarriage is sometimes also referred to as "spontaneous abortion," "spontaneous fetal death," "spontaneous fetal loss," or "fetal wastage." The term "pregnancy loss" may refer to either miscarriage or stillbirth.

remembered (Berntsen and Rubin 2002), and a terminated pregnancy that triggers a divorce, social censure, or continual health problems is therefore more likely to be remembered than one that does not. The longer the duration of any event, the more likely it is to be remembered (Belli 1998). A termination that is prolonged or requires a hospital stay is more likely to be remembered than one that does not. Similarly, terminations that are physically painful or that occur late in gestation are distinctly vivid. Conversely, some terminated pregnancies can be more ephemeral; most miscarriages occur very early in pregnancy (Macklon, Geraedts, and Fauser 2002; Nepomnaschy et al. 2006; Wang et al. 2003; Wilcox et al. 1988; Zinaman et al. 1996). Women therefore are often uncertain whether they were pregnant and are unable to confidently identify the occurrence of a miscarriage (Casterline 1989; Edmonds et al. 1982; James 1970). A study in the U.S. found that women are more likely to report miscarriages in a survey if the loss occurred after five weeks gestation (Jones and Kost 2007). In contexts where regular menstruation has cultural importance, induced abortions also serve the function of "menstrual regulation" and often occur without ever confirming a pregnancy (Johnston et al. 2010).

In addition, social processes affect whether a terminated pregnancy will be remembered or not. Cultural perceptions about the nature and importance of terminations influence whether women remember them. Memories are embedded within cultural norms about the salience and importance of the event, as well as what that event means for that person's life trajectory (Belli 1998). In rural Gambia, for example, repeated miscarriages may spur a divorce (Bledsoe, Banja, and Hill 1998).

Cultural scripts about terminated pregnancies also influence whether and how often they are discussed. Memories that people discuss or mentally revisit after their occurrence are better recalled than those that have no thematic place within a cultural framework or that people try actively to forget ever occurred (Berntsen and Rubin 2004). In rural Tanzania, for example, pregnancy losses may be discussed if the fetus was "mature," but losses early in gestation are kept private, or are supposed to be discussed only within a close confidence (Haws et al. 2010). In Ethiopia, Amhara women believe a stillbirth should only be mourned privately, but Oromiya women believe that it should be mourned "like the death of an adult" (Sisay et al. 2014). These different social processes following a terminated pregnancy suggest different likelihoods for women across different societies to report it in a survey.

1.1.2 Underreporting of terminated pregnancies

Social desirability bias and reporting terminated pregnancies

Even when women correctly recall a terminated pregnancy, reporting error in a survey can result from deliberate omission. Tourangeau and Yan (2007) argue that deliberate misreporting can be the "main source of error" for sensitive questions—those that are intrusive (they are inappropriate topics for polite conversation, "regardless of what the correct answer is"), that are a threat if disclosed (there would be negative consequences if the true answer became known to a third party), or that have socially desirable answers (social desirability can be viewed as a subset of the threat of disclosure, wherein the negative effect is social censure) (Tourangeau and Yan 2007). Questions about terminated pregnancies—particularly questions about induced abortion—clearly fall into the sensitive category in most settings.

Women frequently omit induced abortion in surveys. A U.S. study compared women's medical records of induced abortion with their responses in a survey and found that a maximum of 80% of induced abortions identified in medical records were reported in the survey (Udry et al. 1996). From estimates derived from

abortion providers, Jones and Forrest (1992) estimated that only between 35% to 59% of women reported their induced abortions, depending on the survey and the year.

This underreporting of induced abortion is likely deliberate due to social desirability bias, and may be exacerbated in settings where induced abortion is illegal, stigmatized, or carries severe social consequences for women. Women's reports of induced abortion increase as techniques to affirm anonymity or conceal their response from the interviewer are incorporated into surveys compared with surveys that require directly responding in a face-to-face interview (Fu et al. 1998; Juarez, Cabigon, and Singh 2010). Surveys that use the random response technique—where the interviewer does not know which of several questions the respondent is answering—also record higher rates of induced abortion compared with face-to-face interviews (Chow and Rider 1972; Chow, Gruhn, and Chang 1979; Tezcan and Omran 1981).

Social desirability bias leads to different patterns of underreporting for different social groups. In Estonia, women were more likely to omit reporting an induced abortion if they were over age 40 or were ethnic Estonians (Anderson et al. 1994). Studies in the U.S. have found that women are less likely to report an induced abortion if they are nonwhite, have incomes below 200% of the poverty level, are unmarried, are Catholic, or live in the South (Fu et al. 1998; Jones and Forrest 1992; Jones and Kost 2007; Udry et al. 1996).

Although social desirability bias clearly reduces reporting of induced abortion, it is less clear the extent to which reporting of miscarriage or stillbirth may also be affected by social desirability bias. In the U.S., Jones and Kost (2007) found that women reported more instances of miscarriages and stillbirths in self-administered survey responses than in face-to-face interviews. This finding suggests that social desirability bias curbs women's propensity to report spontaneous abortion and stillbirths in a similar manner as it does for reports of induced abortion.

Several qualitative studies in sub-Saharan Africa suggest that social scripts determine the pattern of social pressure to conceal miscarriages and stillbirths. Miscarriage may be stigmatized if it is perceived to be an indicator of infertility, the consequence of previously having had an induced abortion, or caused by malevolent spirits (Bledsoe, Banja, and Hill 1998; Haws et al. 2010; Sisay et al. 2014; van der Sijpt 2010). However, miscarriage generates less stigma when perceived as proof that a woman can get pregnant, as described in a rural Gambian study: "simply getting pregnant periodically, even if some of these pregnancies eventually go wrong, is a key sign that a marriage is on track" (Bledsoe, Banja, and Hill 1998). Such events trigger less social censure when they are perceived to be the result of biological forces outside of the woman's control (Sisay et al. 2014; van der Sijpt 2010). Although the study of reporting miscarriages and stillbirths has been underdeveloped compared with the study of induced abortions (van der Sijpt 2010), the existing literature suggest that social desirability bias likely contributes to underreporting of miscarriages and stillbirths in surveys as well as underreporting of induced abortion.

Misclassification of terminated pregnancies

When women misreport induced abortions in surveys, they can either omit the pregnancy altogether, or report their induced abortion as a miscarriage. Social desirability bias may influence women to recast their experience with a terminated pregnancy as being a type of termination that is less stigmatized. In a U.S. study by Fu et al. (1998), women were asked about induced abortion during a face-to-face interview and again in a self-administered response format. Between 2%-5% of women who had reported a miscarriage

or ectopic pregnancy during the face-to-face interview changed their response to an induced abortion during the self-administered portion of the survey. Another study estimated that in Turkey a third of abortions that were reported in surveys as miscarriages had likely been induced abortions, on the basis of factors such as length of gestation before the abortion, contraceptive use preceding the pregnancy, reason for discontinuing contraception, and the wantedness of the pregnancy (Magnani, Rutenberg, and McCann 1996). Misreporting of induced abortions as miscarriages leads to overestimating miscarriages and underestimating induced abortions (Casterline 1989).

Misclassification of terminations can occur from miscommunication or misunderstanding. For example, researchers in Tanzania encountered difficulties when English classifications of terminations did not translate clearly into Swahili. They found that respondents might use a word meaning "miscarriage" but give a narrative account that described a termination that occurred after seven months of gestation—a stillbirth (Haws et al. 2010). Similarly, Gambians classified terminations by the woman's experience of the pregnancy loss and the health implications to the woman, rather than fetal age (Bledsoe, Banja, and Hill 1998). Moreover, a woman may recount to the interviewer what she believes to be a true description of the event, but may have received incorrect information or misunderstood information from a medical provider. A study in Australia found discrepancies between women's reports and administrative datasets by some women "misreporting a late spontaneous miscarriage or medical termination as a stillbirth" (Hure et al. 2015). Genuine confusion may also occur in borderline cases. Medical professionals might classify fetal deaths as late as 30 weeks gestation as miscarriages rather than as stillbirths, particularly in settings without neonatal intensive care (Blencowe et al. 2016). Anderson et al. (1994) also noted the possibility for women to confuse an induced abortion with a spontaneous abortion "if a troubled pregnancy or a medical recommendation led to the decision to abort the fetus."

1.1.3 Time and reporting of terminated pregnancies

Time and social desirability

Evidence on the effects of the passage of time on the misreporting of induced abortions is mixed; Udry et al. (1996) found that women were less likely to report an induced abortion as more time passed since the abortion, suggesting fading memories of the abortion with time. Fu et al. (1998), however, found that women were more likely to accurately report induced abortions that occurred further in the past compared with recent induced abortions—suggesting that time serves to create emotional distance from social pressures and allows for more objective reporting. The two could be operating simultaneously, with the net effect varying depending on social context.

Recall of the timing and displacement of terminated pregnancies

Many women accurately recall their experience with pregnancy termination but inaccurately recall when the termination occurred. Accurate recall of timing may become more difficult as the memory of the event fades with time. A study in Bangladesh found that women were more likely to misremember the timing of a birth the further into the past the pregnancy occurred (Espeut and Becker 2015). The more frequently an event occurs, the greater the likelihood a respondent will confuse the correct date (Sudman and Bradburn (1973). The implications of this study could be that women who experience repeated pregnancy terminations may be less likely to accurately place the timing of each one. Another study in Bangladesh

found that the more reproductive events of any kind that a woman had, the less likely she could reliably recall the timing of any given event (Callahan and Becker 2012).

Although vivid events are generally more likely to be remembered and nondescript ones forgotten, when a respondent remembers an event vividly, the respondent may incorrectly infer recency from the clarity of the memory, an effect called telescoping (Bradburn, Rips, and Shevell 1987; Sudman and Bradburn 1973). A study in Bangladesh, however, found that when women misreported the timing of births, they reported births farther back in time than actually occurred (Becker and Mahmud 1984). Even when women are willing to disclose their terminated pregnancies in a survey, difficulties with accurately recalling their timing may influence their reporting within the specific window of time captured by a reproductive calendar.

1.1.4 Improving reporting through calendar methods

Event history (or life history) calendar methods improve the reporting of the timing of events compared with direct questions in surveys by anchoring events around more memorable events. Anchors are easily recalled events (such as births) that help respondents place the timing of less memorable events in reference (Freedman et al. 1988). Commonly used anchors include births, birthdays, marriages, or public events (e.g., a presidency). Less memorable events are then nested in reference to the more accurately remembered events. For example, a survey on the purchase of major household goods might use an event history calendar that first asks a respondent to list the month and year of all births, marriages, moves, and job changes to make the task of remembering the date of a household purchase easier. Event history calendars facilitate accurate recall of events through incorporating the natural process of recall into the structure of the survey (Axinn, Pearce, and Ghimire 1999; Belli 1998; Belli et al. 2004).They improve recall of whether an event occurred by helping the respondent recall the chronology of events (Belli 1998).

A study on intimate partner violence in the U.S. found that an event history calendar facilitated remembering events further in the past compared with standard questionnaires, and therefore produced higher lifetime estimates of intimate partner violence (Yoshihama et al. 2005). A study on contraceptive use found both more accurate estimates of *when* events occurred and higher reported incidence of *whether* contraceptive use occurred when measured with the DHS calendar compared with a standard questionnaire (Goldman, Moreno, and Westoff 1989a).

Calendars also improve the recall of events compared with direct survey questionnaires by grouping events of a similar theme (e.g., a survey on reproductive behavior anchored around births, a survey on sexual behavior anchored around relationships) (Belli 1998). Event history calendars cue individuals with related anchors that "facilitate the remembrance of other thematic or temporally related events" from their own past (Belli, Shay, and Stafford 2001). By contrast, typical survey questionnaires "segment related aspects of autobiographical events from one another" (Belli 1998). A study in Costa Rica examined the results from an event history calendar that overlaid past work, pregnancy, contraception, and union events onto one calendar compared with the results from a standard questionnaire that segmented questions by topic. This study found that a higher percentage of women reported experiencing a miscarriage when interviewed with an event history calendar compared with the standard survey (6.7% versus 4.9%) (Becker and Sosa 1992).

Calendars also improve completeness of reporting by facilitating a more natural flow to the survey compared with standard questionnaires. This more natural structure helps build rapport between the

interviewer and respondent and decreases misreporting due to social desirability bias (Belli et al. 2004). A study on sexual behavior in Kenya estimated higher incidence of abstinence for men and multiple sexual partners for women with an event history calendar than with a standard questionnaire, suggesting that the event history calendar elicited more accurate reporting of socially sensitive behaviors (Luke, Clark, and Zulu 2011).

Calendars have received positive assessments for data collection in a number of areas, including dating relationships, employment, postpartum breastfeeding, amenorrhea, abstinence, intimate partner violence, contraceptive use, and birth intervals (Becker and Diop-Sidibé 2003; Callahan and Becker 2012; Freedman et al. 1988; Glasner and Van der Vaart 2009; Goldman, Moreno, and Westoff 1989a; Luke, Clark, and Zulu 2011; Yoshihama et al. 2005). Nonetheless, event history calendar methods can be improved upon. A study in one Indian state that incorporated a narrative life story approach with a calendar-style survey instrument elicited a lifetime abortion rate nearly five times higher than similar estimates from the National Family and Health Survey-2 (NFHS-2), which adopted the DHS calendar (Edmeades et al. 2010). A specific focus on abortion (rather than a multipurpose health indicator survey), interviewer-respondent rapport, and narrative structure, and careful attention to anchors, memory cues, and probes, may have contributed to improved reporting of induced abortion (Edmeades et al. 2010).

1.2 DHS Calendar

1.2.1 History of the DHS calendar

The DHS Program first developed the reproductive calendar[2] in an experimental study conducted in Peru and replicated in the Dominican Republic in 1986 (Goldman, Moreno, and Westoff 1989b; Westoff, Goldman, and Moreno 1990). In particular, these experiments tested "the potential of a 6-year calendar for the collection of monthly data on contraceptive practice, breastfeeding, amenorrhea, postpartum abstinence and exposure to risk; the comparative merits of a calendar approach vs. the standard format of collecting such information within each birth interval for estimates of fecundability, natural fertility, and contraceptive efficacy" (Goldman, Moreno, and Westoff 1989b p. 1).

Analysis of the data collected in the Peru survey showed improved data collection from the calendar format in the experimental questionnaire compared with the previously used tabular format, particularly for data on contraceptive histories (Goldman, Moreno, and Westoff 1989b, 1989a; Moreno, Goldman, and Babako 1991).

Subsequently, the reproductive calendar became a standard part of the DHS Model A questionnaire in the second phase of DHS (DHS-2) starting in 1990. In phases DHS-2 through DHS-4 the calendar was included only in countries with high contraceptive prevalence. Beginning in DHS-5 the core questionnaire for all countries included a reproductive calendar that collected information on births, pregnancies, terminations, and episodes of contraceptive use.

[2] This description of the DHS reproductive calendar borrows extensively from two sources: Bradley, S. E. K., W. Winfrey, and T. N. Croft. 2015. *Contraceptive Use and Perinatal Mortality in the DHS: An Assessment of the Quality and Consistency of Calendars and Histories*. DHS Methodological Reports No. 17. Rockville, Maryland, USA: ICF International; and Croft, T., S. E. K. Bradley, and C. Allen. 2018. *DHS Contraceptive Calendar Tutorial*. Rockville, MD: ICF.

The current DHS-7 standard questionnaire uses a two-column calendar collecting month-by-month data on births, pregnancies, and contraceptive use in column 1, and the reason for discontinuation of contraception in column 2. The DHS-6 standard questionnaire followed the same format as in DHS-7. The DHS-5 standard questionnaire included only one column for births, pregnancies, and contraceptive use, and did not include the reason for discontinuation of contraception. Earlier rounds of the DHS questionnaire collected a variety of information in the calendar.

1.2.2 Collecting birth, termination, and pregnancy information in the DHS calendar

This report analyzes the consistency of terminated pregnancies across the reproductive history calendar. The reproductive history calendar is a month-by-month history of reproductive events for five or more completed calendar years up to and including the year of the survey. The reproductive events included are: live births, months of pregnancy preceding live births, months of current pregnancy, terminated pregnancies, completed months of pregnancy before termination, and months of contraceptive method use. This report will include a discussion only of the process of recording pregnancies, births, and terminations. Discussion of data collection on contraceptive episodes occurs elsewhere (e.g., Bradley, Winfrey, and Croft 2015).

The calendar survey asks women about the most recent 5 years up to and including the current survey year. The survey therefore includes a column with 72 boxes in six sections—one box for up to 6 years' worth of months in which a woman can contribute information about reproductive events.

The reproductive calendar follows a complete birth history.[3] That is, the interviewer elicits data from the respondent through direct questions in the questionnaire, but records them in calendar format. A study of 192 surveys found DHS birth histories to be generally of excellent quality, with minimal evidence of omission or displacement of live births (Pullum and Becker 2014). Questions marked with a bold **C** indicate to the interviewer to transfer the response onto the calendar. In the birth history section of the questionnaire, the interviewer asks the respondent to list all her live births, usually from her first birth through her most recent birth.[4] The interviewer records characteristics of each live birth including the month and year of the birth. See Figure 1.1 as an example of the birth history from the DHS-7 Model Questionnaire. The interviewer then records any births that occurred in the past 5 years in the appropriate month in the reproductive calendar with a "B" for "birth." This becomes the starting point for filling out the reproductive calendar and effectively anchors reproductive events around live births.

[3] The majority of DHS questionnaires employ a birth history. However, some surveys instead employ a more complete pregnancy history in their questionnaires.
[4] This is a forward reported birth history when births are recorded in this direction. A backward reported birth history, beginning with the most recent birth, is used in a smaller proportion of surveys.

Figure 1.1 Sample birth history in the DHS-7 Model Questionnaire

211 Now I would like to record the names of all your births, whether still alive or not, starting with the first one you had. RECORD NAMES OF ALL THE BIRTHS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE ROWS. IF THERE ARE MORE THAN 10 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE, STARTING WITH THE SECOND ROW.

212 What name was given to your (first/ next) baby? RECORD NAME. BIRTH HISTORY NUMBER.	213 Is (NAME) a boy or a girl?	214 Were any of these births twins?	215 On what day, month, and year was (NAME) born?	216 Is (NAME) still alive?	217 IF ALIVE: How old was (NAME) at (NAME)'s last birthday? RECORD AGE IN COMP-LETED YEARS.	218 IF ALIVE: Is (NAME) living with you?	219 IF ALIVE: RECORD HOUSEHOLD LINE NUMBER OF CHILD. RECORD '00' IF CHILD NOT LISTED IN HOUSEHOLD.	220 IF DEAD: How old was (NAME) when (he/she) died? IF '12 MONTHS' OR '1 YR', ASK: Did (NAME) have (his/her) first birthday? THEN ASK: Exactly how many months old was (NAME) when (he/she) died? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Were there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
01	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (NEXT BIRTH)	DAYS 1 MONTHS 2 YEARS 3	
02	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)

The interviewer then proceeds to fill out the boxes in column 1 of the reproductive calendar, starting with the duration of each pregnancy preceding each live birth. Figure 1.2 displays the standard two-column calendar in the DHS-7 Model Questionnaire. (The second column records information on reasons for discontinuation of contraception, and is not germane this report.) Each month spent pregnant preceding a live birth is marked with a "P" for "pregnant." The final month of the pregnancy is the month of birth, "B," and the total months of pregnancy is therefore the sum of the number of P's plus one. The interviewer then asks the woman whether she is currently pregnant. If so, the interviewer enters the current month and any preceding months spent pregnant into column 1 with a "P."

Figure 1.2 Reproductive calendar in the DHS-7 Model Questionnaire

INSTRUCTIONS:
ONLY ONE CODE SHOULD APPEAR IN ANY BOX.
COLUMN 1 REQUIRES A CODE IN EVERY MONTH.

CODES FOR EACH COLUMN:

COLUMN 1: BIRTHS, PREGNANCIES, CONTRACEPTIVE USE (2)

B BIRTHS
P PREGNANCIES
T TERMINATIONS

0 NO METHOD

1 FEMALE STERILIZATION
2 MALE STERILIZATION
3 IUD
4 INJECTABLES
5 IMPLANTS
6 PILL
7 CONDOM
8 FEMALE CONDOM
9 EMERGENCY CONTRACEPTION
J STANDARD DAYS METHOD
K LACTATIONAL AMENORRHEA METHOD
L RHYTHM METHOD

M WITHDRAWAL
X OTHER MODERN METHOD
Y OTHER TRADITIONAL METHOD

COLUMN 2: DISCONTINUATION OF CONTRACEPTIVE USE

0 INFREQUENT SEX/HUSBAND AWAY
1 BECAME PREGNANT WHILE USING
2 WANTED TO BECOME PREGNANT
3 HUSBAND/PARTNER DISAPPROVED
4 WANTED MORE EFFECTIVE METHOD
5 SIDE EFFECTS/HEALTH CONCERNS

6 LACK OF ACCESS/TOO FAR
7 COSTS TOO MUCH
8 INCONVENIENT TO USE
F UP TO GOD/FATALISTIC
A DIFFICULT TO GET PREGNANT/MENOPAUSAL
D MARITAL DISSOLUTION/SEPARATION
X OTHER

_____
(SPECIFY)

Z DON'T KNOW

(1) Year of fieldwork is assumed to be 2015. For fieldwork beginning in 2016, all references to calendar years should be increased by one; for example, 2009 should be changed to 2010, 2010 should be changed to 2011, 2011 should be changed to 2012, and similarly for all years throughout the questionnaire.

(2) Response categories may be added for other methods, including fertility awareness methods.

				COL. 1	COL. 2	
	12	DEC	01			
	11	NOV	02			
	10	OCT	03			
2	09	SEP	04			2
0	08	AUG	05			0
1	07	JUL	06			1
5	06	JUN	07			5
(1)	05	MAY	08			
	04	APR	09			
	03	MAR	10			
	02	FEB	11			
	01	JAN	12			
	12	DEC	13			
	11	NOV	14			
	10	OCT	15			
2	09	SEP	16			2
0	08	AUG	17			0
1	07	JUL	18			1
4	06	JUN	19			4
	05	MAY	20			
	04	APR	21			
	03	MAR	22			
	02	FEB	23			
	01	JAN	24			
	12	DEC	25			
	11	NOV	26			
	10	OCT	27			
2	09	SEP	28			2
0	08	AUG	29			0
1	07	JUL	30			1
3	06	JUN	31			3
	05	MAY	32			
	04	APR	33			
	03	MAR	34			
	02	FEB	35			
	01	JAN	36			
	12	DEC	37			
	11	NOV	38			
	10	OCT	39			
2	09	SEP	40			2
0	08	AUG	41			0
1	07	JUL	42			1
2	06	JUN	43			2
	05	MAY	44			
	04	APR	45			
	03	MAR	46			
	02	FEB	47			
	01	JAN	48			
	12	DEC	49			
	11	NOV	50			
	10	OCT	51			
2	09	SEP	52			2
0	08	AUG	53			0
1	07	JUL	54			1
1	06	JUN	55			1
	05	MAY	56			
	04	APR	57			
	03	MAR	58			
	02	FEB	59			
	01	JAN	60			
	12	DEC	61			
	11	NOV	62			
	10	OCT	63			
2	09	SEP	64			2
0	08	AUG	65			0
1	07	JUL	66			1
0	06	JUN	67			0
	05	MAY	68			
	04	APR	69			
	03	MAR	70			
	02	FEB	71			
	01	JAN	72			

Once the interviewer has recorded data on all live births a woman has experienced, the interviewer then asks the woman about pregnancies that did not end in a live birth:

- *Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?*

Note that this wording asks whether or not a woman ever had a pregnancy that did not end in a live birth, and does not ask the woman to state *how* the pregnancy ended.

If the woman says "no," the interviewer proceeds with the interview and collects information on contraceptive use to fill out the rest of the calendar.

If the woman says "yes" to indicate that she has had a pregnancy that did not end in a live birth, the interview asks:

- *When did the last such pregnancy end?*

If the pregnancy ended in the last 5 years and is therefore eligible to be included in the calendar, the interviewer asks:

- *In what month and year did the preceding such pregnancy end?*

And enters a "T" for "terminated pregnancy" next to the appropriate month and year in the calendar.

The interviewer then asks:

- *How many months pregnant were you when that pregnancy ended?*

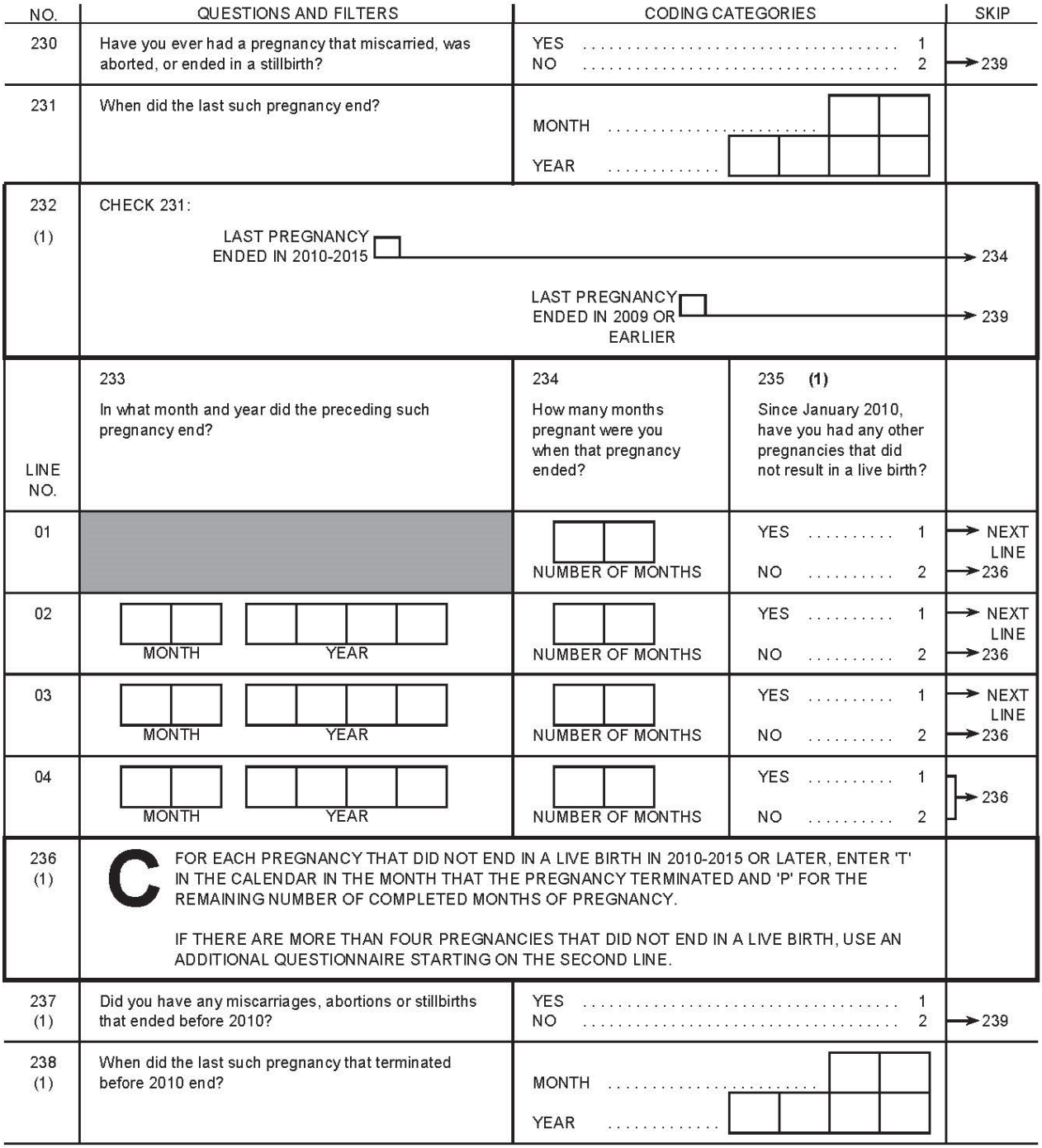
And enters a "P" into the calendar for each month the woman was pregnant preceding the termination. As with pregnancies ending in a live birth, the final month of the pregnancy is the month of termination, "T," and the total number of months of pregnancy is therefore the sum of the number of P's plus one. Pregnancies that terminate in their first month are recorded with a T and no P's in the preceding months.

The interviewer then asks:

- *Since [the beginning month and year of the eligible calendar period], have you had any other pregnancies that did not result in a live birth?*

The interviewer repeats this process until the woman responds "no"—she has not had any (additional) pregnancies that did not result in a live birth. The interviewer then continues with the survey, including information on contraceptive use, which fills out the rest of the calendar. Note that in the standard DHS-7 Model Questionnaire the interviewer never asks the woman to differentiate between whether the pregnancy ended in a miscarriage, abortion, or a stillbirth. Figure 1.3 shows the standard questions used in the DHS-7 Model Questionnaire to collect data on terminated pregnancies.

Figure 1.3 Sample questions on terminated pregnancies in the DHS-7 Model Questionnaire



There is a hierarchy to the data collected in the calendar and the priority certain events have, and this follows from the order in which the data are collected, as described in the previous section. DHS reproductive calendars prioritize live births and use them to anchor memories of other reproductive and contraceptive events. The priority order for recording events in each month is as follows:

1) Live births
2) Completed months of pregnancy preceding live births
3) Months of current pregnancy
4) Terminated pregnancies
5) Completed months of pregnancy before a terminated pregnancy
6) Months of use of the current contraceptive method
7) Discontinuation of a contraceptive method, and months of use preceding the discontinuation

The calendar only permits a single code in each month, which necessitates adding the month in which B or T is recorded to the P's to calculate the duration of the pregnancy. Additionally, if a delivery of a pregnancy with multiples results in a live birth and a stillbirth in the same month, then only the live birth is recorded in the calendar. This potentially results in a slight undercount of stillbirths.

This section has described how the standard DHS questionnaire completes the reproductive calendar using a woman's birth history. Countries can request deviations from the standard questionnaire. In certain surveys the terminated pregnancies are further classified as stillbirths, abortions, or miscarriages. These surveys typically use a pregnancy history rather than a birth history in the Women's Questionnaire.

For example, the 2015-16 India DHS survey (also referred to as the NFHS-4) included questions on induced abortion (see Figure 1.4). Like the standard DHS questionnaire, the India survey questionnaire asks, "Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?" Like the core questionnaire, the interviewer asks when the pregnancy ended. Unlike the standard questionnaire, the India questionnaire includes a follow-up question asking the respondent how the pregnancy ended:

- *Did that pregnancy end in a miscarriage, an abortion, or a stillbirth?*

The interviewer then marks a "M," "A," or "S" in the corresponding month and year in the calendar to indicate whether the pregnancy ended in a miscarriage, abortion, or stillbirth.[5] These data on the types of terminations are usually recorded in a survey-specific calendar variable. The specific question wording for any questionnaire can be found in the appendix of the survey's final report.

[5] In DHS recode data files, "M," "A," or "S" codes are converted to a "T" code in the standard variable for the first column of the calendar (vcal_1) to maintain comparability across DHS data files. The "M," "A," or "S" code is retained in a survey-specific variable.

Figure 1.4 India 2015-16 DHS questionnaire and reproductive calendar with survey-specific questions distinguishing miscarriage, induced abortion, and stillbirth

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
231	क्या आपका कोई गर्भ ऐसा था जिसका अपने आप गर्भपात हो गया, गर्भपात कराया गया या मरे हुए बच्चे का जन्म हुआ? Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?	YES ..... 1 NO 2	→ 248
232	ऐसे सबसे आखिरी गर्भ की समाप्ति कब हुई? When did the last such pregnancy end?	MONTH ..... ☐☐ YEAR ..... ☐☐☐☐	
233	CHECK 232: LAST PREGNANCY ENDED IN JANUARY 2011 OR LATER ☐ LAST PREGNANCY ENDED BEFORE JANUARY 2011 ☐ →		248
234	क्या वह गर्भ का स्वतः गर्भपात हो गया, या गर्भपात कराया गया था या बच्चा मृत पैदा हुआ था? Did that pregnancy end in a miscarriage, an abortion, or a stillbirth? **C** CIRCLE RESPONSE CODE AND ENTER 'M' FOR MISCARRIAGE, 'A' FOR ABORTION, OR 'S' FOR STILLBIRTH IN **COLUMN 1** OF THE CALENDAR IN MONTH IN WHICH PREGNANCY WAS TERMINATED.	MISCARRIAGE ..... 1 ABORTION ..... 2 STILLBIRTH 3	
235	आखिरी ऐसे गर्भ की जब समाप्ति हुई उस समय आपको कितने महीने का गर्भ था? How many months pregnant were you when the last such pregnancy ended? **C** RECORD NUMBER OF COMPLETED MONTHS. ENTER 'P's IN **COLUMN 1** OF CALENDAR IN MONTHS **BEFORE** THE THE PREGNANCY TERMINATED. TOTAL NUMBER OF 'P's MUST BE ONE LESS THAN NUMBER OF MONTHS PREGNANT AT TIME OF TERMINATION.	MONTHS ..... ☐☐	
236	क्या इस गर्भावस्था के दौरान कभी भी आपका अल्ट्रासाउंड/सोनोग्राफी परीक्षण हुआ था? At any time during this pregnancy, did you have an ultrasound test? **C** RECORD 'Y' IF YES AND 'N' IF NO IN **COLUMN 2** OF THE CALENDAR IN MONTH IN WHICH PREGNANCY WAS TERMINATED.		
237	CHECK 234: ABORTION ☐ MISCARRIAGE OR STILLBIRTH ☐ →		244

Continued

Figure 1.4—*Continued*

INSTRUCTIONS:

ONLY ONE CODE SHOULD APPEAR IN ANY BOX.
FOR COLUMN 1, ALL MONTHS SHOULD BE FILLED IN.

INFORMATION TO BE CODED FOR EACH COLUMN

COLUMN 1:

BIRTHS, PREGNANCIES, CONTRACEPTIVE USE

- B BIRTHS
- P PREGNANCIES
- A ABORTIONS
- M MISCARRIAGES
- S STILLBIRTHS
- T TERMINATIONS

- 0 NO METHOD
- 1 FEMALE STERILIZATION
- 2 MALE STERILIZATION
- 3 IUD/PPIUD
- 4 INJECTABLES
- 5 PILL
- 6 CONDOM/NIRODH
- 7 FEMALE CONDOM
- 8 DIAPHRAGM
- F FOAM OR JELLY
- L LACTATIONAL AMENORRHOEA METHOD
- R RHYTHM METHOD
- W WITHDRAWAL
- X OTHER MODERN METHODS
- Y OTHER TRADITIONAL METHODS

COLUMN 2:

ULTRASOUND CONDUCTED DURING PREGNANCY

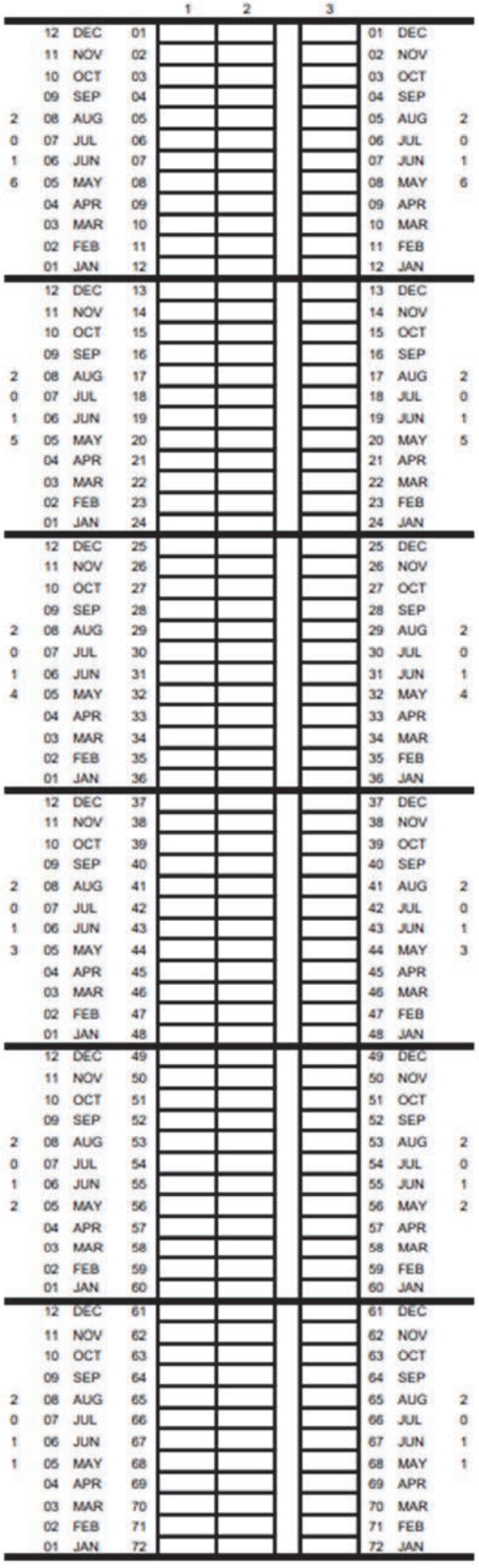
- Y YES
- N NO

COLUMN 3:

DISCONTINUATION OF CONTRACEPTIVE USE

- 0 INFREQUENT SEX/HUSBAND AWAY
- 1 METHOD FAILED/BECAME PREGNANT WHILE USING
- 2 WANTED TO BECOME PREGNANT
- 3 HUSBAND DISAPPROVED
- 4 WANTED MORE EFFECTIVE METHOD
- 5 FEAR OF SIDE EFFECTS/ HEALTH CONCERNS
- 6 LACK OF ACCESS/TOO FAR
- 7 COSTS TOO MUCH
- 8 INCONVENIENT TO USE
- 9 FATALISTIC/ UP TO GOD
- F DIFFICULT TO GET PREGNANT/MENOPAUSAL
- A MARITAL DISSOLUTION/SEPARATION
- D LACK OF SEXUAL SATISFACTION
- L CREATED MENSTRUAL PROBLEM
- M GAINED WEIGHT
- G DID NOT LIKE METHOD
- N LACK OF PRIVACY FOR USE

- X OTHER _____ (SPECIFY)
- Z DON'T KNOW



2 METHODS

2.1 Calendar Data and Survey Characteristics

In this study, we analyze 162 standard DHS surveys from 62 countries that administered a reproductive calendar, as shown in Table 2.1. Of these, 30 surveys are in Asia, 67 in sub-Saharan Africa, 33 in Latin America and the Caribbean (LAC), and 32 in 13 countries of North Arica, the Middle East, West and Central Asia, and Eastern Europe (hereafter grouped as "Other Countries" in this study, for the purpose of analysis). The surveys were conducted between 1991 and 2017, with their data publicly available by June 2018. Data for all surveys can be obtained freely from The DHS Program at https://www.dhsprogram.com/data/, with the exception the Turkey 2008 DHS and Turkey 2013 DHS. These data can be obtained by request from the Institute of Population, Hacettepe University, at http://www.hips.hacettepe.edu.tr/tnsa/request.php.

The number of columns typically included in the calendar has changed over different phases of The DHS Program. We make use of the first calendar column in which pregnancies, births, and terminations are recorded, regardless of the other columns recorded in the calendar. Specifically, we use events files created from the calendar string variables available in standard DHS recode data files. A method for preparing such events files is described in *The DHS Contraceptive Calendar Tutorial*[6] (Croft, Bradley, and Allen 2018).

Although the calendar is generally standard in its implementation, there are some survey-to-survey differences in the way it is administered, as shown in Table 2.1. Most calendars are recorded from a complete birth history in which women are asked about every birth they have experienced, whether still living or not. However, in about 20 surveys the calendar is based on a pregnancy history in which women are asked about every pregnancy they have had, whether resulting in a live birth or not. All but a few surveys employ a forward reported history, which collects data beginning with the first birth/pregnancy and moves through each subsequent one until reaching the time of the survey. Just nine surveys use a backward reported history, which collects data beginning with the most recent birth/pregnancy and moves backward until the first birth/pregnancy. The majority of surveys, when inquiring about pregnancies that do not result in a live birth, do not distinguish between terminations that result from miscarriages versus induced abortion; however, 24 surveys in Asia and the Other Countries region do make this distinction.

DHS surveys have changed in other ways over time. They are increasingly administered using computer-assisted field editing (CAFÉ) or computer-assisted personal interview (CAPI) on tablets rather than with a pen-and-paper interview. Additionally, questionnaires have become longer over subsequent phases of The DHS Program. These survey characteristics may influence the consistency of reporting of terminated pregnancies in DHS calendars.

[6] The *DHS Contraceptive Calendar Tutorial* and associated programs and resources are available on The DHS Program website at www.dhsprogram.com/data/Calendar-Tutorial/index.cfm.

Table 2.1 Survey characteristics of DHS surveys with reproductive calendars

Survey	DHS phase	Type of history [1]	Direction of reporting [2]	Questions distinguish miscarriage and induced abortion	Mode of data collection [3]	Survey length [4]	# of questions
Asia							
Afghanistan 2015	7	Birth	Forward	No	PAPI	Long	383
Bangladesh 1993-94	3	Birth	Forward	No	PAPI	Short	253
Bangladesh 1996-97	3	Birth	Forward	Yes	PAPI	Short	261
Bangladesh 1999-00	3	Birth	Forward	No	PAPI	Short	270
Bangladesh 2004	4	Birth	Forward	No	PAPI	Short	245
Bangladesh 2007	5	Birth	Forward	No	PAPI	Short	256
Bangladesh 2011	6	Birth	Forward	No	PAPI	Short	302
Bangladesh 2014	6	Birth	Forward	No	PAPI	Short	273
Cambodia 2010	5	Birth	Forward	No	PAPI	Short	352
Cambodia 2014	6	Birth	Forward	No	PAPI	Long	375
India 2005-06	5	Birth	Forward	No	PAPI	Long	433
India 2015-16	6	Birth	Forward	Yes	CAPI	Long	493
Indonesia 1991	2	Birth	Forward	No	PAPI	Short	226
Indonesia 1994	3	Birth	Forward	No	PAPI	Short	255
Indonesia 1997	3	Birth	Forward	Yes	PAPI	Short	215
Indonesia 2002-03	4	Birth	Forward	No	PAPI	Short	294
Indonesia 2007	5	Birth	Forward	No	PAPI	Short	297
Indonesia 2012	6	Birth	Forward	Yes	PAPI	Long	446
Maldives 2009	5	Birth	Forward	No	CAPI	Short	320
Myanmar 2015-16	7	Birth	Forward	No	CAFÉ	Long	390
Nepal 2006	5	Pregnancy	Forward	Yes	PAPI	Short	332
Nepal 2011	6	Pregnancy	Forward	Yes	CAPI	Short	334
Nepal 2016	7	Pregnancy	Forward	Yes	CAPI	Long	446
Pakistan 2012-13	6	Pregnancy	Forward	Yes	PAPI	Short	319
Philippines 1993	2	Pregnancy	Forward	No	PAPI	Short	312
Philippines 1998	3	Pregnancy	Forward	No	PAPI	Short	280
Philippines 2003	4	Pregnancy	Forward	No	PAPI	Short	284
Timor-Leste 2009-10	5	Birth	Forward	No	PAPI	Long	419
Vietnam 1997	3	Pregnancy	Backward	No	PAPI	Short	263
Vietnam 2002	4	Pregnancy	Backward	No	PAPI	Short	263
Africa							
Angola 2015-16	7	Birth	Forward	No	CAPI	Long	429
Benin 2006	5	Birth	Forward	No	PAPI	Long	399
Benin 2011-12	6	Birth	Forward	No	CAPI	Long	391
Burkina Faso 2003	4	Birth	Forward	No	PAPI	Short	330
Burkina Faso 2010	6	Birth	Forward	No	PAPI	Long	405
Burundi 2010	6	Birth	Forward	No	PAPI	Short	350
Burundi 2016-17	7	Birth	Forward	No	CAPI	Long	469
Comoros 2012	6	Birth	Forward	No	PAPI	Long	391
Ethiopia 2005	4	Birth	Forward	No	PAPI	Long	370
Ethiopia 2011	6	Birth	Forward	No	PAPI	Short	349
Ethiopia 2016	7	Birth	Forward	No	CAPI	Long	476
Gambia 2013	6	Birth	Forward	No	PAPI	Long	390
Ghana 2003	4	Birth	Forward	No	PAPI	Short	280
Ghana 2008	5	Birth	Forward	No	PAPI	Long	444
Ghana 2014	6	Birth	Forward	No	CAFÉ	Long	418
Guinea 2005	4	Birth	Forward	No	PAPI	Long	390
Kenya 1998	3	Birth	Forward	No	PAPI	Short	296
Kenya 2003	4	Birth	Forward	No	PAPI	Short	316

Continued

Table 2.1—*Continued*

Survey	DHS phase	Type of history [1]	Direction of reporting [2]	Questions distinguish miscarriage and induced abortion	Mode of data collection [3]	Survey length [4]	# of questions
Africa cont'd							
Kenya 2008-09	5	Birth	Forward	No	PAPI	Long	445
Kenya 2014	6	Birth	Forward	No	PAPI	Long	391
Lesotho 2009	5	Birth	Forward	No	CAPI	Long	447
Lesotho 2014	6	Birth	Forward	No	CAPI	Long	379
Liberia 2013	6	Birth	Forward	No	PAPI	Short	350
Madagascar 2003-04	4	Birth	Forward	No	PAPI	Long	403
Madagascar 2008-09	5	Birth	Forward	No	PAPI	Long	422
Malawi 2000	4	Birth	Forward	No	PAPI	Short	304
Malawi 2004	4	Birth	Forward	No	PAPI	Short	343
Malawi 2010	5	Birth	Forward	No	PAPI	Long	500
Malawi 2015-16	7	Birth	Forward	No	CAPI	Long	450
Mali 2001	4	Birth	Forward	No	PAPI	Short	322
Mali 2006	5	Birth	Forward	No	PAPI	Long	444
Mali 2012-13	6	Birth	Forward	No	CAPI	Long	407
Mozambique 2003	4	Birth	Forward	No	PAPI	Short	297
Mozambique 2011	6	Birth	Forward	No	CAPI	Long	381
Namibia 2006-07	5	Birth	Forward	No	PAPI	Long	445
Namibia 2013	6	Birth	Forward	No	PAPI	Long	400
Niger 2006	5	Birth	Forward	No	PAPI	Long	408
Niger 2012	6	Birth	Forward	No	PAPI	Long	404
Nigeria 2008	5	Birth	Forward	No	PAPI	Long	491
Nigeria 2013	6	Birth	Forward	No	PAPI	Long	396
Rwanda 2000	4	Birth	Forward	No	PAPI	Short	315
Rwanda 2005	4	Birth	Forward	No	PAPI	Long	411
Rwanda 2010	6	Birth	Forward	No	PAPI	Long	366
Rwanda 2014-15	6	Birth	Forward	No	PAPI	Long	378
Senegal 2005	4	Birth	Forward	No	PAPI	Long	383
Senegal 2010-11	6	Birth	Forward	No	CAPI	Short	328
Senegal 2012-13	6	Birth	Forward	No	CAPI	Short	293
Senegal 2014	6	Birth	Forward	No	CAPI	Short	344
Senegal 2015	6	Birth	Forward	No	CAPI	Short	354
Senegal 2016	6	Birth	Forward	No	CAPI	Short	353
Sierra Leone 2008	5	Birth	Forward	No	PAPI	Long	444
Sierra Leone 2013	6	Birth	Forward	No	PAPI	Long	409
Swaziland 2006-07	5	Birth	Forward	No	PAPI	Long	414
Tanzania 2004-05	4	Birth	Forward	No	PAPI	Long	369
Tanzania 2010	5	Birth	Forward	No	PAPI	Long	466
Tanzania 2015-16	7	Birth	Forward	No	PAPI	Long	412
Uganda 2000-01	4	Birth	Forward	No	PAPI	Short	310
Uganda 2006	5	Birth	Forward	No	PAPI	Long	467
Uganda 2011	6	Birth	Forward	No	PAPI	Long	387
Uganda 2016	7	Birth	Forward	No	CAPI	Long	387
Zambia 2007	5	Birth	Forward	No	PAPI	Long	464
Zambia 2013-14	6	Birth	Forward	No	PAPI	Long	382
Zimbabwe 1994	3	Birth	Forward	No	PAPI	Short	339
Zimbabwe 1999	4	Birth	Forward	No	PAPI	Short	286
Zimbabwe 2005-06	5	Birth	Forward	No	PAPI	Long	485
Zimbabwe 2010-11	6	Birth	Forward	No	CAPI	Long	384
Zimbabwe 2015	7	Birth	Forward	No	CAPI	Long	432

Continued

Table 2.1—*Continued*

Survey	DHS phase	Type of history [1]	Direction of reporting [2]	Questions distinguish miscarriage and induced abortion	Mode of data collection [3]	Survey length [4]	# of questions
LAC							
Bolivia 1994	3	Birth	Forward	No	PAPI	Short	322
Bolivia 2003	4	Birth	Forward	No	PAPI	Long	359
Bolivia 2008	5	Birth	Forward	No	PAPI	Long	499
Brazil NE 1991	2	Birth	Forward	No	PAPI	Short	297
Brazil 1996	3	Birth	Forward	No	PAPI	Short	286
Colombia 1990	2	Birth	Forward	No	PAPI	Short	252
Colombia 1995	3	Birth	Forward	No	PAPI	Short	278
Colombia 2000	4	Birth	Forward	No	PAPI	Short	342
Colombia 2005	4	Birth	Forward	No	CAPI	Long	477
Colombia 2010	5	Birth	Forward	No	CAPI	Long	582
Colombia 2015	7	Birth	Forward	No	CAPI	Long	493
Dominican Republic 1991	2	Birth	Forward	No	PAPI	Short	306
Dominican Republic 1996	3	Birth	Forward	No	PAPI	Short	287
Dominican Republic 1999	3	Birth	Forward	No	PAPI	Long	389
Dominican Republic 2002	4	Birth	Forward	No	PAPI	Long	380
Guatemala 1995	3	Birth	Forward	No	PAPI	Short	301
Guatemala 1998-99	3	Birth	Forward	No [7]	PAPI	Short	275
Guatemala 2014-15	6	Birth	Forward	No	PAPI	Long	420
Guyana 2009	5	Birth	Forward	No	PAPI	Long	425
Honduras 2005-06	5	Birth	Forward	No	PAPI	Long	459
Honduras 2011-12	6	Birth	Forward	No	PAPI	Long	415
Nicaragua 1998	3	Birth	Forward	No	PAPI	Short	334
Nicaragua 2001	4	Birth	Forward	No	PAPI	Short	298
Paraguay 1990	2	Birth	Forward	No	PAPI	Short	250
Peru 1991-92	2	Birth	Forward	No	PAPI	Short	312
Peru 1996	3	Birth	Forward	No	PAPI	Short	284
Peru 2000	4	Birth	Forward	No	PAPI	Short	358
Peru 2004-06	5	Birth	Forward	No	CAPI	Short	335
Peru 2007-08	5	Birth	Forward	No	CAPI	Short	336
Peru 2009	6	Birth	Forward	No	CAPI	Short	320
Peru 2010	6	Birth	Forward	No	CAPI	Short	323
Peru 2011	6	Birth	Forward	No	CAPI	Short	323
Peru 2012	6	Birth	Forward	No	CAPI	Short	323
Other Countries							
Albania 2008-09	5	Pregnancy [6]	Forward	Yes	CAPI	Long	426
Armenia 2000	4	Pregnancy	Backward	Yes	PAPI	Long	384
Armenia 2005	4	Pregnancy	Backward	Yes	PAPI	Long	377
Armenia 2010	6	Pregnancy	Backward	Yes	PAPI	Long	364
Armenia 2015-16	7	Pregnancy	Forward	Yes	PAPI	Long	445
Azerbaijan 2006	5	Pregnancy	Backward	No	PAPI	Long	463
Egypt 1992	2	Birth	Forward	No	PAPI	Short	343
Egypt 1995	3	Birth	Forward	Yes	PAPI	Short	350
Egypt 2000	4	Birth	Forward	Yes	PAPI	Short	324
Egypt 2003	4	Birth	Forward	Yes	PAPI	Short	277
Egypt 2005	4	Birth	Forward	Yes	PAPI	Long	378
Egypt 2008	5	Birth	Forward	Yes	PAPI	Short	349
Egypt 2014	6	Birth	Forward	Yes	PAPI	Short	349
Jordan 1990	2	Birth	Forward	No	PAPI	Short	234
Jordan 1997	3	Birth	Forward	No	PAPI	Short	266

Continued

Table 2.1—*Continued*

Survey	DHS phase	Type of history [1]	Direction of reporting [2]	Questions distinguish miscarriage and induced abortion	Mode of data collection [3]	Survey length [4]	# of questions
Other Countries cont'd							
Jordan 2002	4	Birth	Forward	No	PAPI	Short	274
Jordan 2007	5	Birth	Forward	No	PAPI	Short	318
Jordan 2009	5	Birth	Forward	No	PAPI	Short	183
Jordan 2012	6	Birth	Forward	No	PAPI	Short	338
Kazakhstan 1999	3	Pregnancy	Backward	Yes	PAPI	Short	353
Kyrgyz Republic 2012	6	Pregnancy	Forward	No	PAPI	Long	420
Moldova 2005	4	Pregnancy	Backward	No	PAPI	Long	410
Morocco 1992	2	Birth	Forward	No	PAPI	Short	291
Morocco 2003-04	4	Birth	Forward	No	PAPI	Short	313
Tajikistan 2012	6	Pregnancy	Forward	No	PAPI	Long	393
Turkey 1993	2	Birth	Forward	Yes	PAPI	Short	310
Turkey 1998	3	Birth	Forward	No	PAPI	Short	328
Turkey 2003	4	Birth	Forward	Yes	PAPI	Long	378
Turkey 2008 [5]	5	Birth	Forward	Yes	PAPI	Short	287
Turkey 2013 [5]	6	Birth	Forward	Yes	PAPI	Short	287
Ukraine 2007	5	Pregnancy	Backward	No	PAPI	Long	400
Yemen 2013	6	Birth	Forward	No	PAPI	Short	337

Notes:

[1] A birth history collects data on every live birth, whether still alive or not. A pregnancy history collects data on all pregnancies, including those that ended in a live birth, an induced abortion, a miscarriage, and a stillbirth.

[2] A forward reported history collects data beginning with the first birth/pregnancy moving through each subsequent one until the most recent, whereas a backward reported history collects data beginning with the most recent birth/pregnancy moving backward until the first birth/pregnancy.

[3] PAPI: pen and paper personal interview; CAFÉ: computer-assisted field editing; CAPI: computer-assisted personal interview.

[4] The survey is categorized as long if the number of questions exceeds the median number of questions across all surveys, and short if the number of questions is fewer than the median number of questions across all surveys.

[5] The Turkey 2008 and 2013 surveys can be obtained from the Institute of Population, Hacettepe University, at http://www.hips.hacettepe.edu.tr/tnsa/request.php. All other surveys are available from The DHS Program at https://www.dhsprogram.com/data/.

[6] The Albania 2008-09 DHS administers a birth history for all births, but a pregnancy history for the last 5 years. It is categorized as having a pregnancy history for the purposes of this study since that is the history type completing the period of time covered by the calendar.

[7] The Guatemala 1998-99 DHS does not distinguish between miscarriage and induced abortion, but does differentiate between early neonatal death and stillbirth.

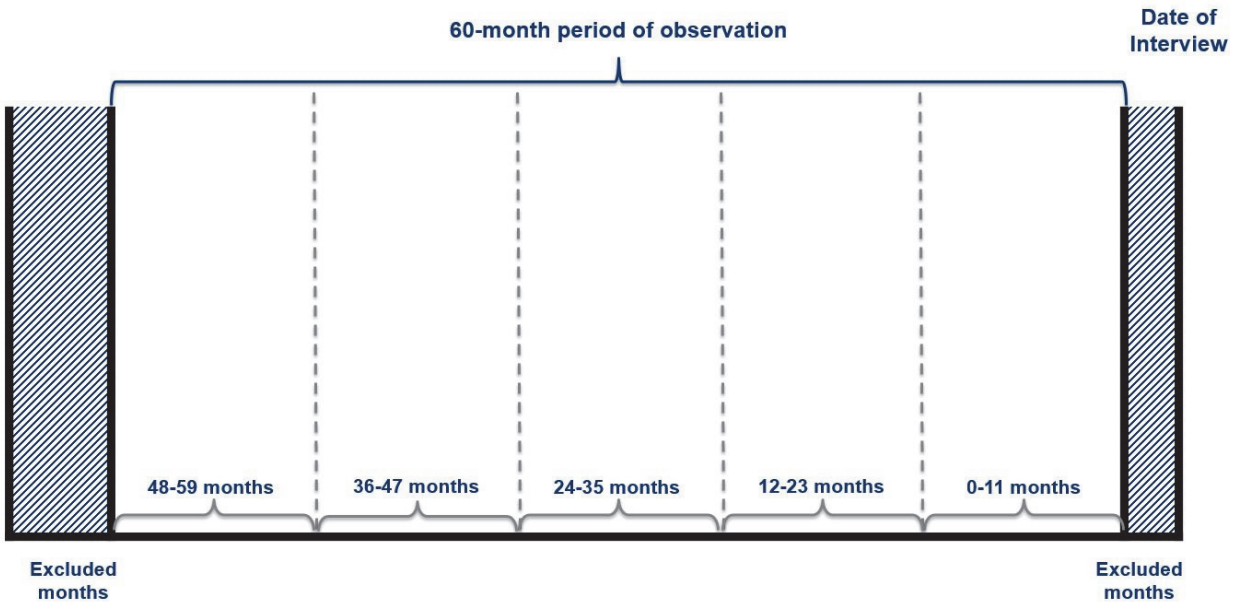
2.2 Period of Observation

Although DHS calendars collect monthly data for a total of more than 60 months, we restrict our period of observation to a 60-month period, as in Figure 2.1. Our 60-month period of observation does not begin with the month of the interview, however, as we do not use the 3 months preceding the date of the interview. There are several reasons: First, we discard the month of the interview because it is an incomplete month of observation for all but approximately 3% of women who happen to be interviewed on the last day of the month. Second, omitting the first 3 months of the calendar follows the convention for analysis of contraceptive discontinuation. Because many women may not recognize that they are pregnant in the first 2 months of pregnancy, this exclusion avoids the potential for biased reporting of pregnancies, pregnancy outcomes, and pregnancies due to contraceptive failure in this period. Finally, this exclusion results in an even distribution of observations across the observation period.

Each survey's calendar varies in length depending on the months of the year in which data collection occurs. We also restrict our period of observation to 60 months so that we are examining a consistent period of time

across all surveys. There is also substantial attrition in the number of cases in the earliest months of the calendar. The exclusion of the earliest tail of the calendar results in an even distribution of observations in the same way that excluding the three months preceding the interview does.

Figure 2.1 Study period of observation



2.3 Measures

2.3.1 Termination ratio

Our primary measure is a termination ratio, which in any given month of the calendar is the ratio of terminated pregnancies to live births, expressed per 100 live births. As such, it is analogous to an abortion ratio or maternal mortality ratio. The termination ratio is simply

$$\left(\frac{terminated\ pregnancies}{live\ births}\right) \times 100$$

We aggregate monthly termination ratios into termination ratios for five 12-month intervals in two ways. The first is with regard to the woman's month of interview. We calculate the termination ratio for each 12-month interval (0-11 months, 12-23 months, 24-35 months, 36-47 months, and 48-59 months) from the month of interview during the observation period. The second is with regard to month and year in the calendar. Thus, for a survey's calendar beginning in January 2010, and June 2015 being the most recent month in the observation period, we calculate the termination ratio for the following 12-month intervals: July 2014–June 2015, July 2013–June 2014, July 2012–June 2013, July 2011–June 2012, and July 2010–June 2011. The period of January–June 2010 would form an incomplete sixth interval and falls outside of our observation period.

2.3.2 Other measures

We classify survey calendars according to six survey characteristics, described in Table 2.1. These are:

- whether the survey employs a birth history or a pregnancy;
- whether the survey gathers forward reported or backward reported history;
- whether the survey includes questions to differentiate types of termination, namely miscarriage and induced abortion;
- whether data were collected through PAPI, CAFÉ, or CAPI;
- whether the survey questionnaire was relatively long or short; and
- phase of The DHS Program.

A survey is classified as having a long questionnaire if the number of questions exceeds the median number of questions across all surveys, and as having a short questionnaire if the number of questions is less than or equal to the median number of questions across all surveys.

2.4 Analytic Strategy

2.4.1 Within-survey consistency

In this study, we first examine within-survey consistency in the termination ratios, in two ways. First, for all 162 surveys, we generate plots to describe termination ratios over the course of the 60-month observation period into five 12-month intervals. Next, we apply a statistical test of the equivalence of termination ratios estimated at the most recent and earliest interval in the calendar.

Ceteris paribus, we would expect that the termination ratio would be constant over the course of a 60-month calendar. Our null hypothesis implicitly assumes that 5 years is a sufficiently short period of time that changing fertility patterns resulting in real changes in the termination ratio would not be detectable. A Wald test of equivalence tests whether the relative odds of termination during the 0-11 months preceding the survey is equivalent to that in the 48-59 months preceding the survey. Thus, with a p-value of the Wald test of less than 0.05, we reject the null hypothesis that the termination ratios at the start and the end of the calendar are statistically equivalent and deem the survey "inconsistent."

2.4.2 Between-survey consistency

Of the 62 countries that have at least one survey with a calendar, more than half—34 countries—have multiple calendars that are consecutive or overlap in time. For these surveys, we supplement the assessment of within-survey consistency by assessing between-survey consistency in termination ratios from one survey to the next. We allow up to a 1-year gap between surveys. This analysis comprises 121 calendars.

For between-survey analysis, we first use graphical analysis to examine the continuity of termination ratios from one survey to the next. In particular, we examine the adjoining (or overlapping) moments of the surveys. The termination ratios calculated from two surveys at these adjoining (or overlapping) points should be similar, i.e., not statistically different. Between-survey inconsistency is evident if they are not similar.

We follow the graphical analysis with a formal test of between-survey consistency. With each pair of consecutive surveys, we calculate the absolute and relative difference in the termination ratios between the earliest observed interval of one survey and the most recent observed interval of the preceding survey. If the relative difference is greater than the absolute value of 20.6%, we reject the null hypothesis that there is no significant difference between the two termination ratios, meaning that between-survey inconsistency is evident. We use a cutoff of 20.6% as the threshold because it is the minimum difference for which a significant difference in termination ratios can be detected.

Fertility patterns, public health status, and health care systems may change over time, influencing the real ratio of pregnancies that end in termination to those ending in live birth. Examining termination ratios over a longer stretch of time allows us to detect whether increasing or decreasing termination ratios reflect a secular trend, which may or may not be detectable in a single 5-year calendar. In the presence of a secular trend, the adjoining (or overlapping) points of the calendars should nonetheless be consistent if termination ratios are consistently reported. A survey that suggests within-survey inconsistency because of a significantly increasing (or decreasing) termination ratio may be revealed to have between-survey consistency if the change in the termination ratio is due to a secular trend. Nonetheless, there should be between-survey consistency, regardless of whether or not there is a secular trend or evidence of within-survey inconsistency. If between-survey inconsistency is indicated, we assume that the higher termination ratio is the more accurate ratio, and hypothesize that this will be recorded in the more recent interval of a preceding calendar rather than in the earlier interval of the following calendar.

2.4.3 Classification by survey characteristics

Based on the two tests of within-survey and between-survey consistency, we classify each survey as either "consistent" or "inconsistent." A survey is classified as "inconsistent" if both the within-survey and between-survey tests indicate inconsistency, and it is classified as "consistent" if either the within-survey or between-survey test, or both, suggests consistency. If only one test is available, a survey is classified according to the results of the within-survey test.

We then disaggregate consistent and inconsistent surveys according to the six survey characteristics to determine if we can identify any patterns. We selected these survey characteristics on the basis of their potential to be associated with the consistency or inconsistency of surveys' termination ratios, but we make no specific hypotheses about any such associations. These data are descriptive; no statistical tests are conducted to conclude whether surveys with certain characteristics are significantly more or less likely to produce calendars with consistent reporting of termination ratios.

3 PATTERNS OF TERMINATION RATIOS IN SINGLE SURVEYS

3.1 Observing Patterns of Termination Ratios in Single Surveys

Figures 3.1 through 3.4 show the termination ratios in 12-month intervals for each of the 162 surveys in the study, organized by region. We expect that if the calendar demonstrates consistency, the reported termination ratios will be constant across all intervals in a survey's calendar in the absence of changes in real-world conditions. With only a few exceptions, however, this is not the pattern we find. The dominant pattern in all four regions is one of higher termination ratios in the most recent interval, 0-11 months preceding the interview, and decreasing termination ratios in earlier intervals.

3.1.1 Patterns of termination ratios in Asia

Of the 30 surveys in Asia, Timor-Leste 2009-2010 most clearly shows a pattern of consistent termination ratios over the course of the calendar. Timor-Leste also shows the lowest termination ratios in the region, at about 3 terminated pregnancies per 100 live births in each interval of the calendar.

Elsewhere in Asia, the majority of termination ratios are below 20, ranging from about 5 terminated pregnancies per 100 live births in the earliest interval preceding interview in the Indonesia 1991, 1994, and 1997 surveys to about 19 terminated pregnancies per 100 live births in the most recent interval. However, several surveys (Cambodia 2010 and 2014, Vietnam 1997 and 2002, and Nepal 2016) show termination ratios beyond this range. The highest termination ratios in this region are observed in Vietnam 2002, at 49 terminated pregnancies per 100 live births in the first interval.

Regardless of the level of termination ratios, the surveys in Asia universally (with the exception of Timor-Leste) show a pattern of decreasing termination ratios in intervals farther away from the time of interview. This pattern is most pronounced in the Cambodia, Vietnam, and Maldives surveys. There is variation, however, as to whether the termination ratios decrease steadily with each interval (e.g., Bangladesh 2014), decrease sharply in all intervals preceding the first interval (e.g., Indonesia 1994), or show the steepest decrease in the earliest intervals (e.g., Philippines 2003), or some combination of these (e.g., Maldives 2009 and Vietnam 1997).

Figure 3.1 Ratios of terminated pregnancies to live births (per 100) in DHS calendars, Asia

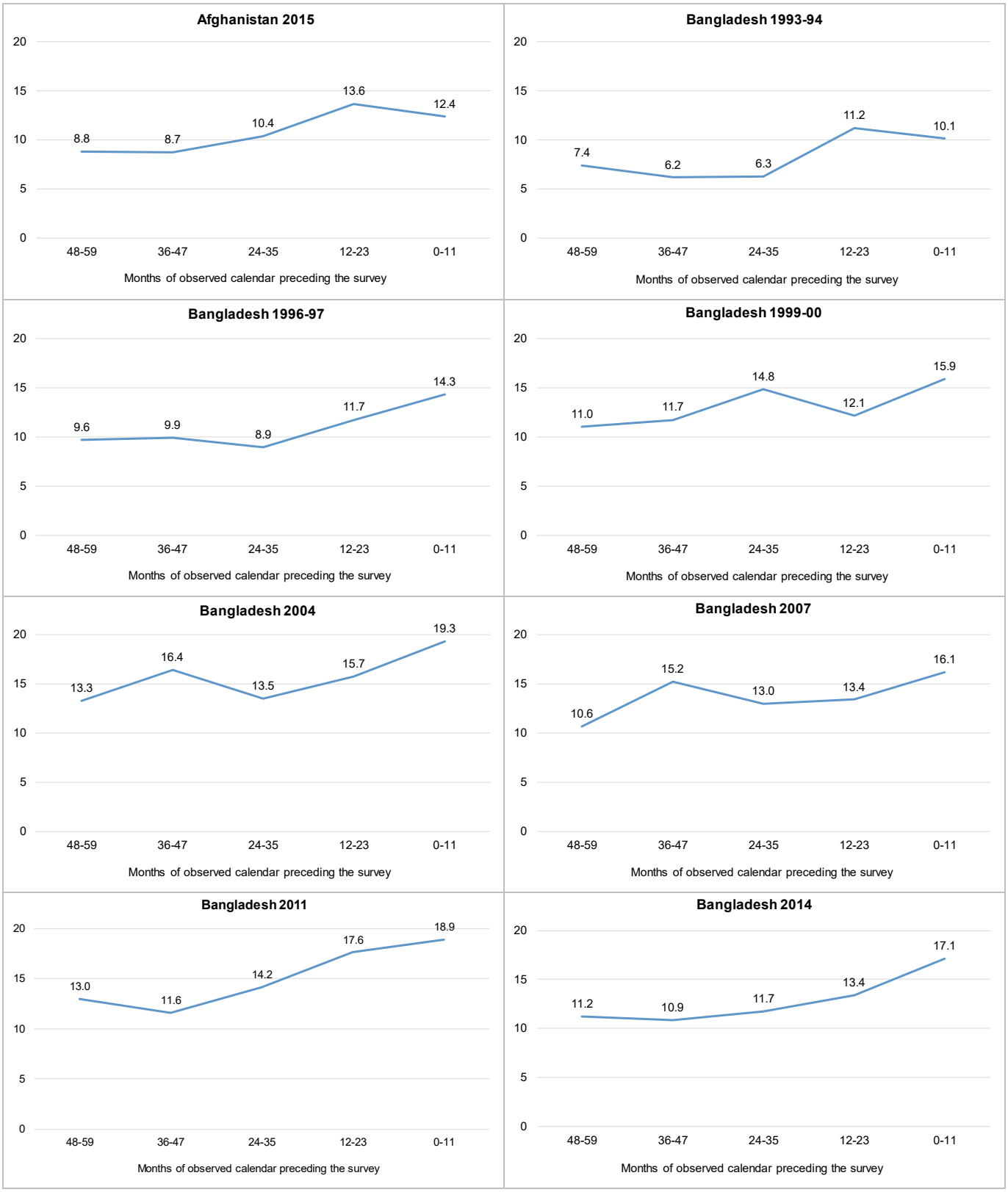


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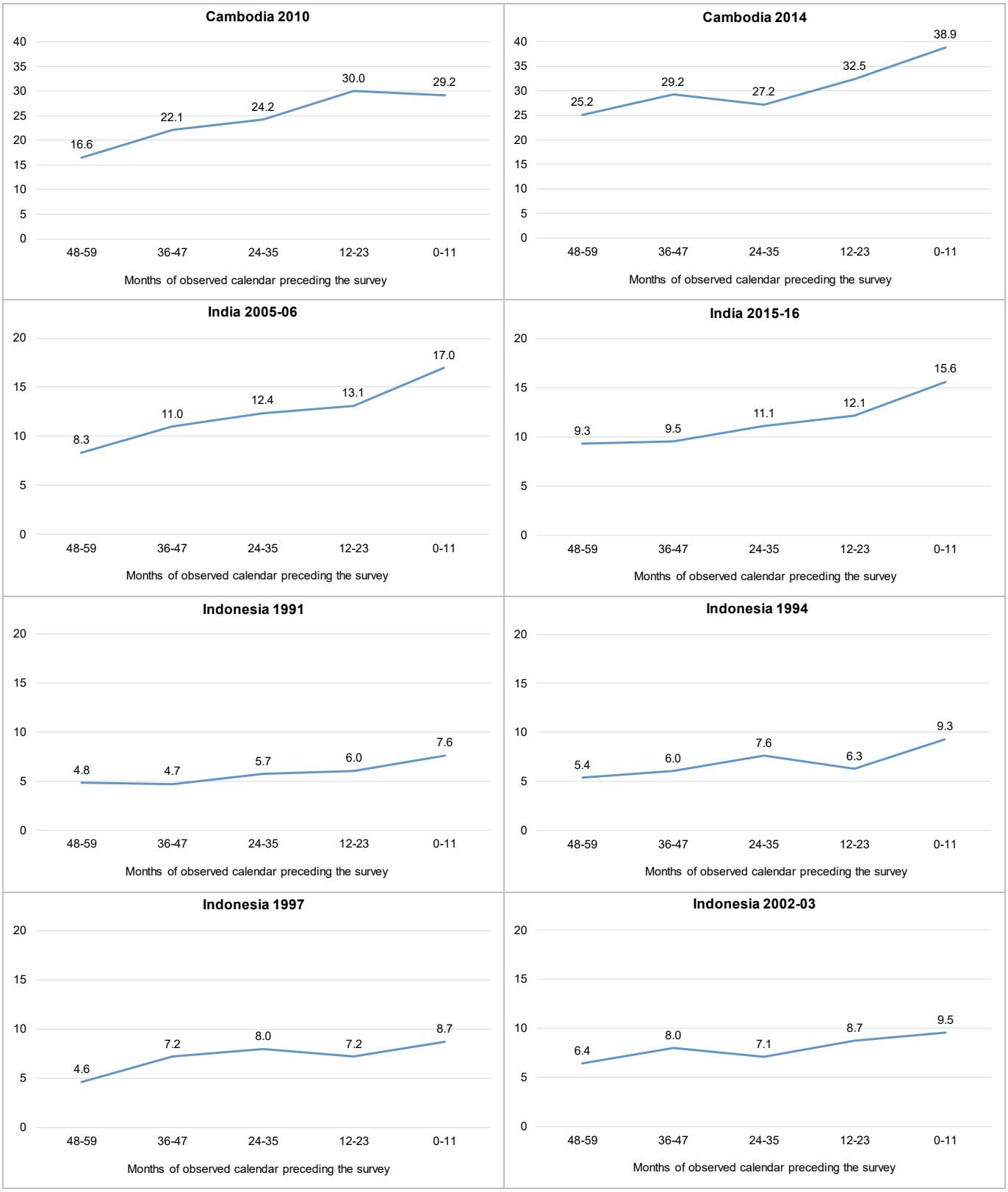
Figure 3.1—*Continued*



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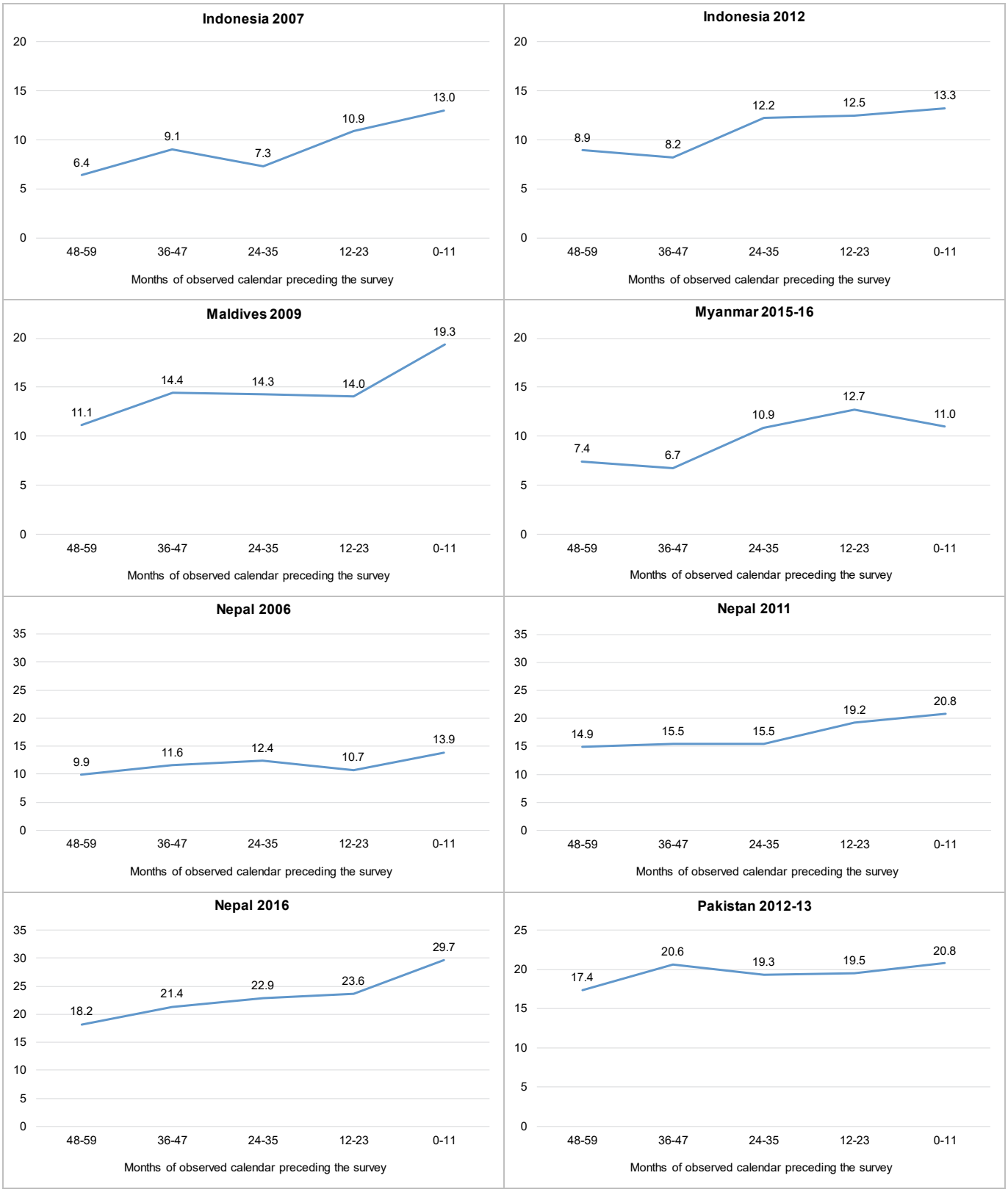

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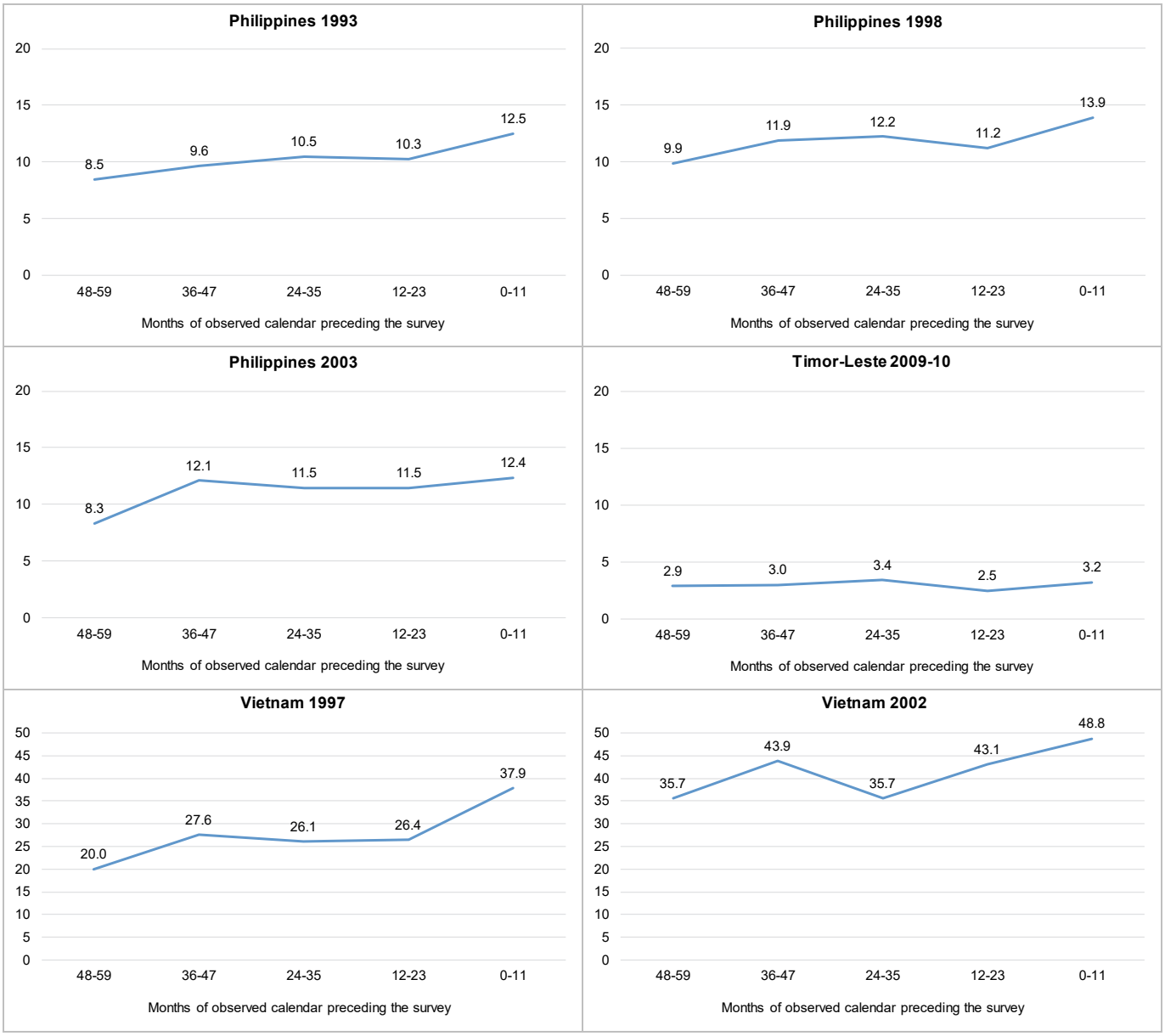


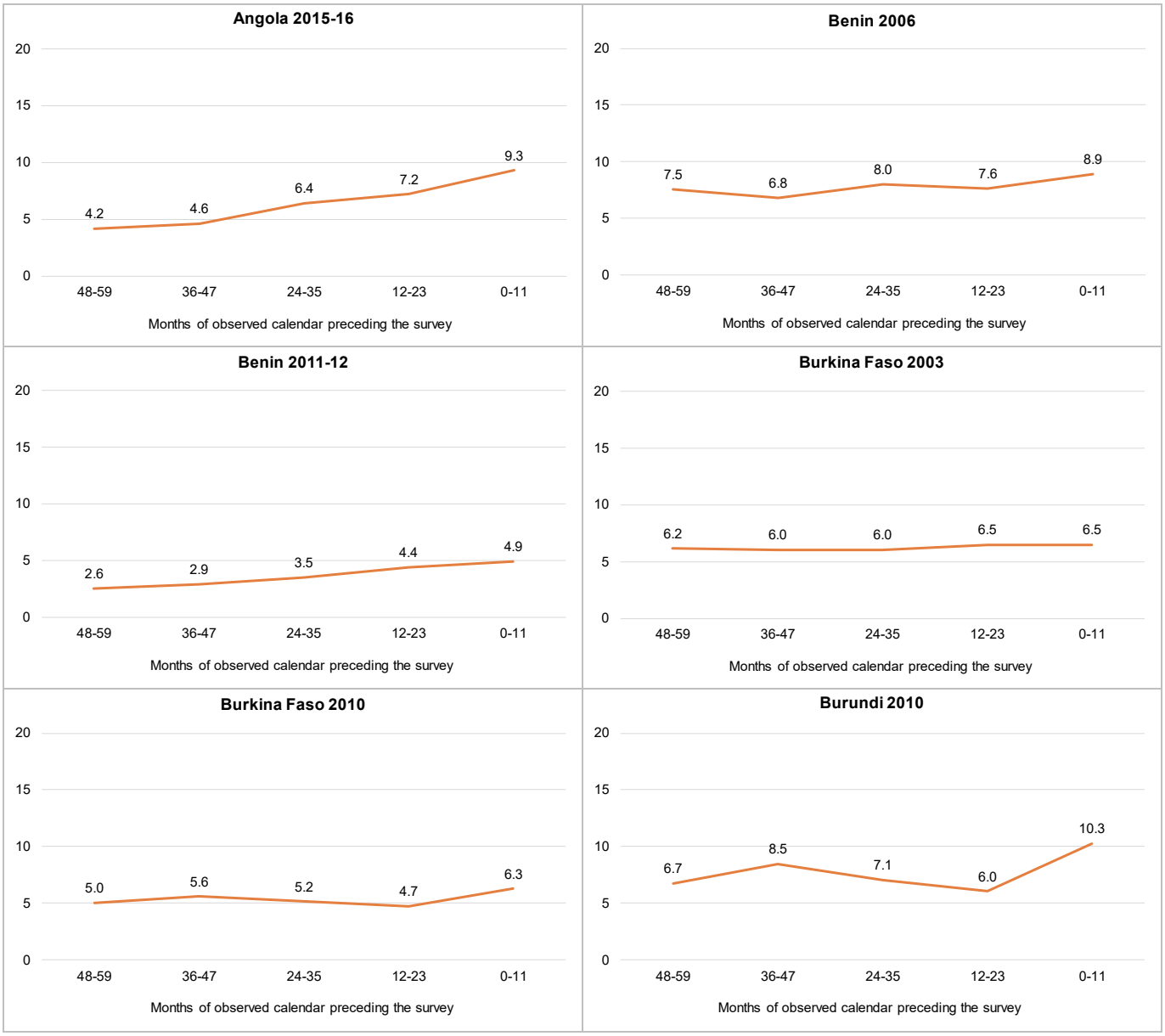
Note: While the scale for most surveys in this region extends from 0 to 20 terminated pregnancies per 100 live births, higher termination ratios in Cambodia, Nepal, Pakistan, and Vietnam necessitate an extended scale.

3.1.2 Patterns of termination ratios in Africa

With the exception of several calendar intervals in the Ghana 2008 and 2014 surveys, observed termination ratios in Africa are less than 20 terminated pregnancies per 100 live births. Six surveys in Africa—Benin 2006, Burkina Faso 2003 and 2010, Malawi 2004, Mali 2012-13, and Niger 2006—exhibit constant termination ratios over the course of the calendar, as shown in Figure 3.2. However, the vast majority of surveys in the region show higher termination ratios in more recent intervals of the calendar. The slope of the termination ratios across intervals may be quite modest, as in Benin 2011-12, or pronounced, as in Ghana 2014 and Uganda 2016. The most common pattern in Africa is a relatively steady increase in the termination ratio as intervals are closer to the date of interview. However, two other patterns are observed

as well. For example, Senegal 2012-13 and Kenya 2008-09 show a marked decrease in all intervals compared with the most recent interval, whereas Liberia 2013 shows a marked decrease both following the first interval and again in the earliest interval.

Figure 3.2 Ratios of terminated pregnancies to live births (per 100) in DHS calendars, Africa



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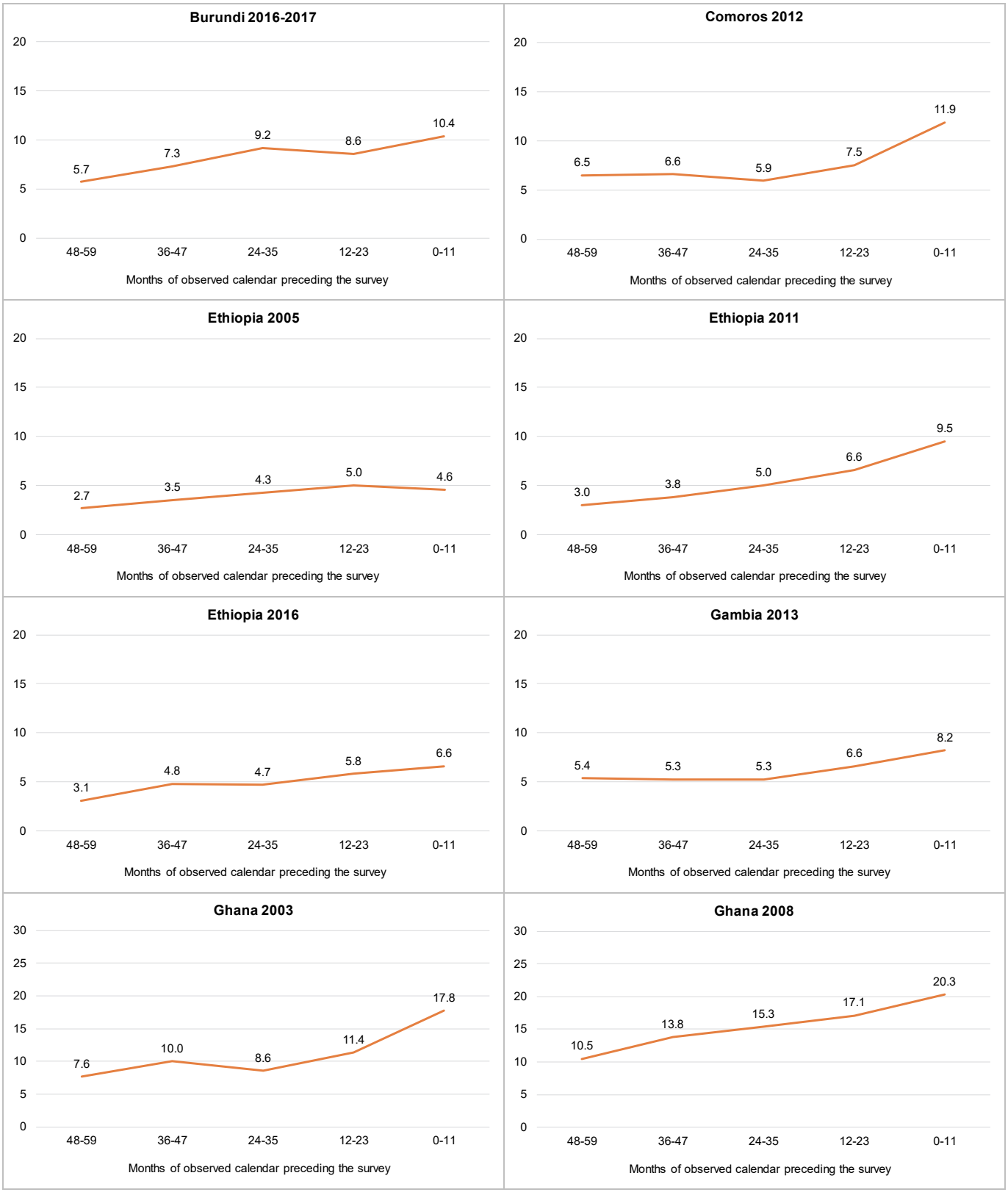

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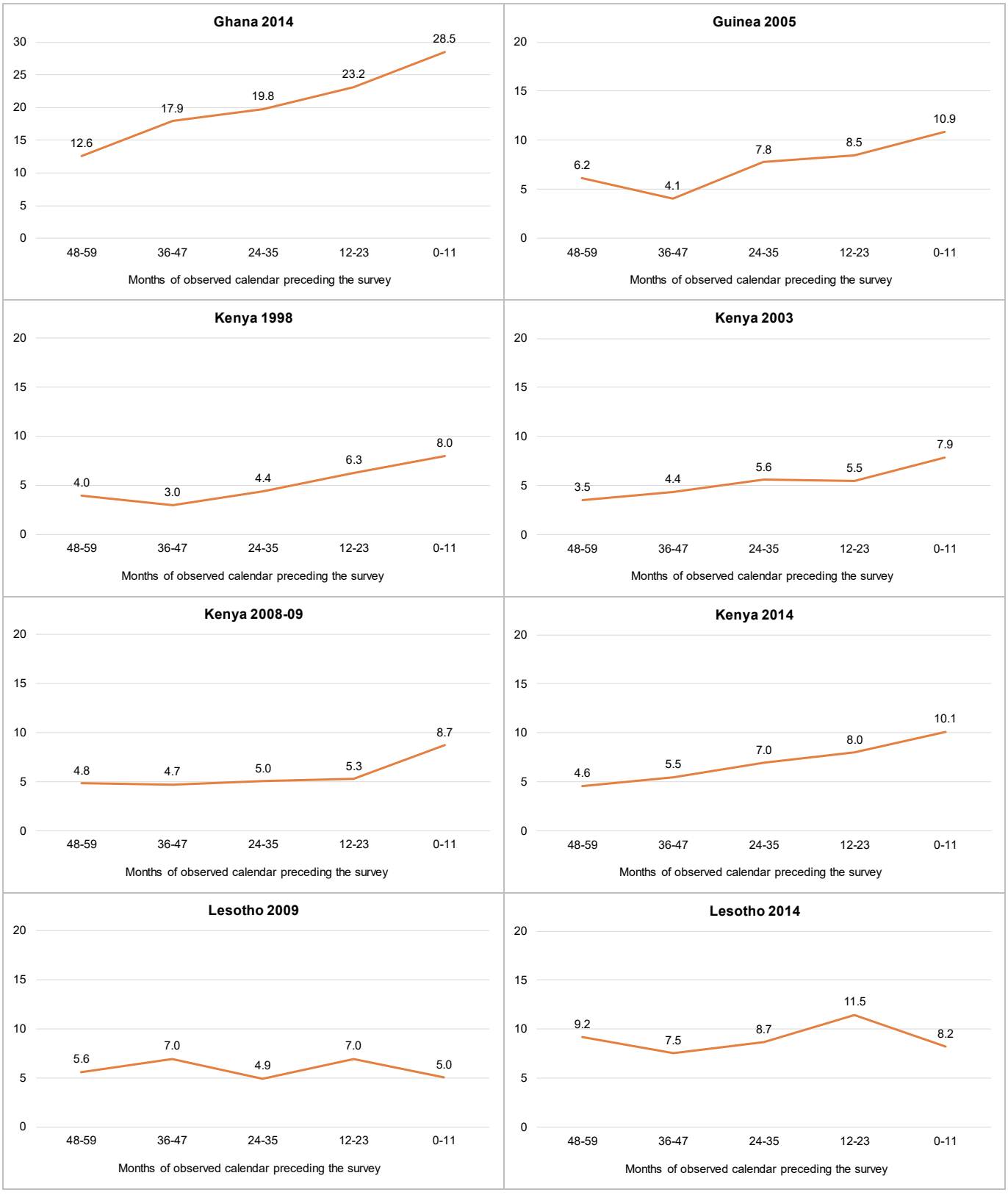

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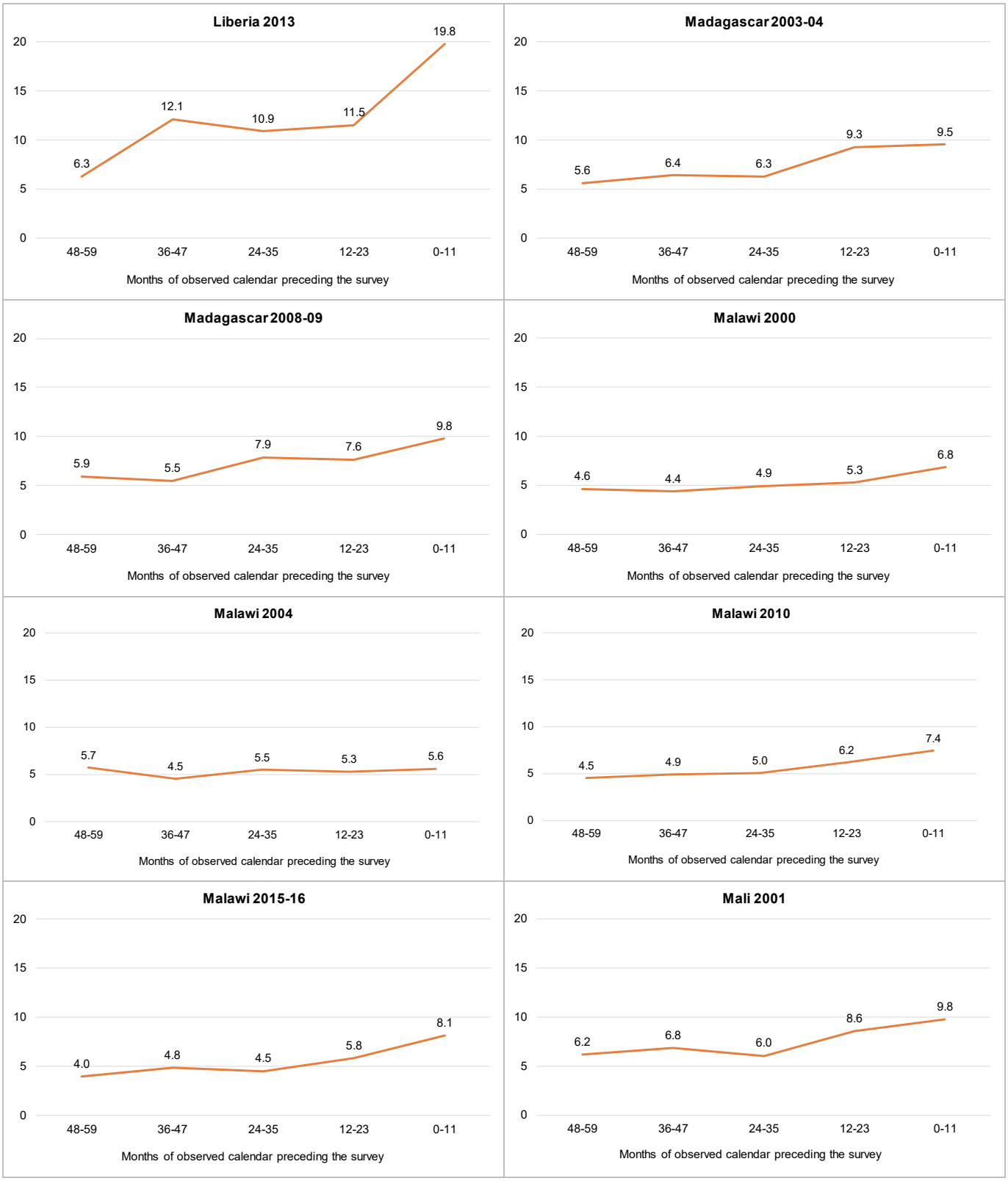

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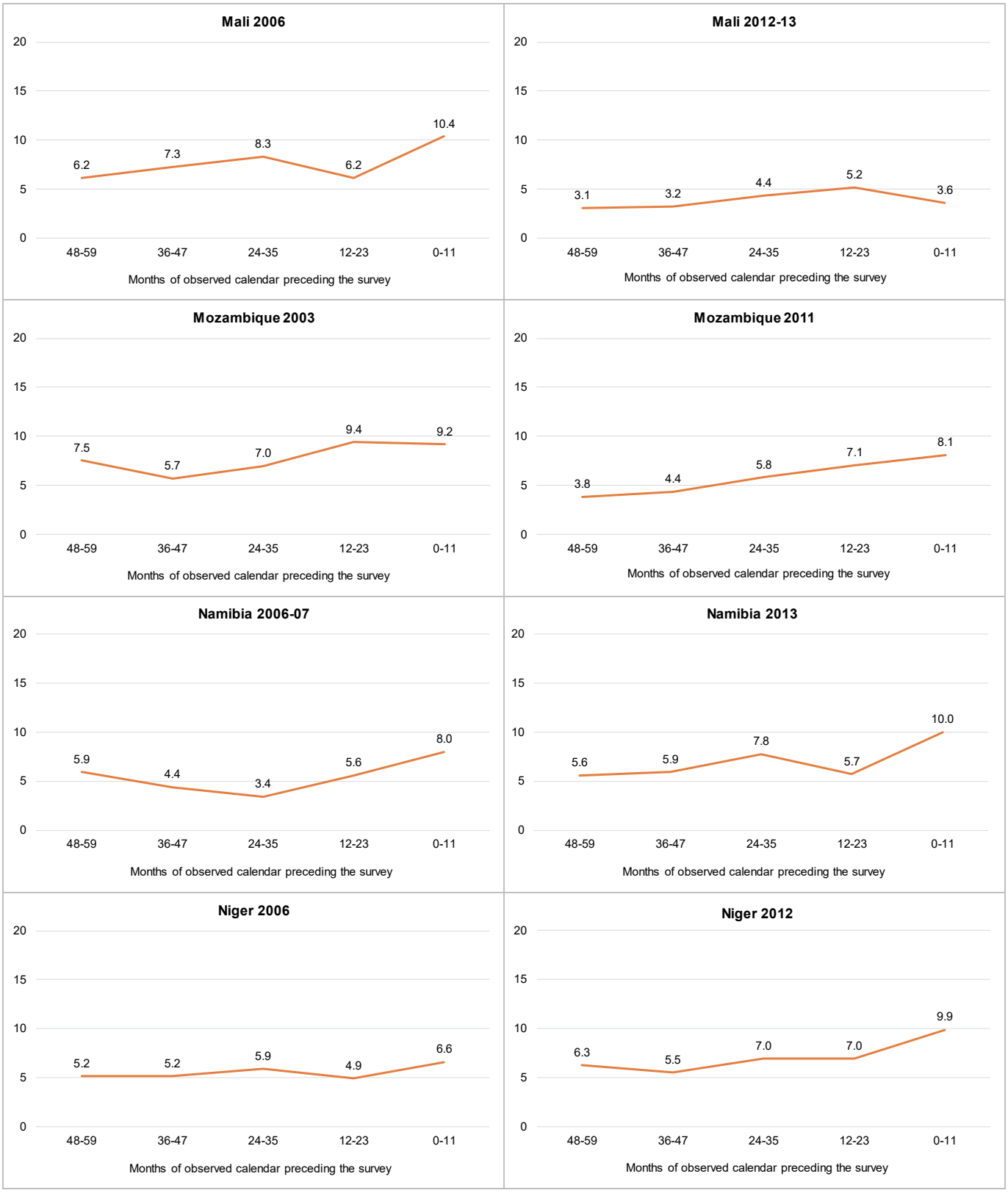

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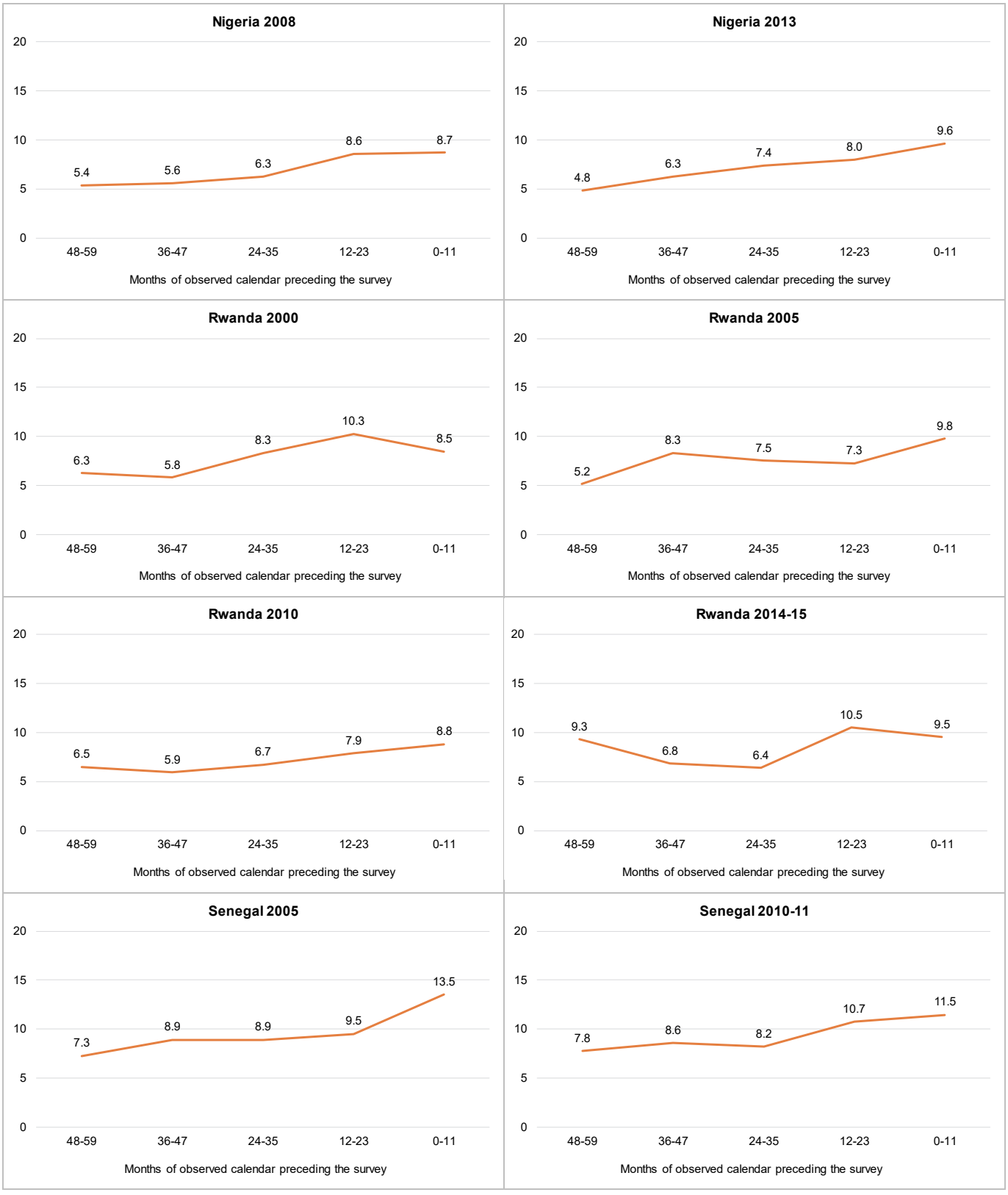

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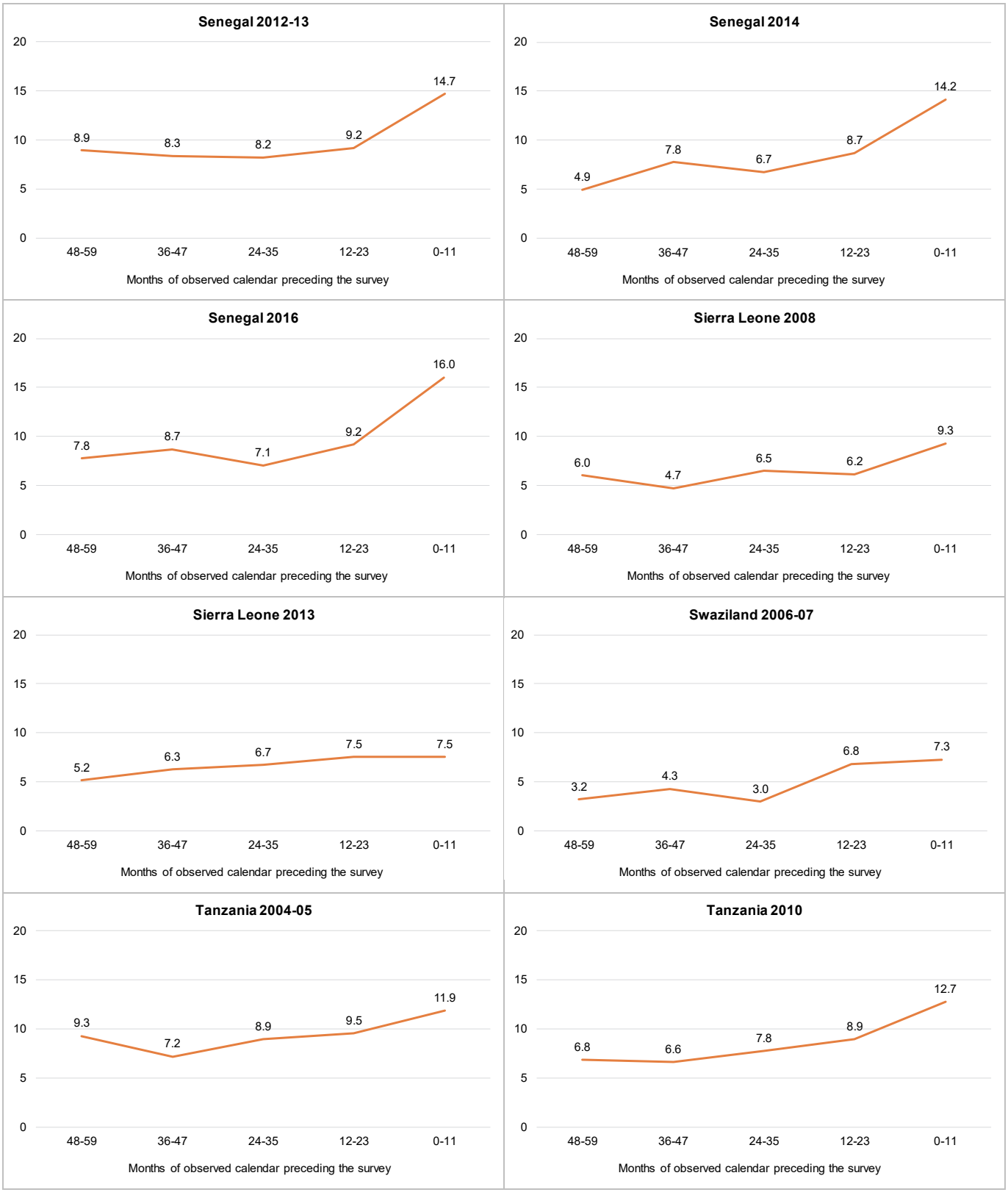

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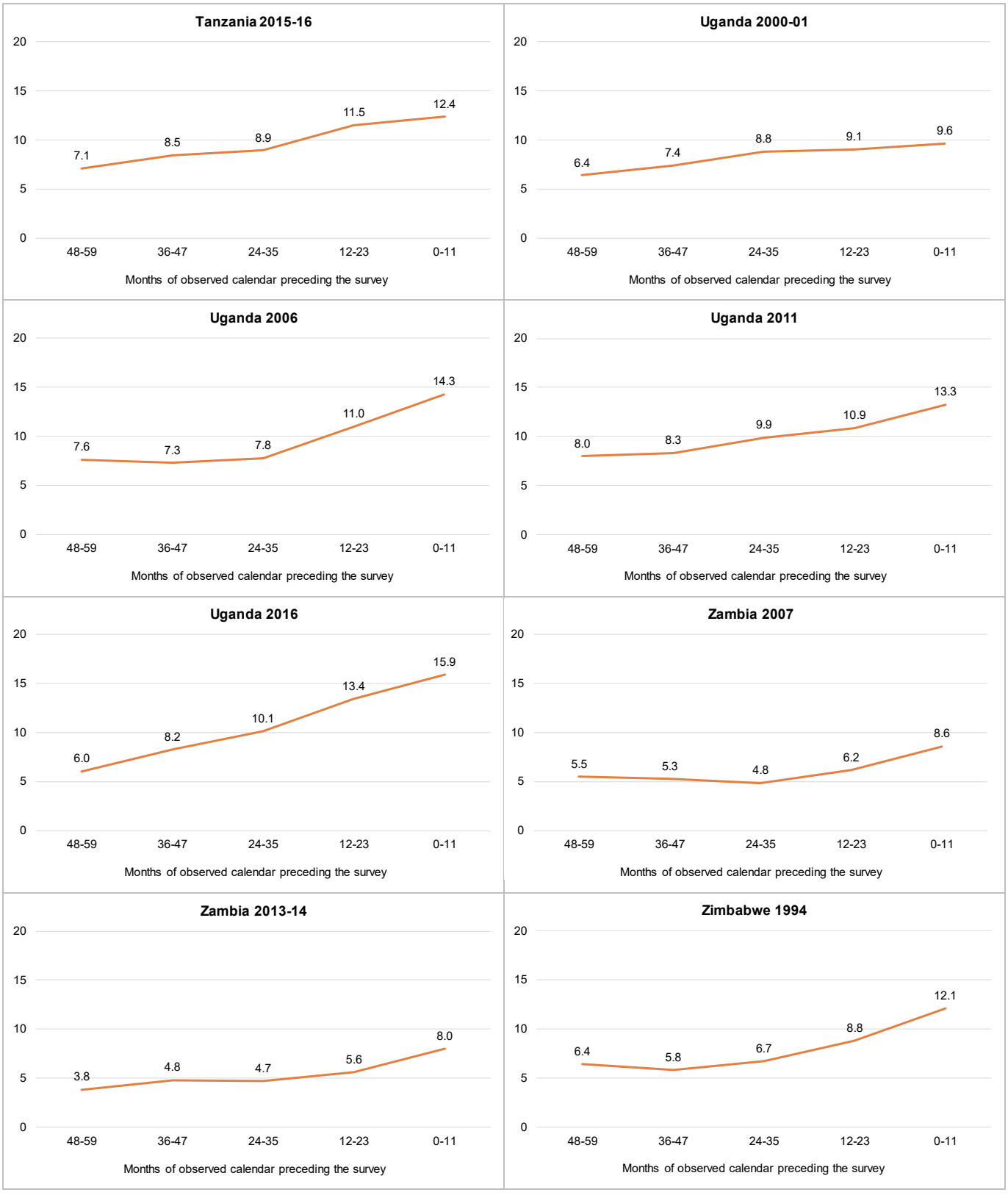

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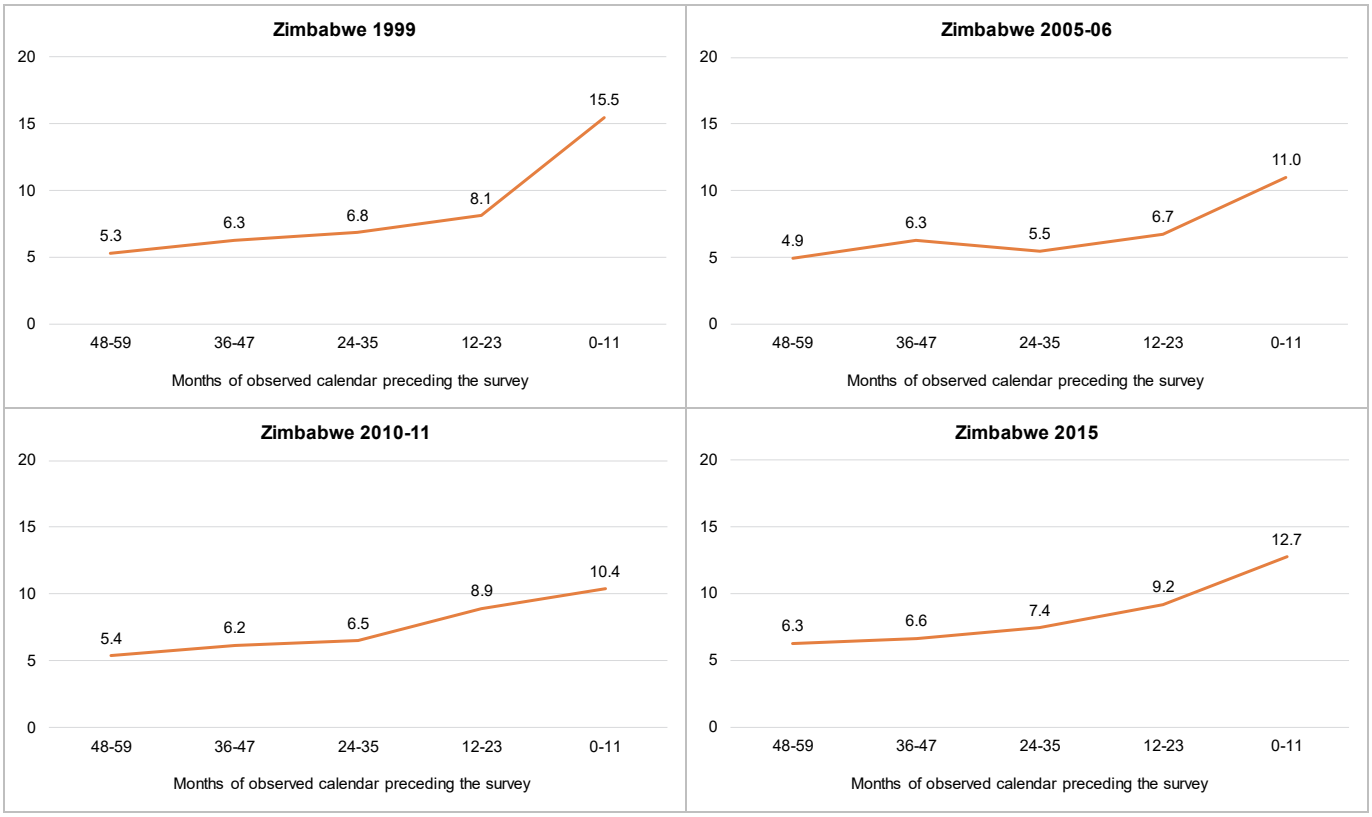


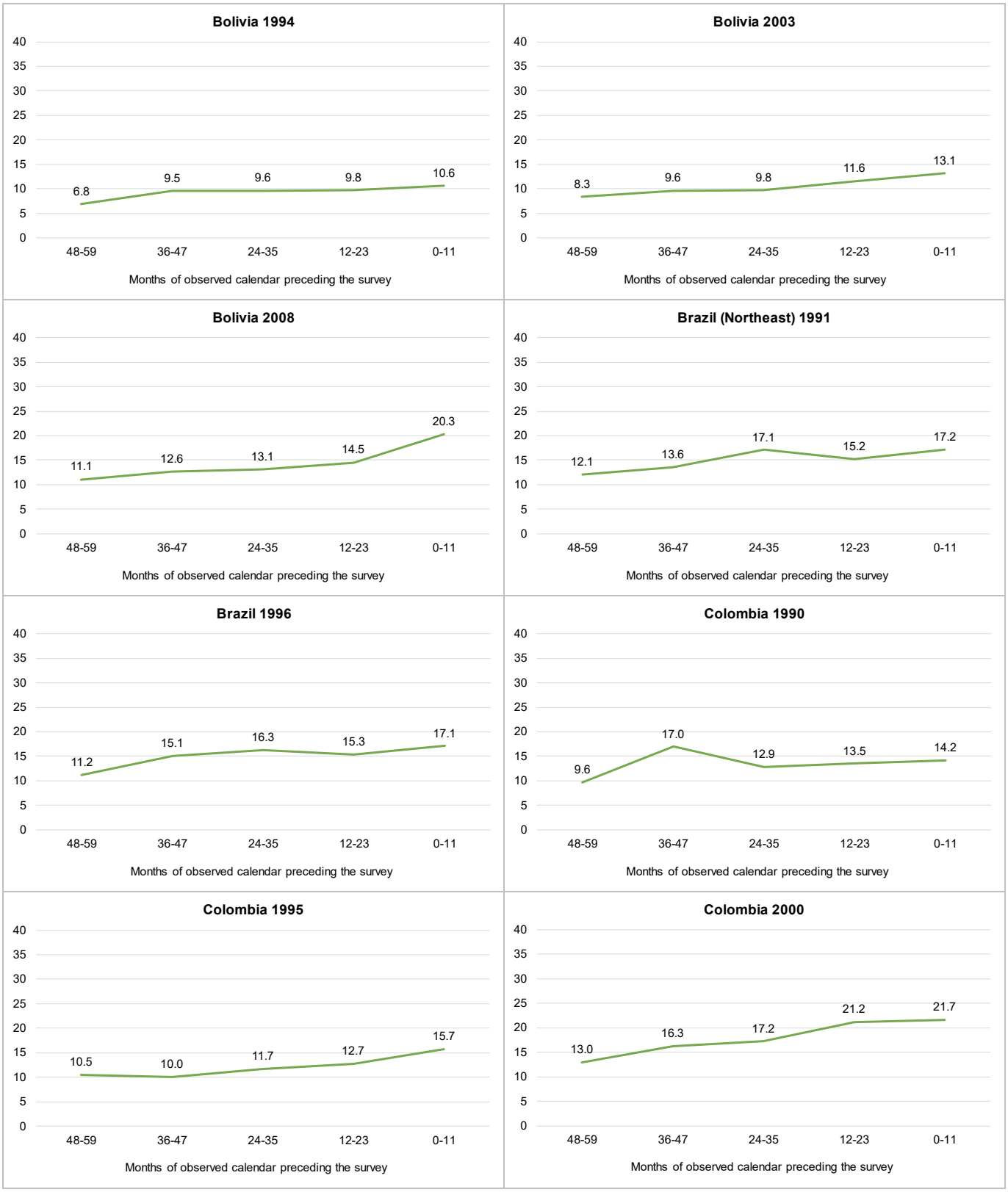
Note: While the scale for most surveys in this region extends from 0 to 20 terminated pregnancies per 100 live births, higher termination ratios in Ghana necessitate an extended scale.

3.1.3 Patterns of termination ratios in Latin America and the Caribbean

In contrast to Asia and Africa, multiple surveys in Latin America and the Caribbean show termination ratios higher than 20 per 100 live births. Therefore, the scale in Figure 3.3 extends from 0-40 terminated pregnancies per 100 live births, rather than from 0-20.

Compared with the other two regions discussed above, the Latin America and Caribbean region shows a greater share of surveys that suggest consistent termination ratios over the course of the calendars. We formally test these in the next section. Steady termination ratios appear to be observed in Bolivia 1994 and 2003, Colombia 2015, Guatemala 1998-99 and 2014-15, Honduras 2005-06, and Nicaragua 1998 and 2001. Nonetheless, the majority of surveys in the region show higher termination ratios in the most recent intervals and lower termination ratios in earlier intervals. In many cases the increase in termination ratios approaching the date of interview is modest, as is evident in the Peru 1996 survey. However, this increase is pronounced in the Dominican Republic 1999 and Guyana 2009 surveys. About 25 points separate the termination ratios in the most recent interval (0-11 months preceding the date of interview) and the earliest interval (48-59 months preceding the date of the interview) in these two surveys.

Figure 3.3 Ratios of terminated pregnancies to live births (per 100) in DHS calendars, Latin America and the Caribbean



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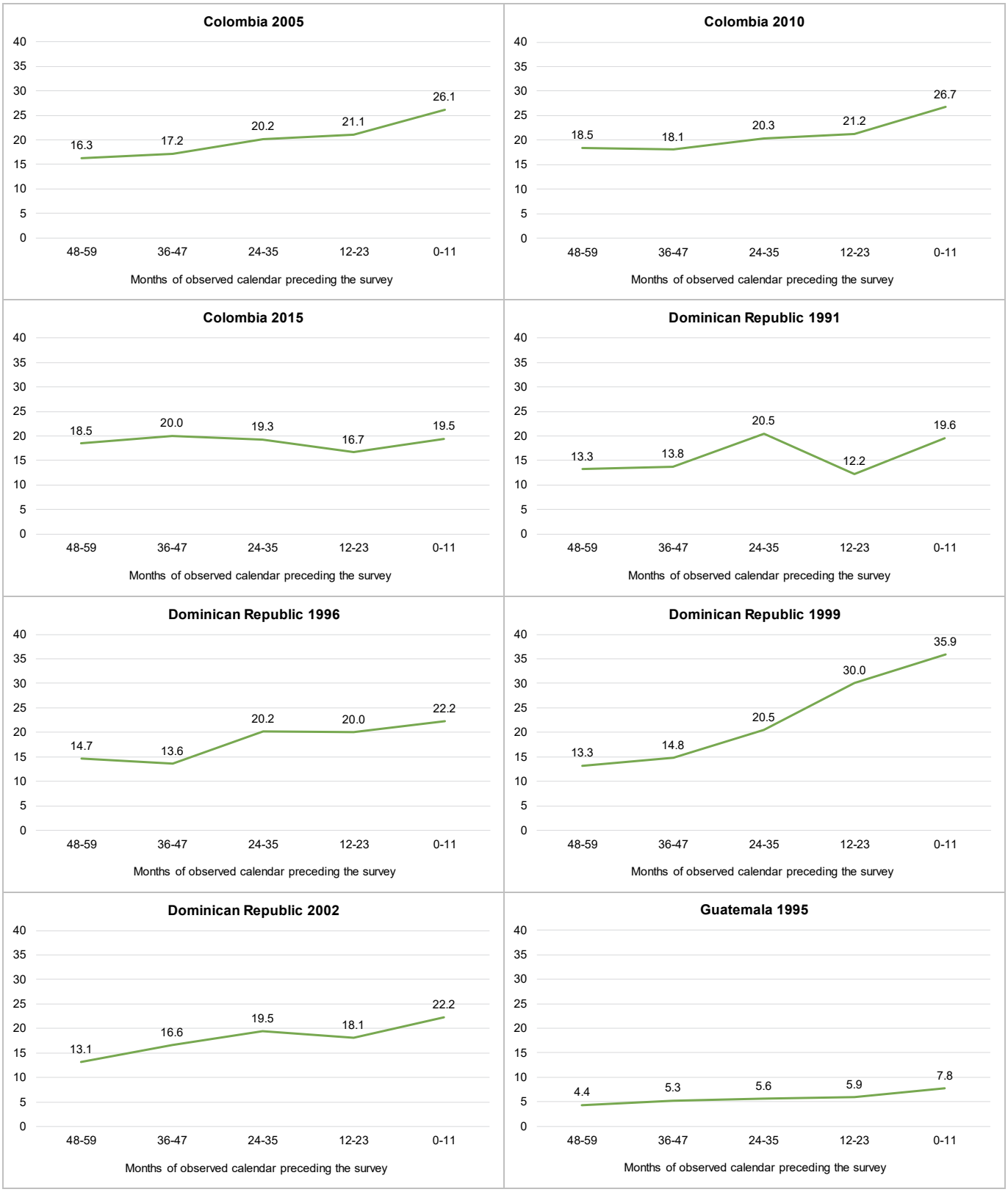

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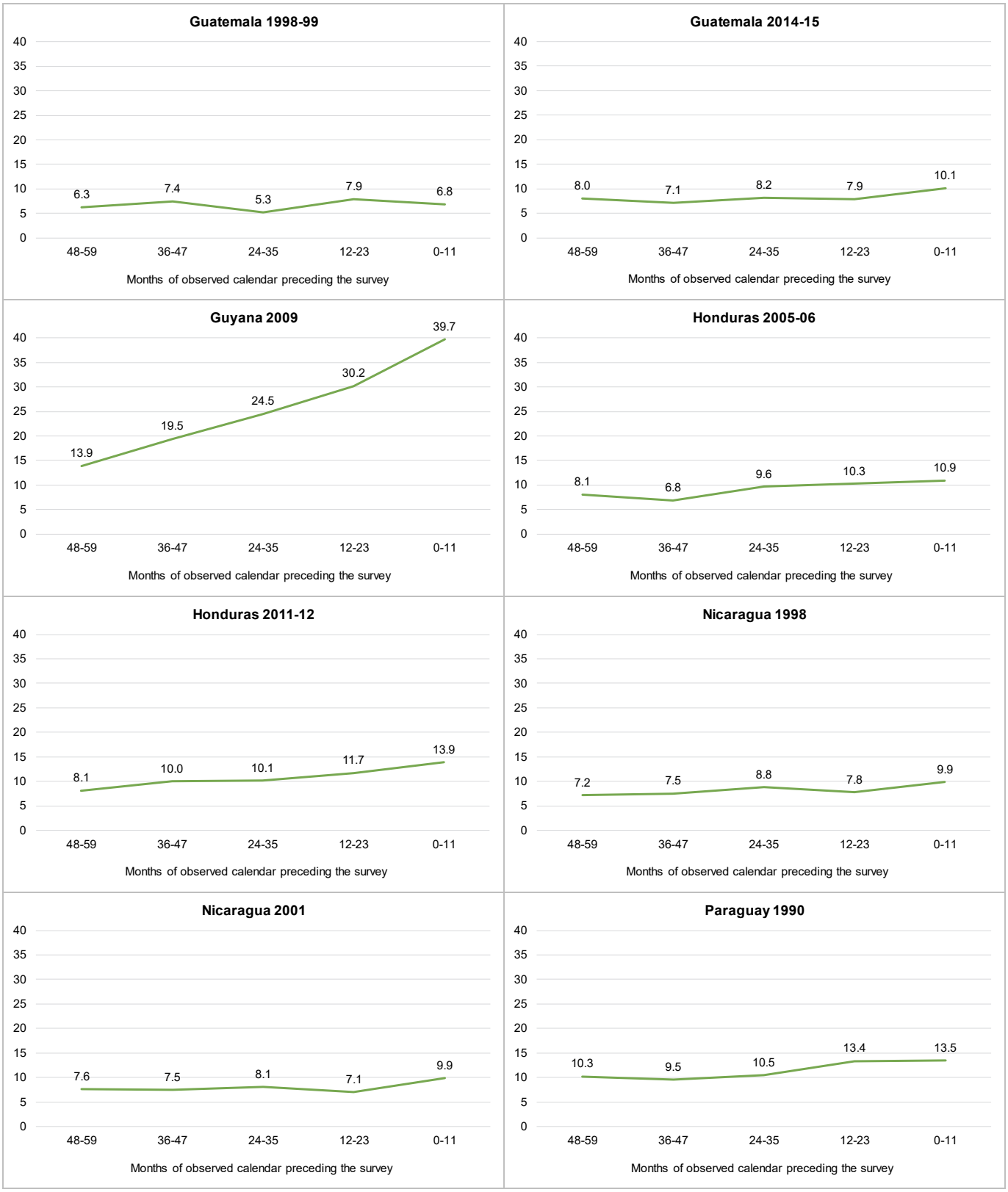

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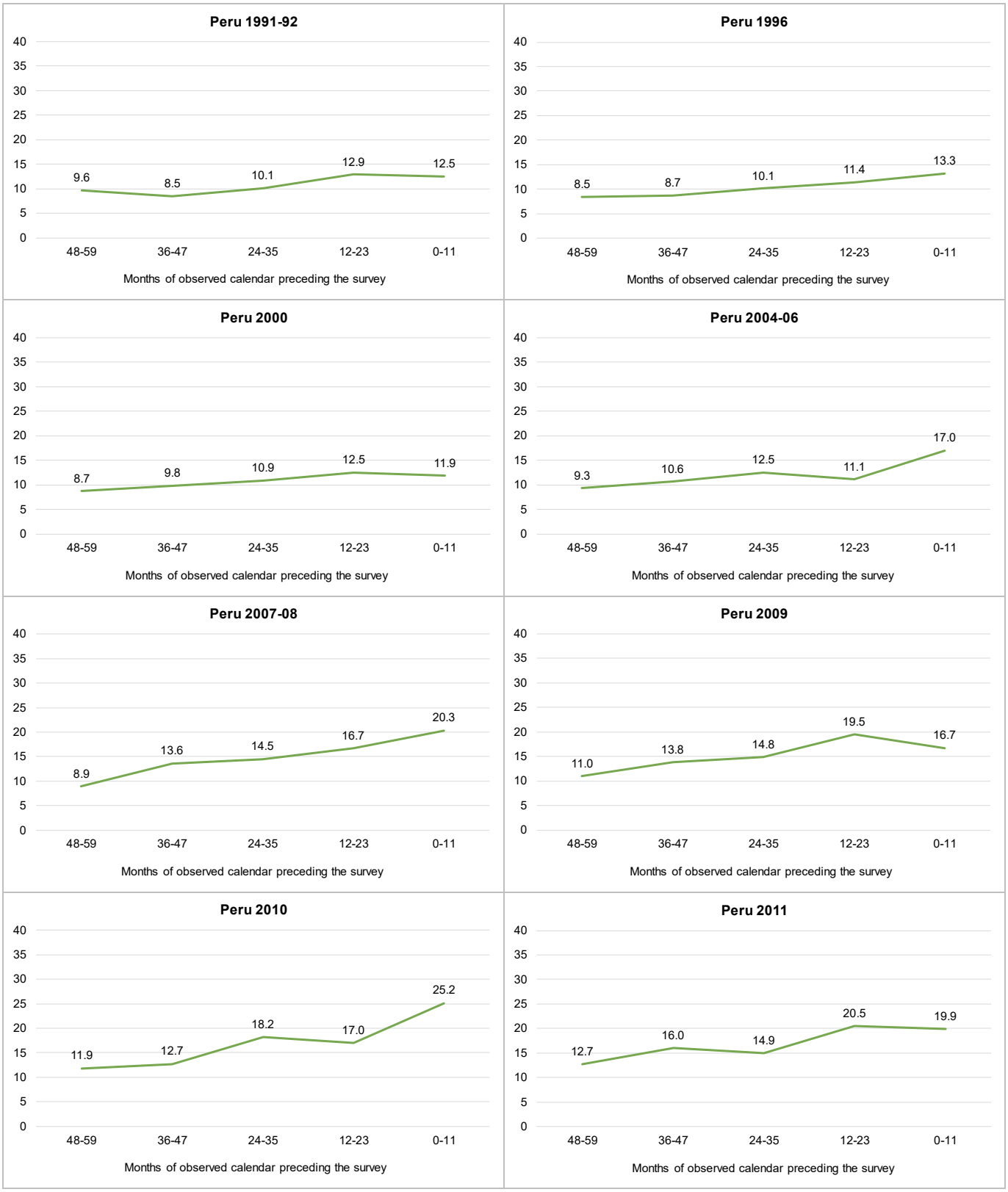

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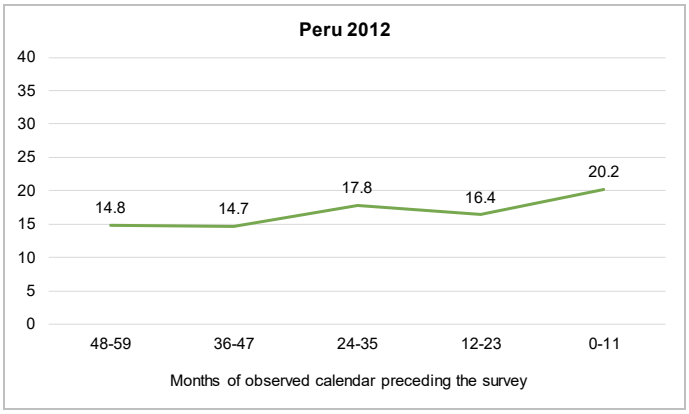


3.1.4 Patterns of termination ratios in Other Countries

The Other Countries region is distinct in several ways compared with the other regions in the study. First, this region exhibits the highest termination ratios of all the surveys in this study, as shown in Figure 3.4. Four surveys[7] display termination ratios of about 100 per 100 live births or more, meaning more than 50% of pregnancies conclude with termination. In the 0-11 months preceding interview in the Armenia 2000 survey, the observed termination ratio was 153 terminated pregnancies per 100 live births. Accordingly, the scale of the plots is extended to 0 to 175 for seven surveys with the highest termination ratios, 0 to 60 for six surveys with medium-high termination ratios, and from 0 to 40 for the remaining 19 surveys in the region.

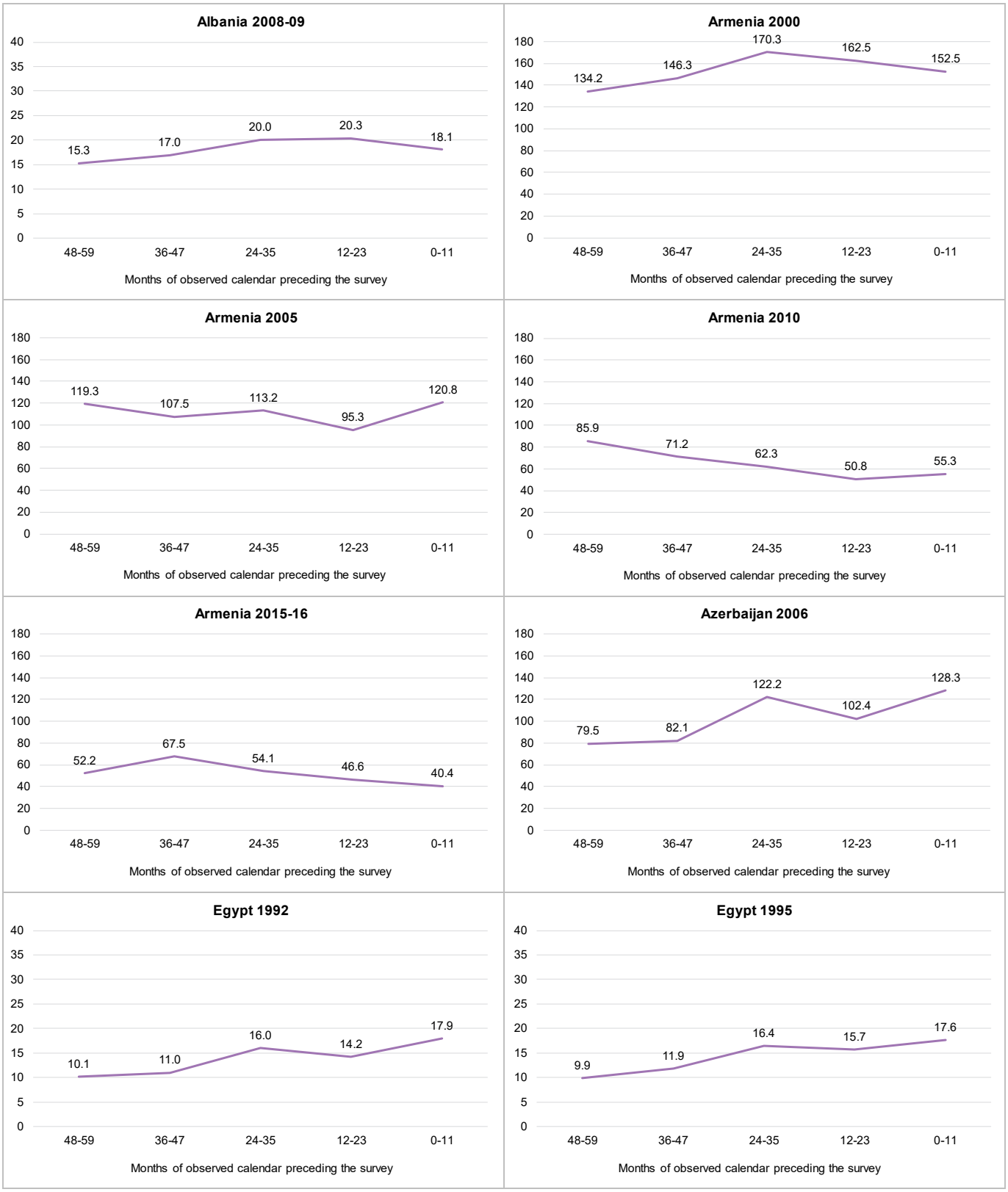
Of the 32 surveys in the Other Countries region, three surveys (Egypt 2005, Egypt 2014, and Morocco 2003-04) suggest consistent observed termination ratios over the observation period of the calendars. Other surveys suggest some type of inconsistency in termination ratios over the observation period of the calendars. The most common pattern of inconsistency is similar to that observed in the other three regions: observed termination ratios are higher in the more recent intervals of the observation period compared with earlier intervals. This pattern is observed in 20 of the 32 surveys in the Other Countries region.

The Other Countries region is also distinguished from the other three regions in that it is the only region where termination ratios decrease over the course of the calendar. In six surveys, the termination ratio in the most recent interval is lower than that observed in the earliest interval of the calendar. It is predominantly the surveys with the highest termination ratios that show this pattern of lower termination ratios closer to the date of interview. Kazakhstan 1999 is a counterexample, illustrating a pattern of very high termination ratios that are highest near the date of interview and lower in earlier intervals of the calendar.

In two other surveys, Albania 2008-09 and Armenia 2000, higher termination ratios are observed in the middle of the observation period than in either the more recent or earlier interval. Finally, Jordan 2009 exhibits inconsistency throughout the observation period, without a clear pattern of increasing or decreasing termination ratios.

[7] Armenia 2000, Armenia 2005, Azerbaijan 2006, Kazakhstan 1999.

Figure 3.4 Ratios of terminated pregnancies to live births (per 100) in DHS calendars, Other Countries



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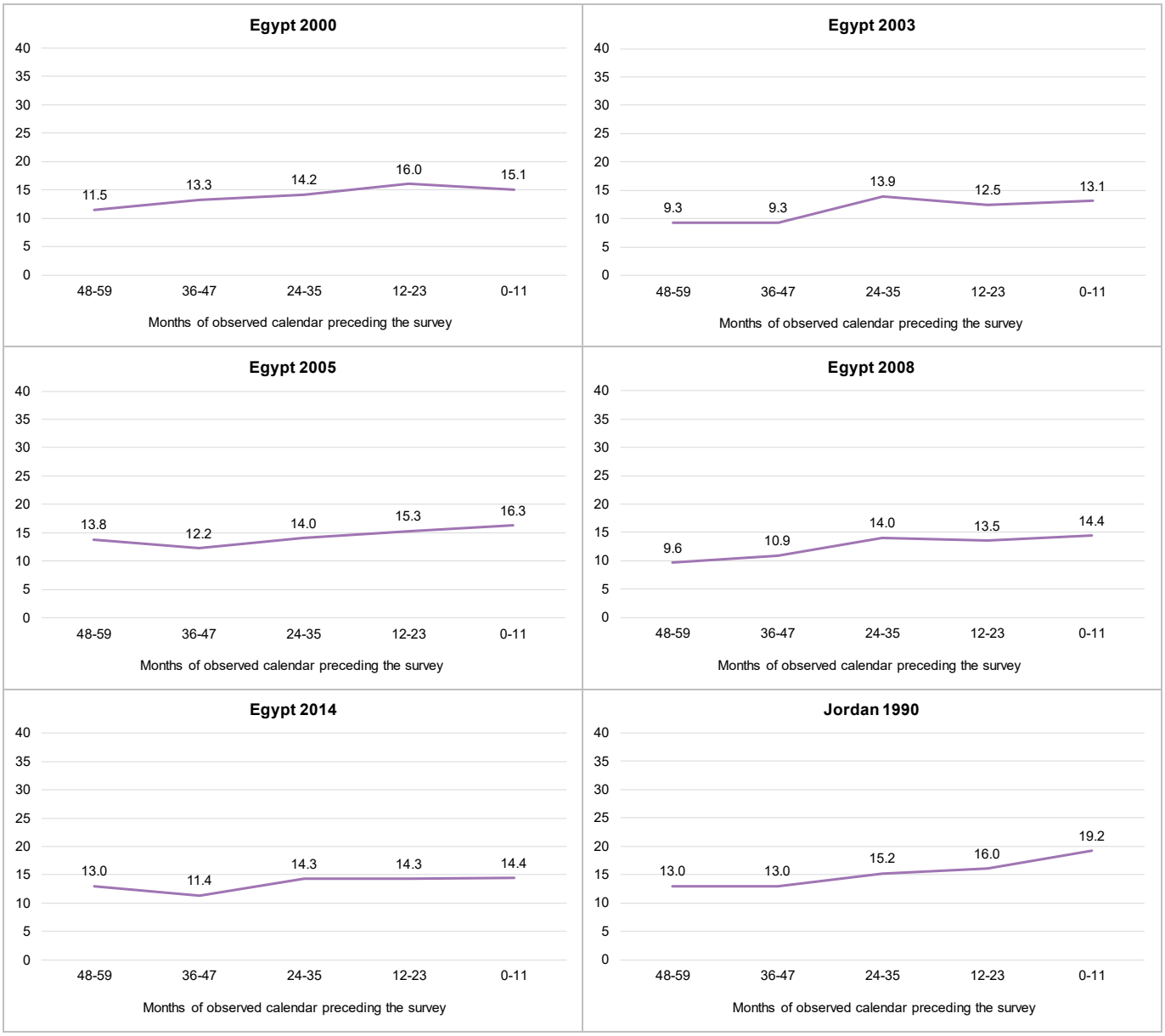

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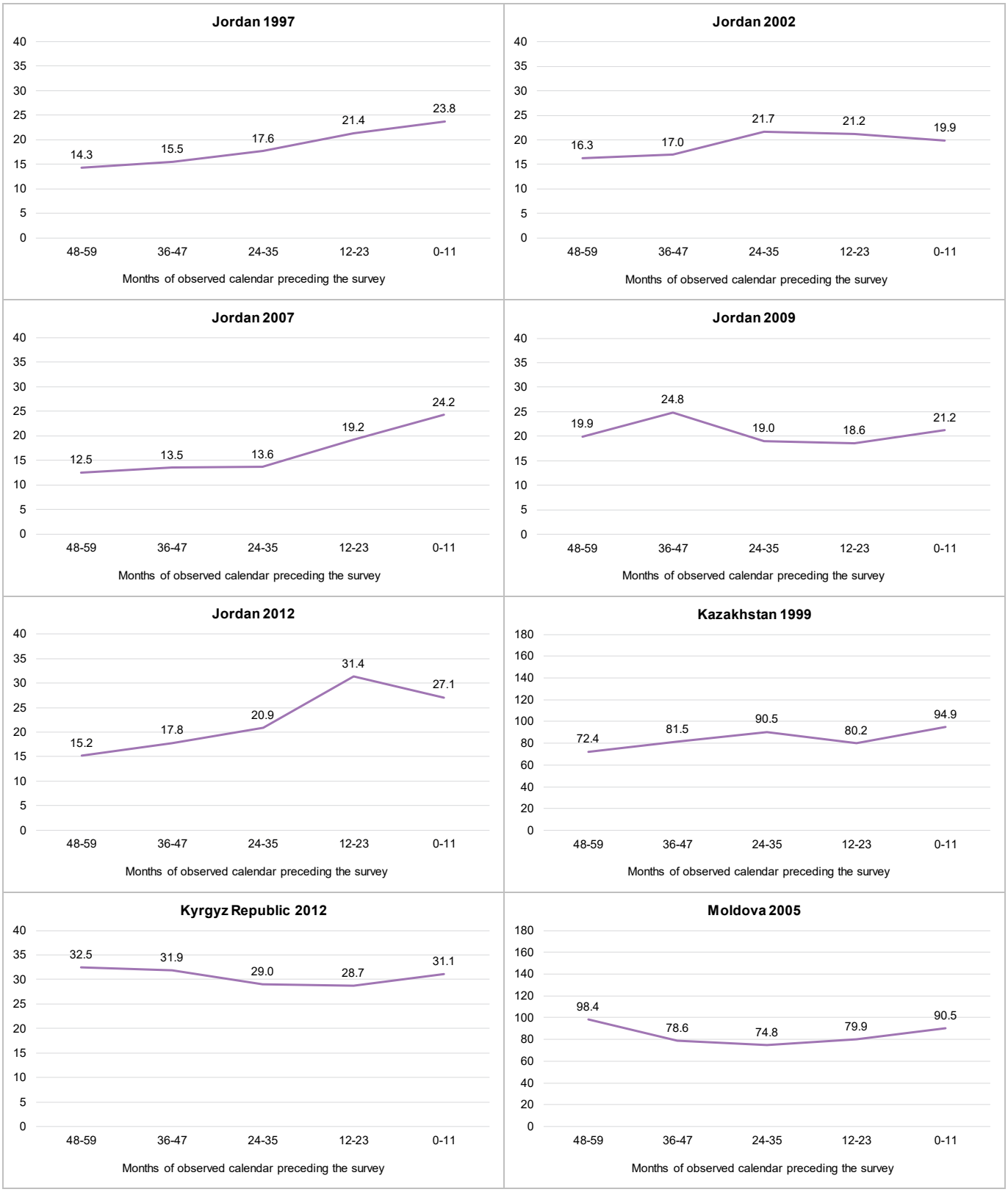

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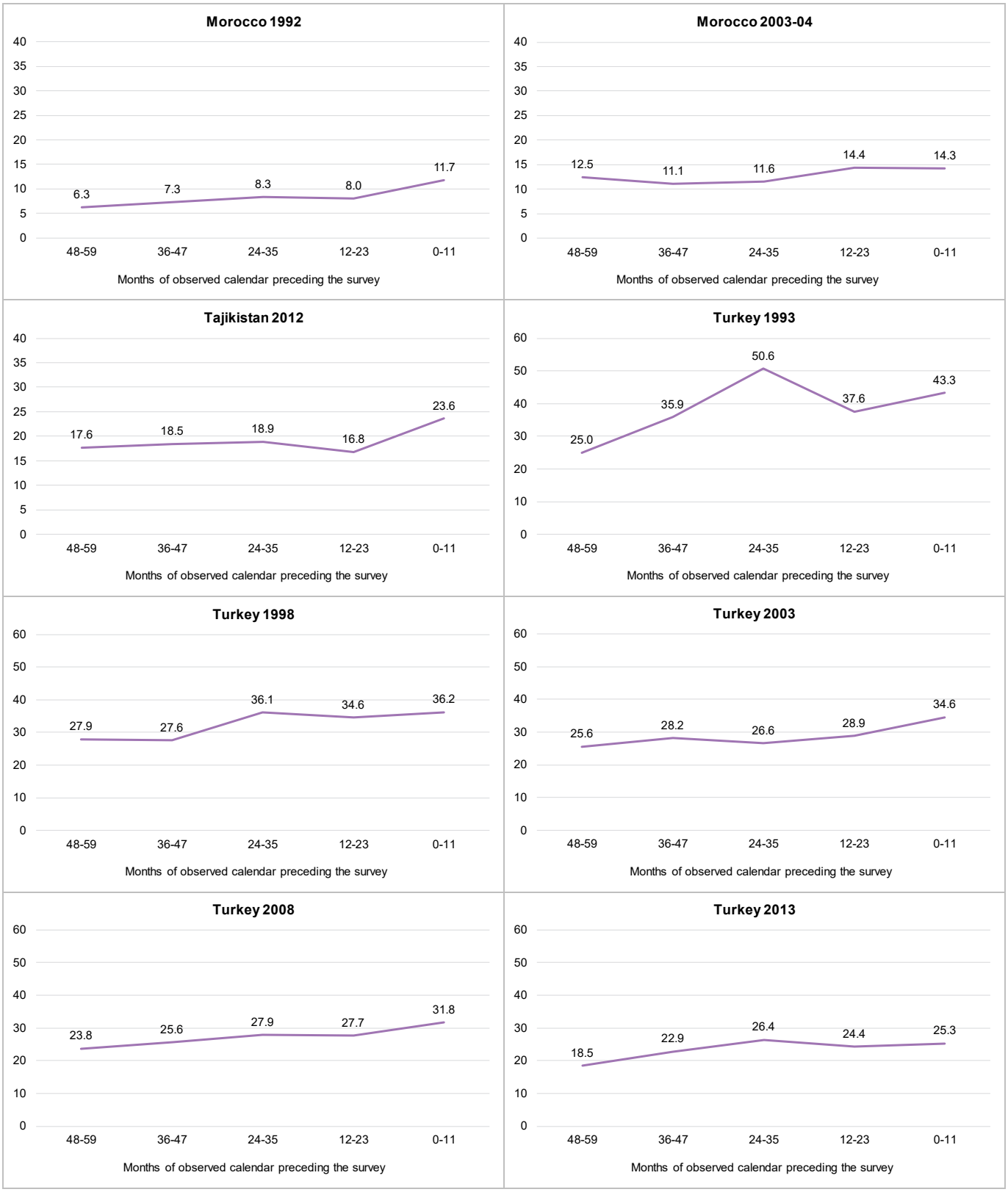

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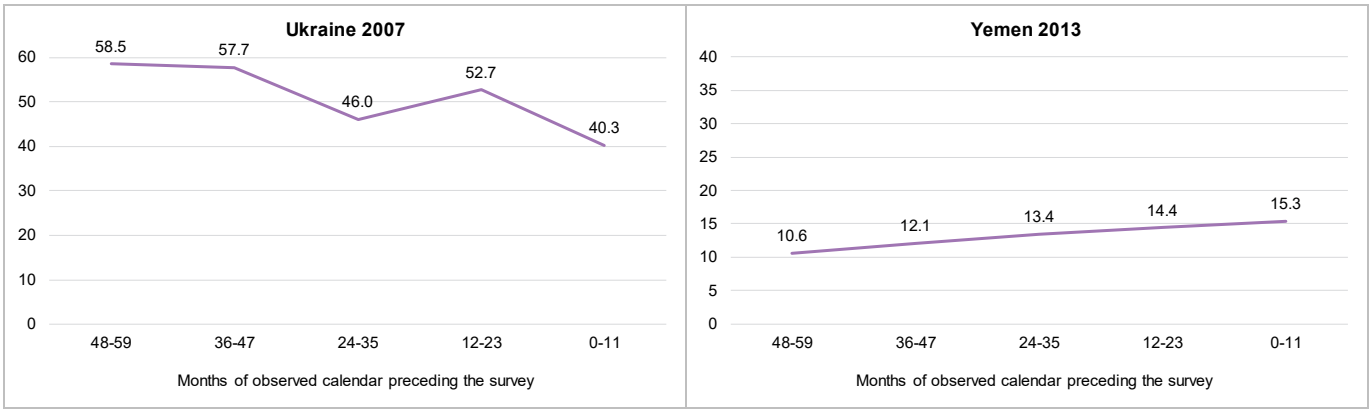


Note: While the scale for most surveys in this region extends from 0 to 40 terminated pregnancies per 100 live births, higher termination ratios are found in Armenia, Azerbaijan, Kazakhstan, Moldova, Turkey, and Ukraine, requiring an extended scale.

3.2 Testing Within-Survey Consistency

The previous section showed that termination ratios appear to be inconsistently reported within most surveys—termination ratios tend to be higher the closer to the date of interview. The graphical analysis of consistency is illustrative but hard to judge definitively. We complete our analysis of within-survey consistency with a more formal, statistical test of the difference between termination ratios observed in the first, most recent interval (0-11 months preceding the interview) and those observed in the fifth, earliest interval (48-59 months preceding the interview). Table 3.1 shows the termination ratios in the first and the fifth intervals of the observation period, their absolute and relative difference, and the level of statistical significance.

The results of the statistical test indicate that a large majority of the surveys (128 of the 162) are marked by within-survey inconsistency. In about 20% of surveys (34) we fail to reject the null hypothesis and detect no significant difference between the observed termination ratios in the first and last intervals. These surveys can be considered to demonstrate within-survey consistency.

A majority of surveys are found to be within-survey inconsistent in all regions. Within-survey consistency appears to be somewhat less common in Asia, at 26 of 30 surveys within-survey inconsistent, compared with the Other Countries region, where in Other Countries, 11 of the 32 surveys are found to be within-survey consistent while 21 of 32 are within-survey inconsistent. In Africa, 13 of 54 surveys are within-survey consistent, while 54 are within-survey inconsistent. In Latin America and the Caribbean, 6 of 33 surveys are within-survey consistent and 27 of 33 surveys are within-survey inconsistent.

In a few surveys the results of the statistical test contradict the apparent pattern shown in graphical analysis of the plots in Figures 3.1-3.4. In 10 surveys,[8] termination ratios appear to be higher in intervals closer to the date of interview, but there is no statistical difference between the first and the fifth intervals. This is also the case for three surveys in the Other Countries region,[9] where termination ratios appear to be lower

[8] Nepal 2006, Vietnam 2002, Gambia 2013, Lesotho 2009 and 2014, Malawi 2004, Mozambique 2003, Namibia 2006-07, Rwanda 2014-15, and Tanzania 2004-05.
[9] Armenia 2015-16, Kyrgyz Republic 2012, and Moldova 2005.

closer to the date of the interview. In the Other Countries region, the three surveys[10] with apparent inconsistency without a clear increasing or decreasing pattern also show no significant difference between the endpoints of the observation period. These surveys are designated within-survey consistent. In three surveys in Latin America and the Caribbean—Bolivia 1994 and 2003 and Honduras 2005-06—termination ratios appeared to be consistent across the observation period in the graphical analysis, but the statistical test shows a significant difference between the first and last intervals; these surveys are designated within-survey inconsistent.

Table 3.1 Measures of consistency within single surveys

Survey	Termination ratio in Interval 1 (0-11 months)	Termination ratio in Interval 5 (46-59 months)	Absolute difference	Relative difference	p-value [1]
Asia					
Afghanistan 2015	12.4	8.8	3.5	29%	*
Bangladesh 1993-94	10.1	7.4	2.7	27%	*
Bangladesh 1996-97	14.3	9.6	4.6	32%	**
Bangladesh 1999-00	15.9	11.0	4.9	31%	**
Bangladesh 2004	19.3	13.3	6.1	31%	**
Bangladesh 2007	16.1	10.6	5.5	34%	**
Bangladesh 2011	18.9	13.0	5.9	31%	***
Bangladesh 2014	17.1	11.2	5.9	34%	***
Cambodia 2010	29.2	16.6	12.6	43%	***
Cambodia 2014	38.9	25.2	13.7	35%	***
India 2005-06	17.0	8.3	8.6	51%	***
India 2015-16	15.6	9.3	6.3	40%	***
Indonesia 1991	7.6	4.8	2.8	37%	**
Indonesia 1994	9.3	5.4	3.9	42%	***
Indonesia 1997	8.7	4.6	4.1	47%	***
Indonesia 2002-03	9.5	6.4	3.1	33%	*
Indonesia 2007	13.0	6.4	6.6	51%	***
Indonesia 2012	13.3	8.9	4.3	33%	***
Maldives 2009	19.3	11.1	8.2	43%	**
Myanmar 2015-16	11.0	7.4	3.6	33%	*
Nepal 2006	13.9	9.9	4.0	29%	
Nepal 2011	20.8	14.9	5.8	28%	*
Nepal 2016	29.7	18.2	11.5	39%	***
Pakistan 2012-13	20.8	17.4	3.4	16%	
Philippines 1993	12.5	8.5	4.0	32%	***
Philippines 1998	13.9	9.9	4.0	29%	*
Philippines 2003	12.4	8.3	4.0	33%	**
Timor-Leste 2009-10	3.2	2.9	0.3	10%	
Vietnam 1997	37.9	20.0	17.9	47%	***
Vietnam 2002	48.8	35.7	13.1	27%	

Continued

[10] Albania 2008-09, Armenia 2000, and Jordan 2009.

Table 3.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months)	Termination ratio in Interval 5 (46-59 months)	Absolute difference	Relative difference	p-value [1]
Africa					
Angola 2015-16	9.3	4.2	5.1	55%	***
Benin 2006	8.9	7.5	1.4	16%	
Benin 2011-12	4.9	2.6	2.4	48%	***
Burkina Faso 2003	6.5	6.2	0.3	5%	
Burkina Faso 2010	6.3	5.0	1.2	20%	
Burundi 2010	10.4	5.7	4.7	45%	**
Burundi 2016-17	10.3	6.7	3.5	34%	***
Comoros 2012	11.9	6.5	5.4	45%	*
Ethiopia 2005	4.6	2.7	1.9	42%	**
Ethiopia 2011	9.5	3.0	6.5	69%	***
Ethiopia 2016	6.6	3.1	3.5	53%	***
Gambia 2013	8.2	5.4	2.9	35%	
Ghana 2003	17.8	7.6	10.1	57%	***
Ghana 2008	20.3	10.5	9.8	48%	***
Ghana 2014	28.5	12.6	15.9	56%	***
Guinea 2005	10.9	6.2	4.7	43%	**
Kenya 1998	8.0	4.0	4.0	51%	**
Kenya 2003	7.9	3.5	4.4	55%	***
Kenya 2008-09	8.7	4.8	3.9	45%	*
Kenya 2014	10.1	4.6	5.5	55%	***
Lesotho 2009	5.0	5.6	-0.6	-11%	
Lesotho 2014	8.2	9.2	-0.9	-11%	
Liberia 2013	19.8	6.3	13.5	68%	***
Madagascar 2003-04	9.5	5.6	3.9	41%	*
Madagascar 2008-09	9.8	5.9	3.8	39%	***
Malawi 2000	6.8	4.6	2.2	33%	*
Malawi 2004	5.6	5.7	-0.1	-2%	
Malawi 2010	7.4	4.5	2.9	39%	***
Malawi 2015-16	8.1	4.0	4.2	51%	***
Mali 2001	9.8	6.2	3.6	37%	**
Mali 2006	10.4	6.2	4.2	41%	**
Mali 2012-13	3.6	3.1	0.5	15%	
Mozambique 2003	9.2	7.5	1.6	18%	
Mozambique 2011	8.1	3.8	4.3	53%	***
Namibia 2006-07	8.0	5.9	2.1	26%	
Namibia 2013	10.0	5.6	4.4	44%	*
Niger 2006	6.6	5.2	1.5	22%	
Niger 2012	9.9	6.3	3.6	37%	**
Nigeria 2008	8.7	5.4	3.3	38%	***
Nigeria 2013	9.6	4.8	4.8	50%	***
Rwanda 2000	8.5	6.3	2.2	26%	*
Rwanda 2005	9.8	5.2	4.6	47%	***
Rwanda 2010	8.8	6.5	2.3	26%	*
Rwanda 2014-15	9.5	9.3	0.2	3%	
Senegal 2005	13.5	7.3	6.2	46%	***
Senegal 2010-11	11.5	7.8	3.7	32%	***
Senegal 2012-13	14.7	8.9	5.7	39%	**
Senegal 2014	14.2	4.9	9.2	65%	***

Continued

Table 3.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months)	Termination ratio in Interval 5 (46-59 months)	Absolute difference	Relative difference	p-value [1]
Africa cont'd					
Senegal 2015	13.4	6.5	6.9	51%	***
Senegal 2016	16.0	7.8	8.3	52%	**
Sierra Leone 2008	9.3	6.0	3.2	35%	*
Sierra Leone 2013	7.5	5.2	2.4	32%	**
Swaziland 2006-07	7.3	3.2	4.1	56%	**
Tanzania 2004-05	11.9	9.3	2.6	22%	
Tanzania 2010	12.7	6.8	5.9	46%	***
Tanzania 2015-16	12.4	7.1	5.3	43%	***
Uganda 2000-01	9.6	6.4	3.3	34%	*
Uganda 2006	14.3	7.6	6.6	47%	***
Uganda 2011	13.3	8.0	5.3	40%	***
Uganda 2016	15.9	6.0	9.8	62%	***
Zambia 2007	8.6	5.5	3.1	36%	*
Zambia 2013-14	8.0	3.8	4.1	52%	***
Zimbabwe 1994	12.1	6.4	5.7	47%	***
Zimbabwe 1999	15.5	5.3	10.2	66%	***
Zimbabwe 2005-06	11.0	4.9	6.1	55%	***
Zimbabwe 2010-11	10.4	5.4	5.0	48%	***
Zimbabwe 2015	12.7	6.3	6.5	51%	***
LAC					
Bolivia 1994	10.6	6.8	3.8	36%	**
Bolivia 2003	13.1	8.3	4.8	36%	***
Bolivia 2008	20.3	11.1	9.2	45%	***
Brazil NE 1991	17.2	12.1	5.1	30%	*
Brazil 1996	17.1	11.2	5.9	34%	**
Colombia 1990	14.2	9.6	4.5	32%	*
Colombia 1995	15.7	10.5	5.2	33%	**
Colombia 2000	21.7	13.0	8.7	40%	***
Colombia 2005	26.1	16.3	9.8	38%	***
Colombia 2010	26.7	18.5	8.3	31%	***
Colombia 2015	19.5	18.5	1.0	5%	
Dominican Republic 1991	19.6	13.3	6.4	32%	*
Dominican Republic 1996	22.2	14.7	7.6	34%	**
Dominican Republic 1999	35.9	13.3	22.6	63%	**
Dominican Republic 2002	22.2	13.1	9.1	41%	***
Guatemala 1995	7.8	4.4	3.4	43%	**
Guatemala 1998-99	6.8	6.3	0.6	8%	
Guatemala 2014-15	10.1	8.0	2.1	21%	
Guyana 2009	39.7	13.9	25.8	65%	***
Honduras 2005-06	10.9	8.1	2.8	25%	*
Honduras 2011-12	13.9	8.1	5.8	42%	***
Nicaragua 1998	9.9	7.2	2.7	27%	
Nicaragua 2001	9.9	7.6	2.2	23%	
Paraguay 1990	13.5	10.3	3.3	24%	
Peru 1991-92	12.5	9.6	2.8	23%	*
Peru 1996	13.3	8.5	4.8	36%	***
Peru 2000	11.9	8.7	3.2	27%	**
Peru 2004-06	17.0	9.3	7.7	45%	*
Peru 2007-08	20.3	8.9	11.4	56%	***

Continued

Table 3.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months)	Termination ratio in Interval 5 (46-59 months)	Absolute difference	Relative difference	p-value [1]
LAC cont'd					
Peru 2009	16.7	11.0	5.7	34%	***
Peru 2010	25.2	11.9	13.3	53%	***
Peru 2011	19.9	12.7	7.2	36%	**
Peru 2012	20.2	14.8	5.4	27%	**
Other Countries					
Albania 2008-09	18.1	15.3	2.7	15%	
Armenia 2000	152.5	134.2	18.3	12%	
Armenia 2005	120.8	119.3	1.5	1%	
Armenia 2010	55.3	85.9	-30.6	-55%	*
Armenia 2015-16	40.4	52.2	-11.8	-29%	
Azerbaijan 2006	128.3	79.5	48.8	38%	**
Egypt 1992	17.9	10.1	7.8	43%	***
Egypt 1995	17.6	9.9	7.8	44%	***
Egypt 2000	15.1	11.5	3.6	24%	**
Egypt 2003	13.1	9.3	3.8	29%	*
Egypt 2005	16.3	13.8	2.5	15%	
Egypt 2008	14.4	9.6	4.8	33%	***
Egypt 2014	14.4	13.0	1.4	10%	
Jordan 1990	19.2	13.0	6.2	32%	***
Jordan 1997	23.8	14.3	9.5	40%	***
Jordan 2002	19.9	16.3	3.6	18%	
Jordan 2007	24.2	12.5	11.7	48%	***
Jordan 2009	21.2	19.9	1.3	6%	
Jordan 2012	27.1	15.2	11.9	44%	***
Kazakhstan 1999	94.9	72.4	22.5	24%	*
Kyrgyz Republic 2012	31.1	32.5	-1.4	-4%	
Moldova 2005	90.5	98.4	-7.9	-9%	
Morocco 1992	11.7	6.3	5.5	47%	***
Morocco 2003-04	14.3	12.5	1.8	13%	
Tajikistan 2012	23.6	17.6	6.0	25%	*
Turkey 1993	43.3	25.0	18.3	42%	***
Turkey 1998	36.2	27.9	8.4	23%	*
Turkey 2003	34.6	25.6	9.0	26%	*
Turkey 2008	31.8	23.8	8.0	25%	*
Turkey 2013	25.3	18.5	6.8	27%	*
Ukraine 2007	40.3	58.5	-18.2	-45%	*
Yemen 2013	15.3	10.6	4.7	31%	***

[1] Result of a Wald test of equivalence of the termination ratio in the first and fifth interval.
* p≤0.05; ** p≤0.01; *** p≤0.001

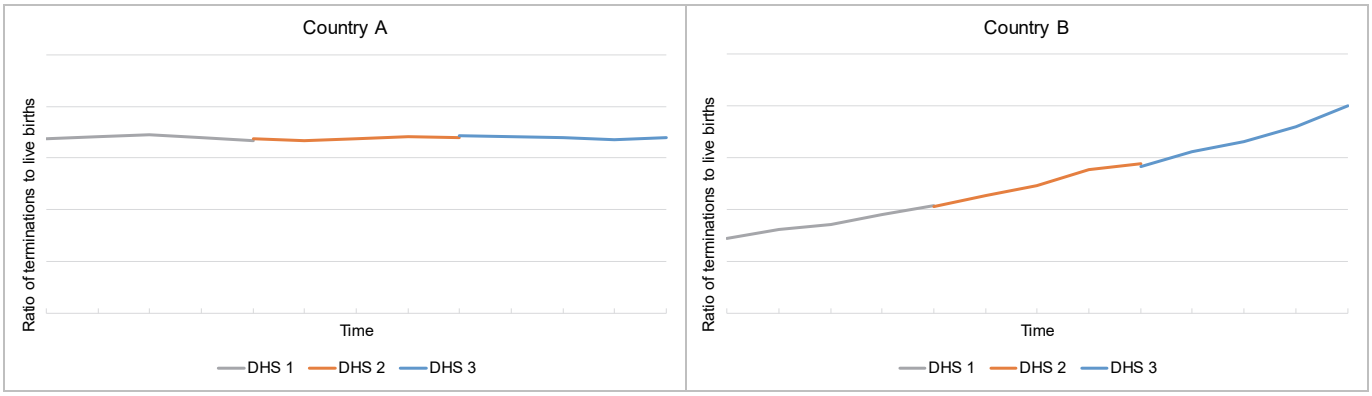
4 TRENDS IN TERMINATION RATIOS ACROSS MULTIPLE SURVEYS

4.1 Models of Between-Survey Consistency and Between-Survey Inconsistency

So far, our study has examined only within-survey consistency. Of the 62 countries contributing surveys to the study, 34 countries have a total of 124 consecutive surveys whose calendars adjoin or overlap. These 124 surveys can be used to examine between-survey consistency.

Of particular focus for this analysis are the adjoining (or overlapping) moments in consecutive calendars. To this point, we have assumed that real and observed termination ratios should be constant over the course of a single calendar if the calendar manifests within-survey consistency. In this scenario, examination of the adjoining point of consecutive calendars should appear as a pattern over time like that shown for Country A in Figure 4.1. The observed termination ratios are similar at the adjoining moments and observed termination ratios are consistent over the course of each separate calendar. These surveys manifest both within-survey consistency and between-survey consistency.

Figure 4.1 Model of consistent calendars with level ratios of terminations to live births over time (Country A) and increasing ratios of terminations to live births over time (Country B)



However, analysis presented in the previous chapter has indicated that termination ratios are in fact seldom consistent within single surveys. Instead, termination ratios are typically higher the closer to the date of interview, and lower in the earliest periods of the calendar. This pattern could either result from an inconsistency in reporting of terminated pregnancies, or be due to a real secular trend in the underlying ratio of terminated pregnancies to live births.

A secular trend could occur if a fertility regime changes in a way that increases the ratio of terminations to live births—for example, desire for fewer children, increasing contraceptive use, and changes in the contraceptive mix could result in fewer births in a population. If the level of contraceptive use does not keep pace with the demand, however, and the level of unmet need for family planning increases, and there are more unintended pregnancies, more women may avoid unintended pregnancies through induced abortion, resulting in an increased termination ratio. Termination ratios can also increase if there are changes

in the willingness to terminate an unintended pregnancy, if safe abortion services become more available, or if the legal status of abortion changes.

On the other hand, we generally expect improvements in population health and health care systems over time. Such improvements may reduce the level of preventable miscarriages and stillbirths, which could result in modest declines in the termination ratio.

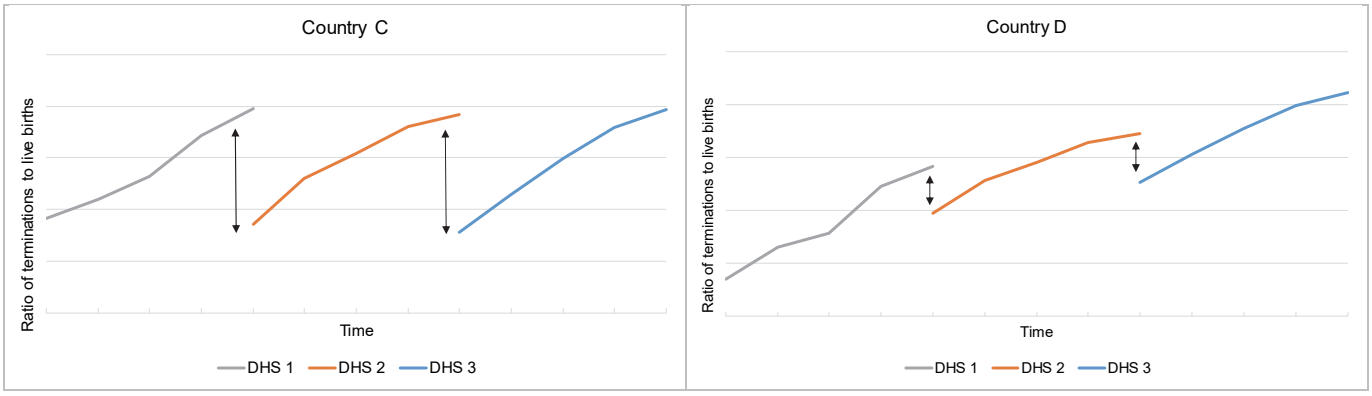
The analysis of 124 consecutive surveys in 34 countries allows us to:

- examine between-survey consistency at the adjoining moments for each of these pairs of surveys;
- examine whether a real secular trend contributes to the within-survey inconsistency observed in many surveys in the previous section.

If there is no trend and surveys are characterized by between-survey consistency, we would expect to see termination ratios like those depicted in Country A in Figure 4.1. If there is a real secular trend toward higher termination ratios over time, but surveys are nonetheless characterized by between-survey consistency, we would expect to see termination ratios like those depicted in Country B in Figure 4.1, which shows within-survey inconsistency but between-survey consistency, suggesting that the within-survey inconsistency can be attributed to a real secular trend. A similar trend could be observed in the opposing direction toward declining termination ratios over time.

Between-survey inconsistency is evident in the models presented in Figure 4.2, as shown by the gap between two observed termination ratios at adjoining points in time of two pairs of surveys. Country C depicts a pattern of no secular trend in termination ratios over time. Within-survey inconsistency is accompanied by between-survey inconsistency. In contrast, Country D in Figure 4.2 depicts a pattern of an evident secular trend toward higher termination ratios over time. A portion of the observed within-survey inconsistency can be attributed to this secular trend, but not all of the within-survey inconsistency. Some degree of between-survey inconsistency persists.

Figure 4.2 Model of inconsistent calendars with level ratios of terminations to live births over time (Country C) and increasing ratios of terminations to live births over time (Country D)



The figures in the following sections depict the termination ratios from 123 consecutive surveys in 34 countries. Graphical examination of these suggests the existence of all four distinct patterns: (1) inconsistent surveys with no evidence of a secular trend; (2) consistent surveys with no evidence of a secular trend;

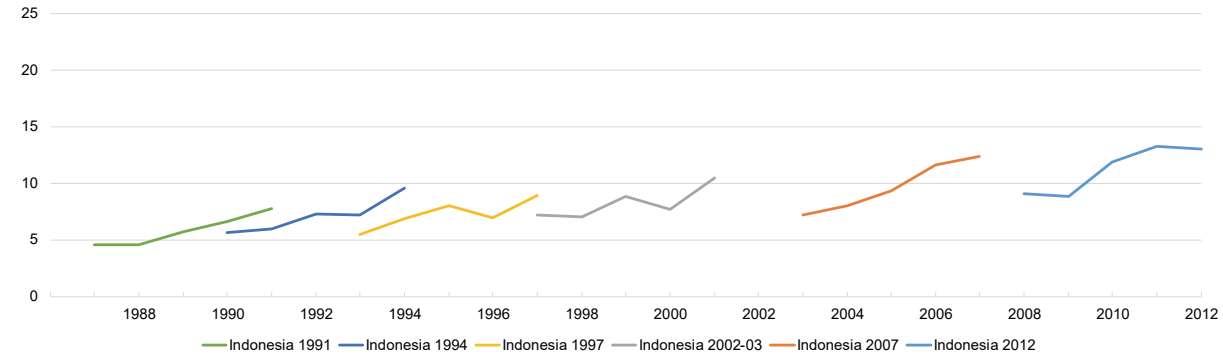
(3) consistent surveys with evidence of a secular trend; (4) inconsistent surveys with evidence of a secular trend.

4.2 Pattern 1: Inconsistent Surveys with No Evidence of Secular Trend

The most common pattern observed is no evidence of a secular trend in termination ratios over time, but evidence of inconsistency both within and between surveys. In 18 countries some or all of the surveys exhibit this pattern, as illustrated for each country in Figures 4.3 through 4.21 respectively. This pattern is found in all four regions, comprising two countries in Asia, 14 countries in Africa, one country in Latin America and the Caribbean, and two countries in the Other Countries region.

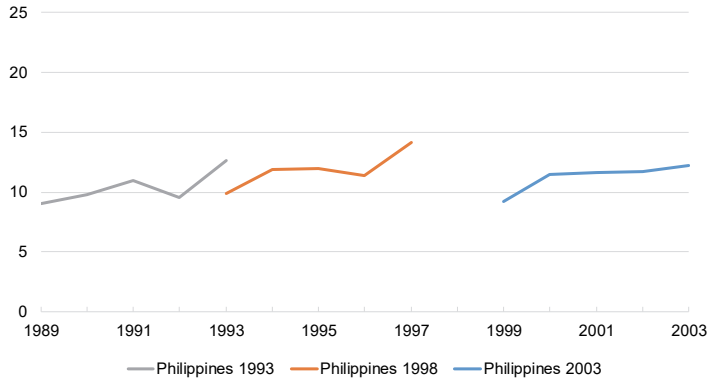
Indonesia offers a good illustrative example both because the pattern shown in Indonesia's surveys typifies the pattern in this group, and because Indonesia has six DHS surveys over about 25 years between 1987 and 2012. As Figure 4.3 shows, the earliest surveys are each marked by higher termination ratios at more recent (closer to the time of data collection) intervals and lower termination ratios in earlier intervals, without any indication of an increase in the termination ratio over the survey period. Each of the first four surveys suggests a similar minimum and maximum observed termination ratio, though the last two surveys suggest a greater range over the course of one survey than the earlier four surveys. Observation of the adjoining and overlapping moments indicates that the more recent period of a previous survey consistently shows higher termination ratios than in the subsequent survey. The two most recent Indonesia surveys may hint at a slight secular rise in the termination ratio in recent years, however the dominant pattern again is a discrepancy between the termination ratios at adjoining points that is large and perhaps increasing compared with that in earlier survey pairs.

Figure 4.3 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Indonesia



The three surveys in the Philippines (Figure 4.4) show a similar discrepancy between the adjoining points of the earliest two surveys, as in Indonesia, and between the most recent survey pair, though this does require extrapolating forward in time the termination ratios observed in the Philippines 1996 DHS. Each of the three surveys produces termination ratios of about 9 in their earliest periods and approaching 12-14 in their most recent intervals, without any sign of an increasing trend over time.

Figure 4.4 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Philippines



The two surveys in Burundi (Figure 4.5) also show initial termination ratios near 5, increasing to about 10 over the course of each survey, but the gap between the two surveys when extrapolated from their terminal points shows discrepant observed ratios. In Ethiopia (Figure 4.6), the relatively steep increase in termination ratios observed over the course of the 2011 DHS is not corroborated by the termination ratios observed in either the preceding or successive survey.

Figure 4.5 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Burundi

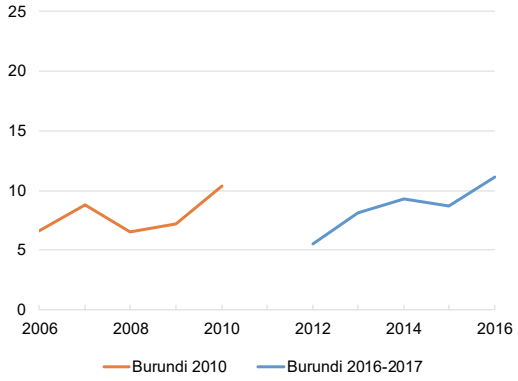
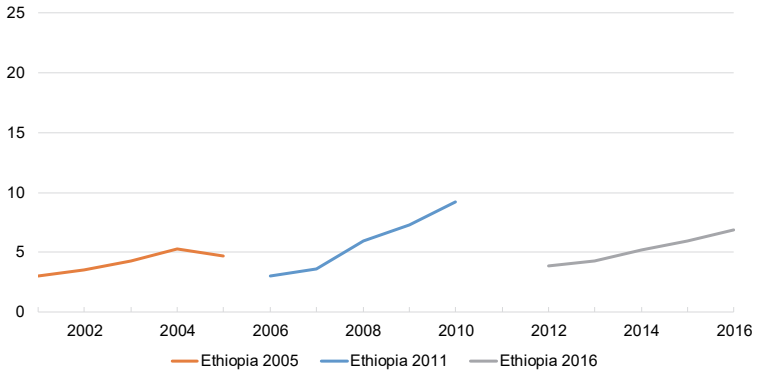


Figure 4.6 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Ethiopia

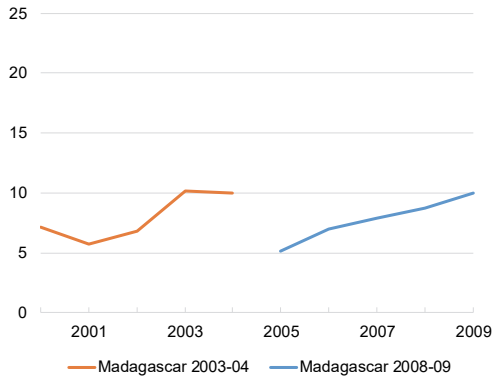


Likewise, the four surveys in Kenya (Figure 4.7) depict a marked increase in the termination ratios within each survey and sizable gaps between the adjoining moments of survey pairs.

Figure 4.7 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Kenya

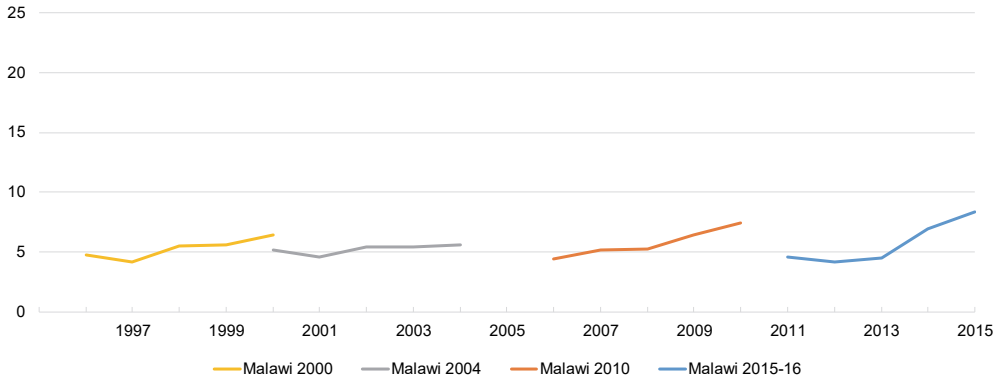
The two surveys in Madagascar (Figure 4.8) depict a similar pattern as Kenya, with termination ratios falling in a similar range. The most recent interval produces nearly identical termination ratios at about 10, with a gap of about 5 points at their adjoining moment.

Figure 4.8 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Madagascar



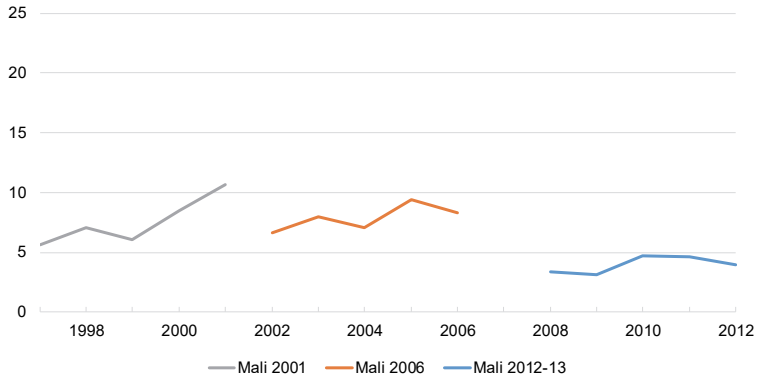
Malawi's two earliest surveys, in 2000 and 2004 (Figure 4.9), show variation within a narrow range, and the gap in the observed termination ratios from their adjoining moment in 2000 is not large. However, the level of within-survey inconsistency and the gap between the two most recent surveys are wider.

Figure 4.9 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Malawi



Mali presents an interesting pattern (Figure 4.10). The three surveys indicate the within-survey and between-survey inconsistency that is typical of all surveys in this group. However, the termination ratios observed throughout the Mali 2012-13 DHS are consistently lower than those observed in either of the previous two surveys. Despite its lower termination ratios, the ratios at the most recent point of the calendar (2012) exceed those measured at its earliest points in 2008-09.

Figure 4.10 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Mali



In Nigeria (Figure 4.11), the termination ratio in each of the two surveys, in 2008 and 2013, show a nearly monotonic, linear increase with time, with a disjuncture between them in 2008-2009, whereas in Rwanda (Figure 4.12), the disjunctures between the termination ratios in the country's four surveys are accompanied by jagged inconsistency within each of the surveys. Additionally, the (nearly) adjoining moment between the two most recent surveys produces similar termination ratios.

Figure 4.11 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Nigeria

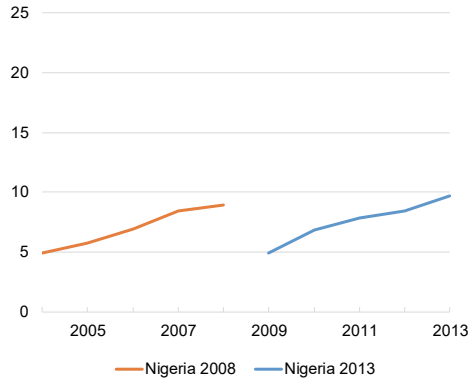
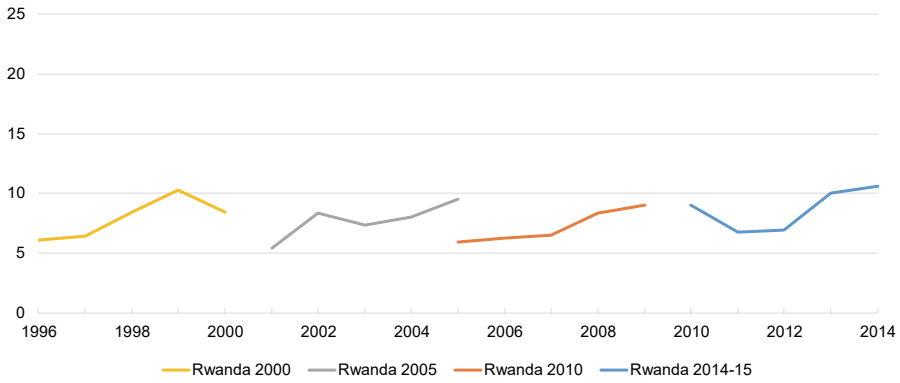
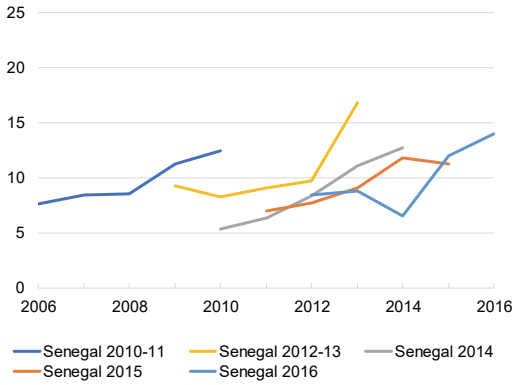


Figure 4.12 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Rwanda



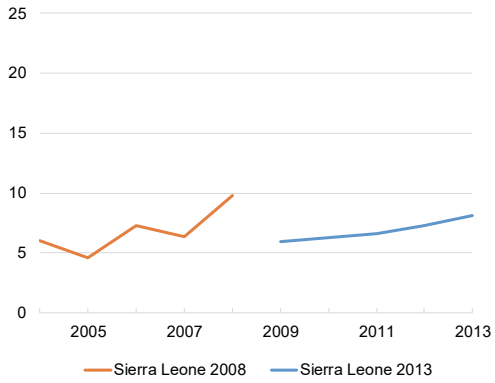
The first three surveys in Senegal (Figure 4.13) show discrepancies between them. The 2012-13 survey, which has a calendar that nearly perfectly overlaps in time with the 2014 survey, consistently produces higher observed termination ratios at every point it shares with the later survey. However, the concordance in observed termination ratios in the three most recent surveys—Senegal 2014, 2015, and 2016—stands in contrast to the earlier surveys. While the first three surveys align with the pattern in this category, the latter two may better fit Pattern 4: between-survey inconsistency accompanied by a (modest) increasing trend in termination ratios, as shown in Figure 4.2, Country D. The latter surveys are all part of the DHS Senegal Continuous Survey.

Figure 4.13 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Senegal



Sierra Leone also shows a disjuncture between the two surveys in 2008-09 (Figure 4.14). It also shows two patterns of within-survey inconsistency: a jagged, erratic pattern of observed termination ratios in the 2008 survey and steadily increasing termination ratios in the 2013 survey.

Figure 4.14 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Sierra Leone



Figures 4.15 and 4.16 show a very similar pattern in the three surveys in Tanzania and four surveys in Uganda. Termination ratios begin near 5 terminated pregnancies per 100 live births in the earliest intervals of each calendar and increase erratically upward toward a ratio of 15 in the most recent intervals of the calendar, producing clear between-survey inconsistency at the adjoining points.

Figure 4.15 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Tanzania

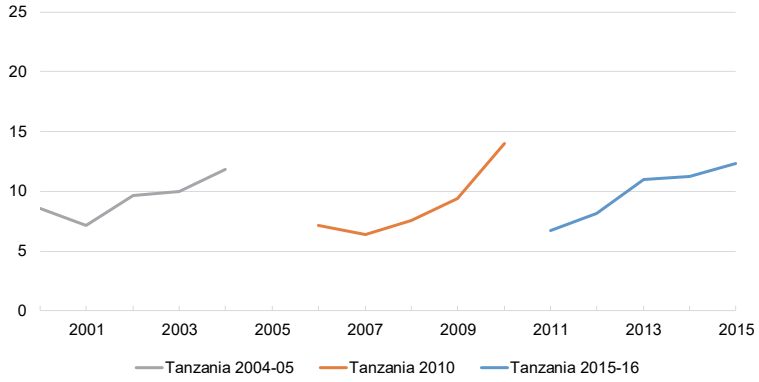
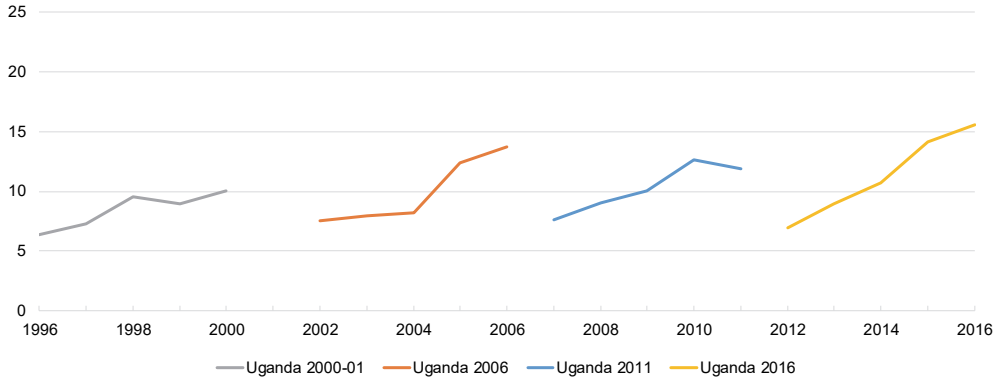
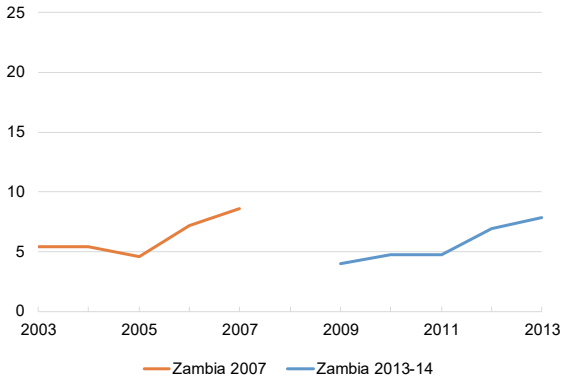


Figure 4.16 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Uganda



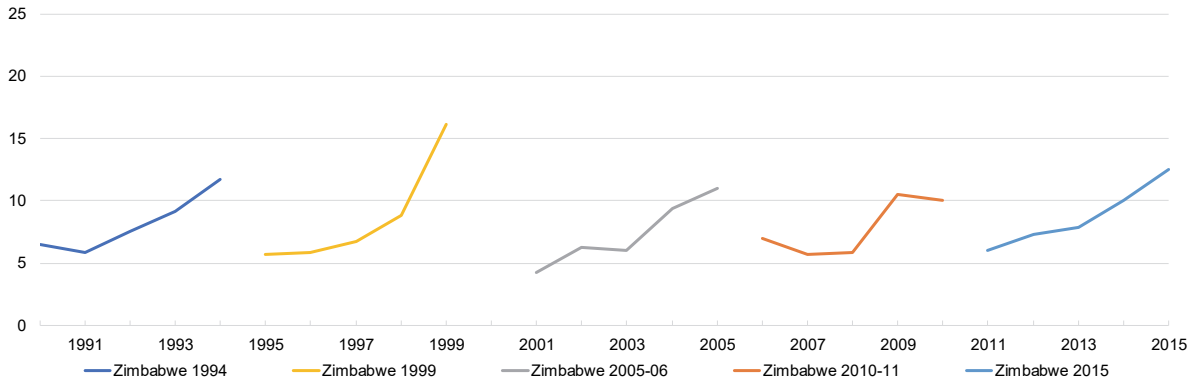
Both the Zambia 2007 and 2013-14 surveys (Figure 4.17) show termination ratios that are consistently low for the earliest three intervals of their calendars but that then increase steadily in the most recent two intervals, making an evident gap between the surveys.

Figure 4.17 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Zambia



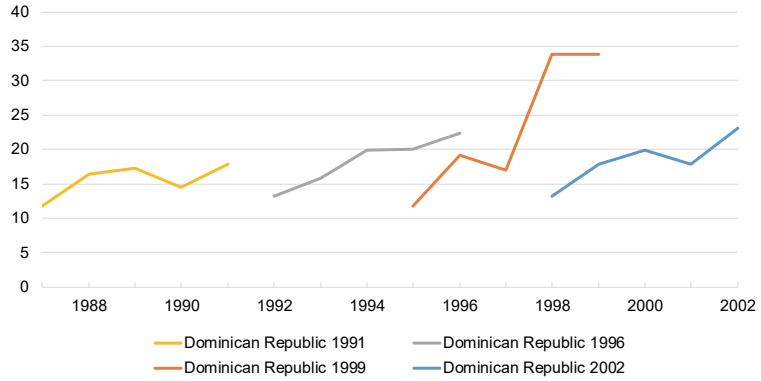
The pattern exhibited by the surveys in Zimbabwe (Figure 4.18) closely resembles that in Kenya, Tanzania, and Uganda, with erratically increasing termination ratios within each survey accompanied by gaps of 5-10 points between surveys.

Figure 4.18 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Zimbabwe



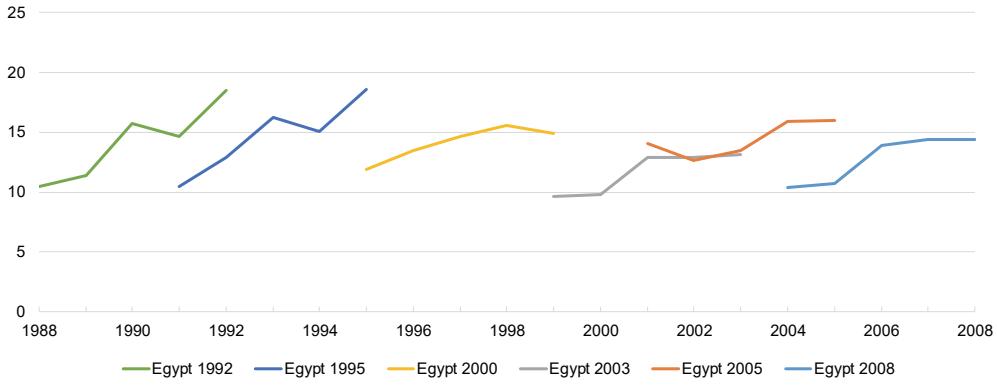
The Dominican Republic surveys (Figure 4.19) exhibit a pattern similar to those of several Eastern and Southern African countries. Note that higher termination ratios in the Dominican Republic necessitate an extended scale from 0 to 40. One feature of these surveys is that the steepest decline in termination ratios is evident in the most recent intervals (between first and second, or second and third) rather than in the earliest intervals of the calendar. Most striking, however, is the exceptionally large range of nearly 25 points in the observed termination ratios in the 1999 survey. Accordingly, there is a notable difference between the adjoining moment of this survey and the 2002 survey. Although by comparison the differences in termination ratios between the 1999 and 1996 surveys are not especially large in 1996, they are wider again in 1995.

Figure 4.19 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Dominican Republic



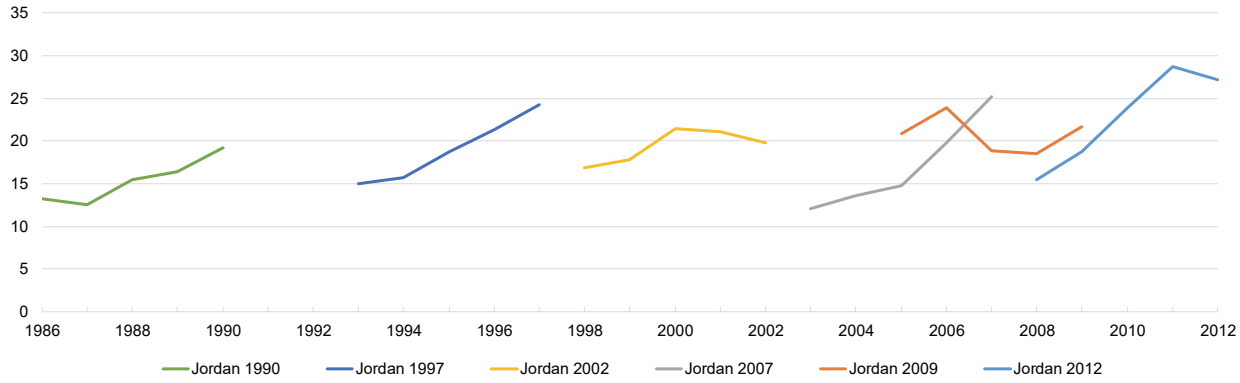
The patterns in Egypt (Figure 4.20) and Jordan (Figure 4.21) are also similar to the several African surveys mentioned above and to the Dominican Republic, but each includes a survey pair that exhibits some degree of between-survey consistency. The Egypt 2005 and 2003 surveys produce nearly identical termination ratios at several overlapping points shared by the two surveys between 2001 and 2003. Likewise, the termination ratios in intervals shared by the Jordan 2012 and 2009 surveys in 2008 and 2009 are not far apart. While evidence from some countries in this category (e.g., Indonesia, the Philippines, Ethiopia, Malawi, and Mali) suggests that between-survey inconsistency widens with more recent surveys, Egypt and Jordan join Senegal in providing evidence potentially suggesting lower between-survey inconsistency over time.

Figure 4.20 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Egypt



Although it is typical for a preceding survey to produce observed termination ratios higher than those observed in the corresponding moments of their calendars, this is not the case with two of the Jordan surveys. The observed termination ratio in the preceding survey (2007) exceeds that in the subsequent survey (2009) at their intersection in 2007, but this relationship is reversed in earlier shared intervals: the termination ratio in 2006 and 2005 is lower in the 2007 survey than in the 2009 survey. Note that the higher termination ratios in Jordan necessitate a scale extended beyond that for the Egypt surveys.

Figure 4.21 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Jordan



4.3 Pattern 2: Consistent Surveys with No Evidence of Secular Trend

Just two countries in Latin America—Guatemala and Nicaragua—typify the pattern of consistent surveys and no evidence of a secular trend in the termination ratio. Each country has two consecutive surveys, and the results of the statistical test (Table 3.1) showed both surveys in each country were within-survey consistent. The graphical analysis presented in Figures 4.22 and 4.23 indicated that observed ratios are stagnant over the combined observation periods that the two surveys cover—1991-1998 in Guatemala and 1994-2001 in Nicaragua. Furthermore, the observed termination ratios are nearly identical in the intervals overlapped by the Guatemala surveys in 1994-95, and very similar in those overlapped by the Nicaragua surveys in 1997-98. Although there is some difference in the termination ratios for 1998 for Nicaragua, they are nearly identical in 1997.

Figure 4.22 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Guatemala

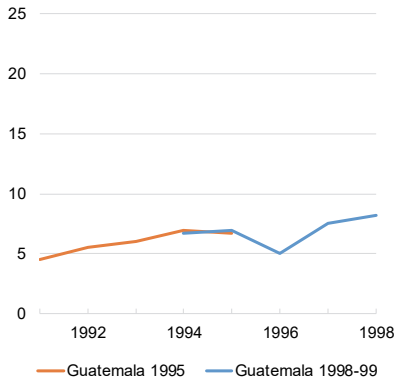
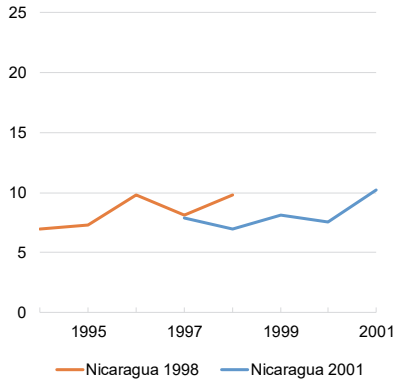


Figure 4.23 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Nicaragua



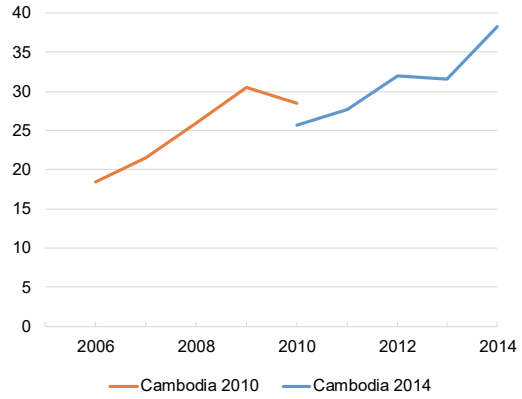
4.4 Pattern 3: Consistent Surveys with Evidence of Secular Trend

The third pattern—consistent surveys with evidence of a secular trend in termination ratios over time—is only a marginally larger category than for Pattern 2. Pattern 3 comprises nine surveys in four countries—Cambodia, Nepal, Vietnam, and Honduras. Recent surveys in Senegal, presented earlier, may join this category. Note that the scale varies for each of these countries to accommodate variation in the level of their termination ratios. With two exceptions[11] among the nine surveys exhibiting Pattern 3, testing found statistically significant within-survey inconsistency (Table 3.1). However, when placed alongside consecutive surveys, a clear secular trend emerges, as presented in Figures 4.24 through 4.27. The secular trend shows increasing termination ratios over time in all four countries. Furthermore, focusing on the adjoining moments in consecutive calendars indicates relatively close correspondence between surveys.

In Cambodia (Figure 4.24), the trend in the termination ratio is clearly rising across the 2010 and 2014 surveys, with a similar overall slope in each survey. However, there is some jaggedness to the rate of increase in the termination ratio, and the termination ratios are similar at the adjoining moment of the two surveys, mainly due to a plateauing or slight decrease in the most recent 12 months of the Cambodia 2010 survey (between 2009 and 2010).

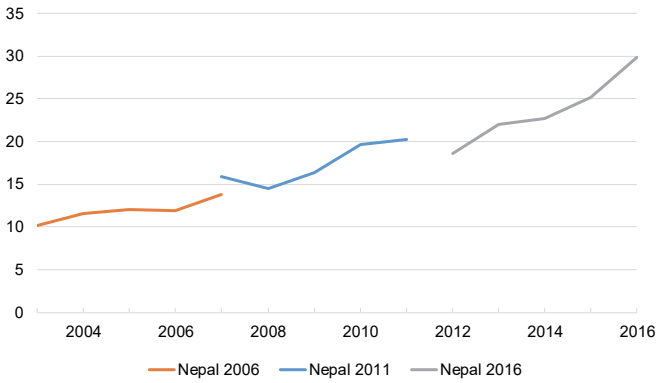
[11] Nepal 2006 and Vietnam 2002.

Figure 4.24 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Cambodia



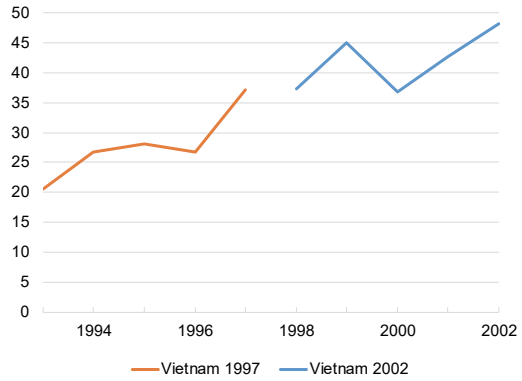
Nepal (Figure 4.25) shows a trend that perhaps most closely aligns with the model of a consistent trend depicted in Country B of Figure 4.1. The slopes are noticeably consistent from survey to survey and the termination ratios at their adjoining moments are noticeably similar, although the termination ratios between the Nepal 2011 and 2016 surveys are somewhat separated in time.

Figure 4.25 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Nepal



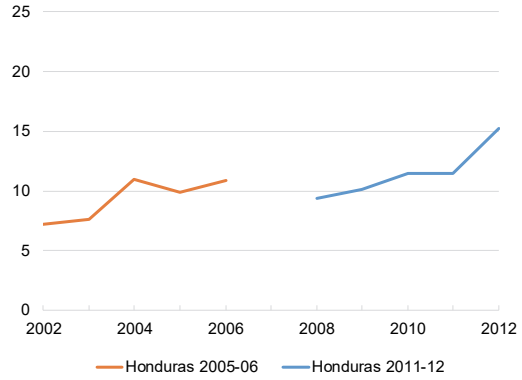
In contrast, in Vietnam (Figure 4.26) the surveys display a decidedly jagged path in their trend toward a termination ratio that quickly increases over time. The overall slope appears steep, rising from about 20 terminated pregnancies per 100 live births in 1993 to about 50 in 2002. The termination ratios at their adjoining moment are nonetheless similar.

Figure 4.26 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Vietnam



In Honduras (Figure 4.27) the termination ratios rise much more slowly than in Vietnam. The slow rise in termination ratios is accompanied by consistent observed termination ratios at the (nearly) adjoining moment between the two surveys.

Figure 4.27 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Honduras



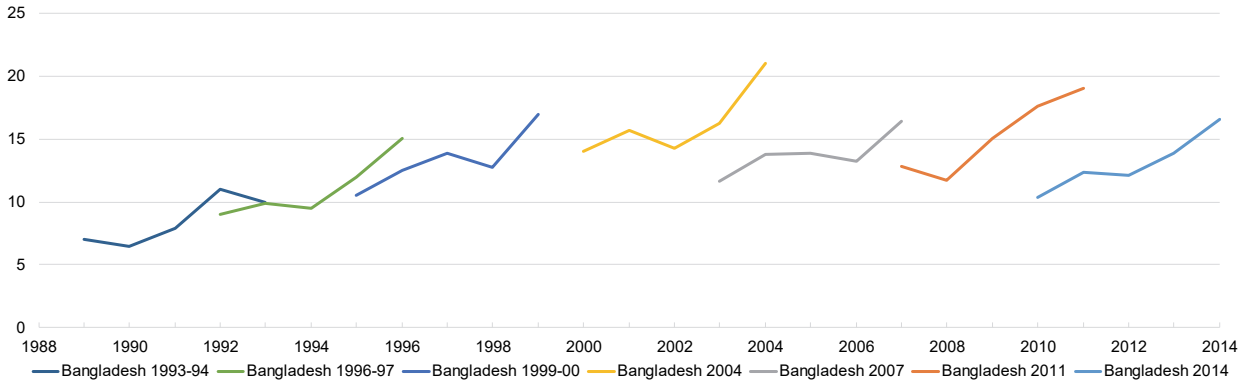
4.5 Pattern 4: Inconsistent Surveys with Evidence of Secular Trend

The fourth pattern is the second-largest category—inconsistent surveys alongside evidence of a secular trend. Surveys in nine countries exhibit this pattern, as illustrated in Figures 4.28 through 4.36. Like the pattern of inconsistent surveys with no secular trend, this pattern is found in all four study regions, comprising one country in Asia, three countries in Africa, three countries in Latin America and the Caribbean, and two countries in the Other Countries region. Pattern 4 presents with two main variants: (1) a secular trend suggestive of increasing termination ratios over time; and (2) a secular trend indicating decreasing termination ratios over time.

4.5.1 Increasing termination ratios over time

Within Pattern 4, six countries—Bangladesh, Ghana, Lesotho, Bolivia, Colombia, and Peru—exhibit a trend toward the first variant—increasing termination ratios. These are shown below in Figures 4.28 through 4.33. Three Other Countries show the second variant—decreasing termination ratios—and are shown in section 4.5.2.

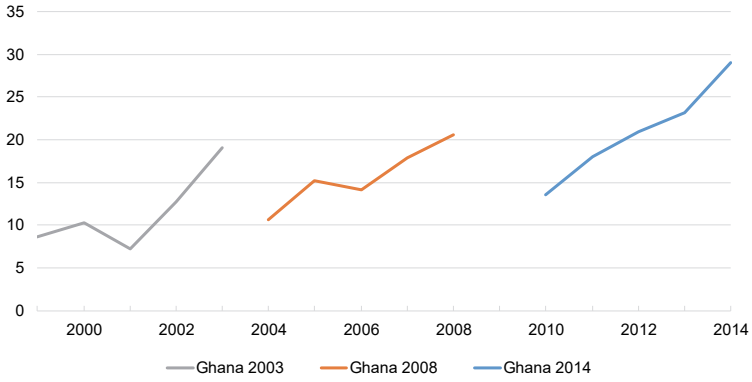
Figure 4.28 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Bangladesh



The trend exhibited by Bangladesh (Figure 4.28) is an amalgam of both trends in this variant of the pattern. For most of the surveys here, there is evidence of an increasing termination ratio between 1989 and 2004. The most recent three surveys, however, offer tentative evidence of a declining trend in termination ratios. The gaps at adjoining or overlapping moments between surveys are smaller between earlier surveys when the trend is increasing—coinciding at one point between the Bangladesh 1993-94 and 1996-97 surveys—than they are at adjoining or overlapping points in later surveys when the trend is decreasing.

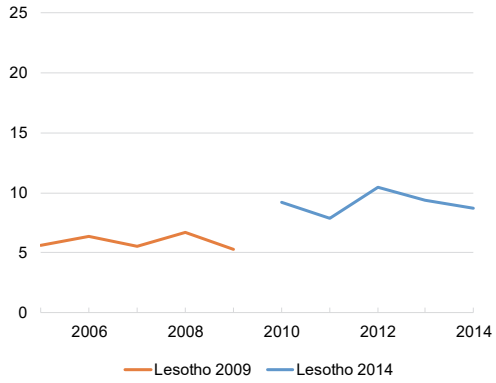
The three surveys in Ghana (Figure 4.29) are a good illustration of inconsistent surveys with evidence of an increasing trend in termination ratios. The range in the termination ratios within a single survey increases with each successive survey, yet there are clear gaps between the surveys.

Figure 4.29 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Ghana



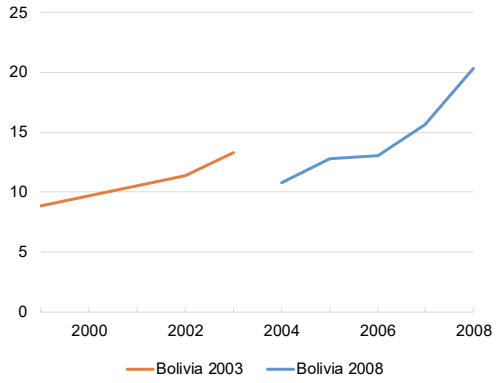
Lesotho offers an interesting variation on Pattern 4. Figure 4.30 makes clear that there is a discordance in the magnitude of the termination ratios estimated at the (nearly) adjoining points of the calendar of approximately 5 points, and evidence of increasing termination ratios over time. However, with some variation, the level of termination ratios is roughly steady throughout either of the two surveys. Indeed, the two Lesotho surveys indicate within-survey consistency (see Table 3.1) at the same time that they demonstrate between-survey inconsistency.

Figure 4.30 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Lesotho



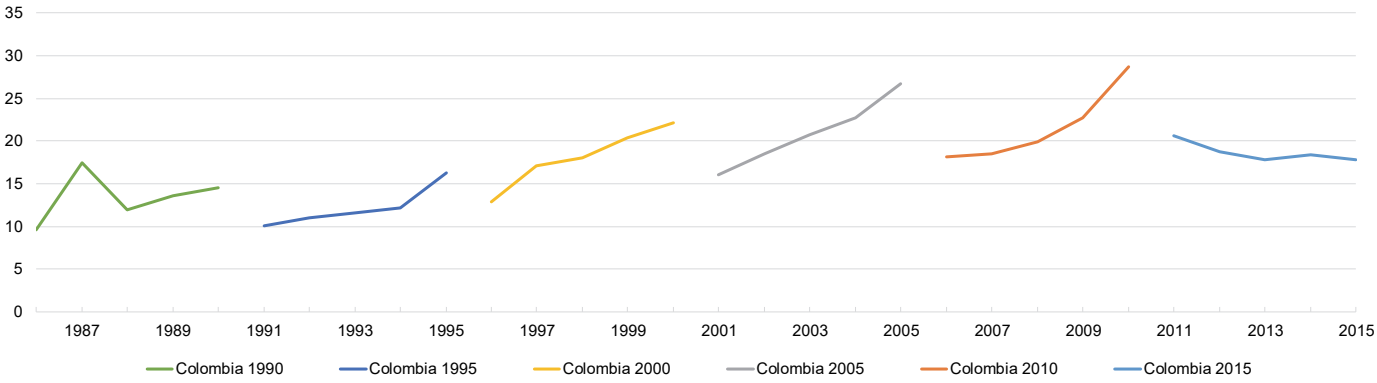
In Bolivia (Figure 4.31) the surveys in 2003 and 2008 indicate a steadily increasing termination ratio over time. Meanwhile, there is a difference of several points between the termination ratios in the surveys observed at their adjoining moments.

Figure 4.31 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Bolivia



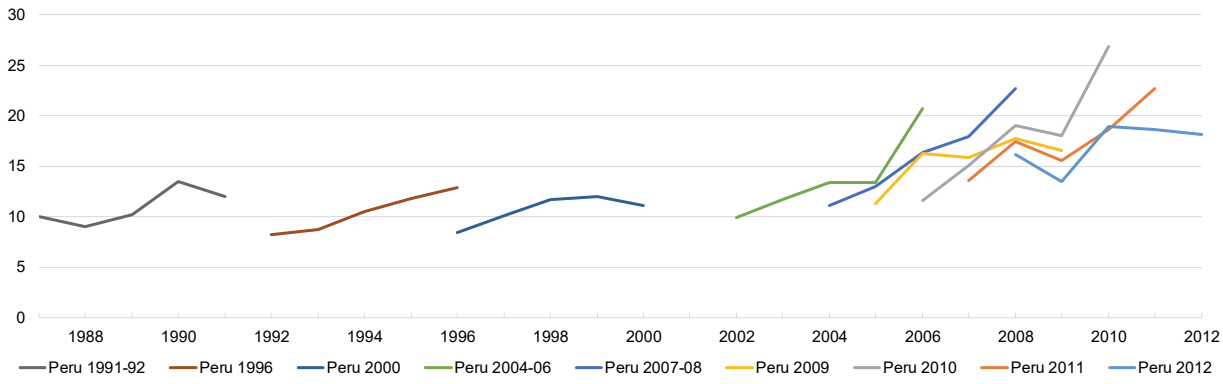
The six surveys in Colombia (Figure 4.32) indicate an increasing termination ratio beginning in the early 1990s, if not earlier. These termination ratios rise to the point of data collection in the Colombia 2010 survey. As in Bangladesh and Ghana, the between-survey difference in observed termination ratios increases with increases in the pace of the rise of the termination ratios. The most recent survey, Colombia 2015, exhibits a pattern contradictory to the other surveys in the country. It is unclear with just the one data point if this is a turning point in a trend to declining termination ratios, as in Bangladesh, or if this survey is an idiosyncrasy in a continuing increasing trend.

Figure 4.32 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Colombia



In Peru (Figure 4.33), the first three surveys are perhaps a better fit with Pattern 1 than Pattern 4—inconsistent surveys with no evidence of a secular trend. The adjoining points of these three surveys are characterized by a discrepancy in the termination ratios observed in each of the survey pairs and by within-survey inconsistency. However, a trend to increasing termination ratios emerges beginning in the early 2000s. Although the latter six surveys in Peru are indicative of this increasing secular trend, there are still inconsistencies between them. There are moments within each calendar where the observed termination ratio is similar to that observed for the corresponding interval in the preceding or consecutive survey. However, with the exception of the Peru 2009 survey, the most recent interval (closest to the point of data collection) in each survey produces an observed termination ratio noticeably larger than the successive survey.

Figure 4.33 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Peru



4.5.2 Decreasing termination ratios over time

As mentioned above, three countries within Pattern 4 (inconsistent surveys alongside evidence of a secular trend) exhibit the second variant of this pattern—decreasing termination ratios over time. These are Benin, Armenia, and Turkey, shown in Figures 4.34 through 4.36.

In Benin (Figure 4.34), within each of the two surveys the observed termination ratios increase slightly (Benin 2011-12) or are relatively steady (Benin 2006). However, in the more recent survey the observed termination ratios are continuously lower than those in the preceding survey and there is a conspicuous

inconsistency between the two surveys' terminal points. To some degree, Benin's pattern with a decreasing trend is analogous but in converse to Lesotho's pattern with an increasing trend, shown in Figure 4.30.

Figure 4.34 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Benin

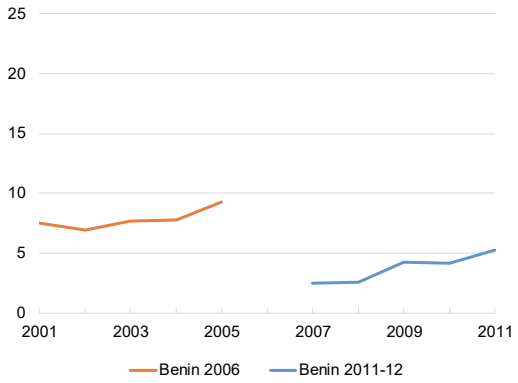
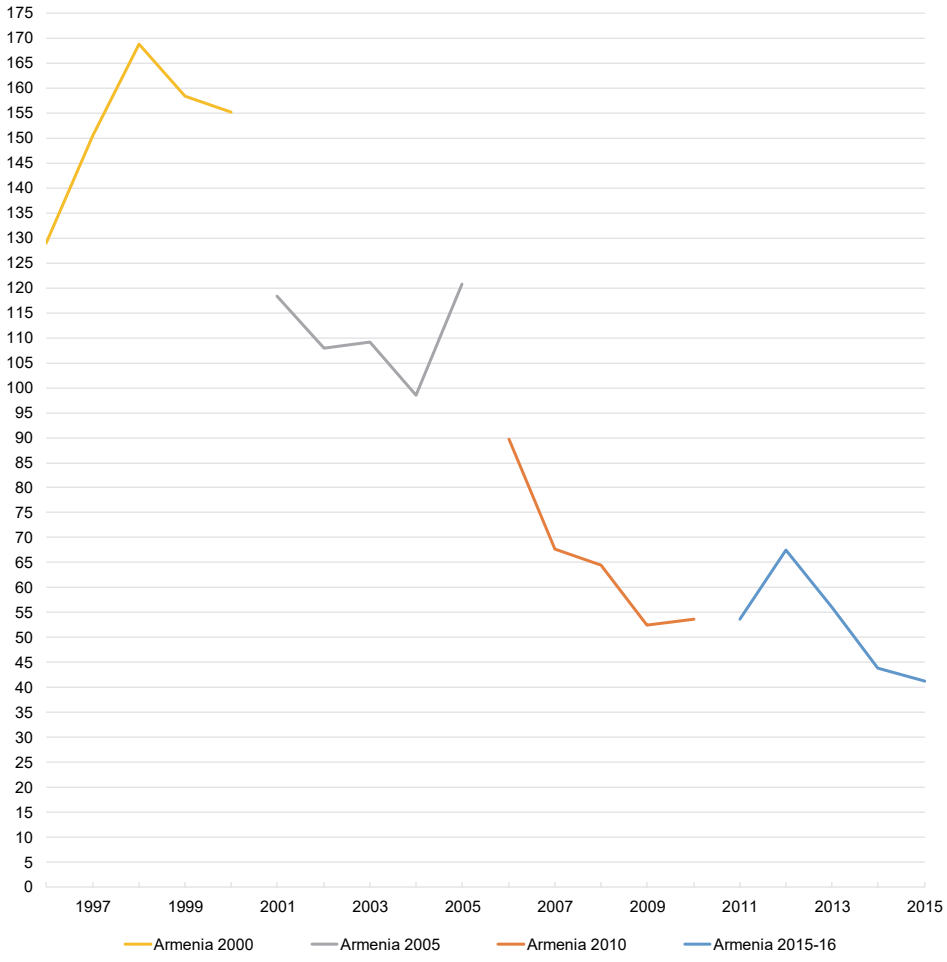


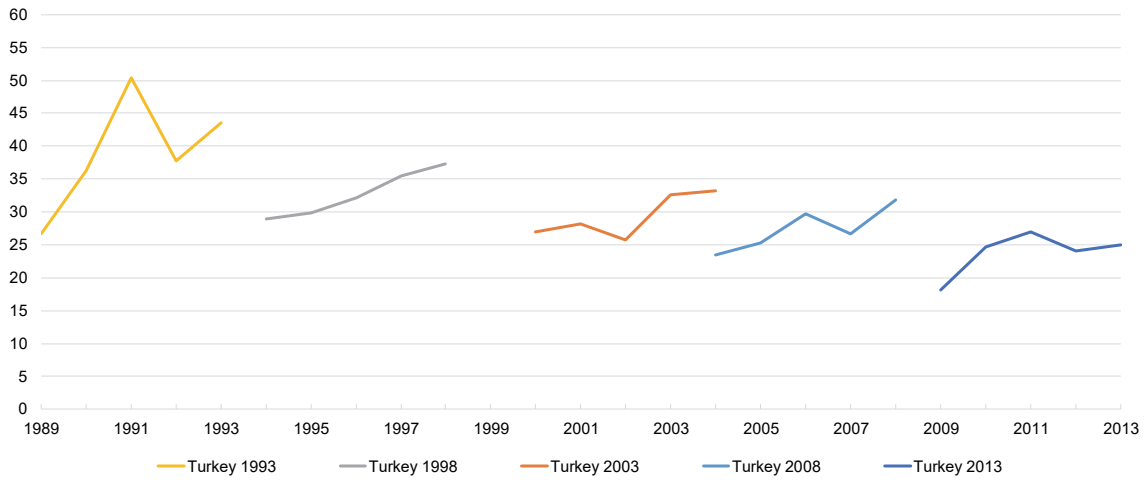
Figure 4.35 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Armenia



In contrast to Benin, the secular downward trend in termination ratios exhibited by Armenia (Figure 4.35) and Turkey (Figure 4.36) are starker, with much higher termination ratios in the earliest surveys. The termination ratios remain considerably higher than Benin's in the most recent surveys. Armenia's highest

termination ratio is observed at about 170 terminated pregnancies to 100 live births in 1998, with a decline to about 40 in the most recent interval of the most recent survey. Turkey's termination ratios have declined from about 50 to 20-25 terminated pregnancies per 100 live births over the six surveys. With one exception—the 2010-2011 period in Armenia—the most recent interval of the preceding survey produces a higher termination ratio than the interval nearest to the later survey. These termination ratios are not measurably different in 2010-2011 in Armenia.

Figure 4.36 Ratios of terminated pregnancies to live births (per 100) in consecutive DHS calendars, Turkey



The two largest categories of surveys are those that indicate inconsistencies between surveys, whether without any indication of a secular trend (Pattern 1) or with evidence of a secular trend (Pattern 4). Thus, the within-survey inconsistency observed in Chapter 3 cannot be explained by a secular trend in the underlying real termination ratio for the majority of surveys. Between-survey inconsistency persists. Where there is evidence of an increasing trend in the termination ratio, this trend may reduce but not eliminate the magnitude of the between-survey inconsistency, though it is difficult to quantify the share of the between-survey inconsistency attributable to the secular trend and the share that can be attributed to reporting inconsistency. Where there is evidence of a decreasing trend in the termination ratio, that trend serves to reinforce and magnify between-survey inconsistencies.

4.6 Testing Between-Survey Consistency

Table 4.1 presents the results of a formal test of between-survey consistency for the same consecutive surveys analyzed graphically in the preceding section. This analysis involves comparing the termination ratio of the first 12-month interval of a preceding survey for a given country with the termination ratio for the interval in a survey that aligns in time with the first 12-month interval of the preceding survey. This analysis aligns with Figures 4.3 to 4.36 in the previous section of this report. The reader is encouraged to refer to these figures for any country appearing with results in this table.

Table 4.1 Measures of consistency between consecutive surveys

Survey	Termination ratio in Interval 1 (0-11 months) of preceding survey	Termination ratio in interval closest in time to Interval 1 of preceding survey	Absolute difference	Relative difference	Consistent or Inconsistent [1]
Asia					
Afghanistan 2015	NA	NA	NA	NA	NA
Bangladesh 1993-94	NA	NA	NA	NA	NA
Bangladesh 1996-97	10.0	9.9	0.1	1%	Consistent
Bangladesh 1999-00	15.1	12.5	2.6	17%	Consistent
Bangladesh 2004	17.0	14.0	2.9	17%	Consistent
Bangladesh 2007	21.1	13.8	7.3	35%	Inconsistent
Bangladesh 2011	16.4	12.9	3.5	22%	Inconsistent
Bangladesh 2014	19.0	12.4	6.7	35%	Inconsistent
Cambodia 2010	NA	NA	NA	NA	NA
Cambodia 2014	28.5	25.6	2.9	10%	Consistent
India 2005-06	NA	NA	NA	NA	NA
India 2015-16	NA	NA	NA	NA	NA
Indonesia 1991	NA	NA	NA	NA	NA
Indonesia 1994	7.8	5.9	1.8	24%	Inconsistent
Indonesia 1997	9.5	6.8	2.7	28%	Inconsistent
Indonesia 2002-03	8.9	7.2	1.8	20%	Consistent
Indonesia 2007	10.5	7.2	3.3	32%	Inconsistent
Indonesia 2012	12.4	9.1	3.3	27%	Inconsistent
Maldives 2009	NA	NA	NA	NA	NA
Myanmar 2015-16	NA	NA	NA	NA	NA
Nepal 2006	NA	NA	NA	NA	NA
Nepal 2011	13.8	15.9	-2.1	-15%	Consistent
Nepal 2016	20.2	18.6	1.6	8%	Consistent
Pakistan 2012-13	NA	NA	NA	NA	NA
Philippines 1993	NA	NA	NA	NA	NA
Philippines 1998	12.6	9.9	2.7	22%	Consistent
Philippines 2003	14.2	9.2	5.0	35%	Inconsistent
Timor-Leste 2009-10	NA	NA	NA	NA	NA
Vietnam 1997	NA	NA	NA	NA	NA
Vietnam 2002	37.2	37.4	-0.2	-1%	Consistent
Africa					
Angola 2015-16	NA	NA	NA	NA	NA
Benin 2006	NA	NA	NA	NA	NA
Benin 2011-12	9.3	2.5	6.8	74%	Inconsistent
Burkina Faso 2003	NA	NA	NA	NA	NA
Burkina Faso 2010	NA	NA	NA	NA	NA
Burundi 2010	NA	NA	NA	NA	NA
Burundi 2016-17	NA	NA	NA	NA	NA
Comoros 2012	NA	NA	NA	NA	NA
Ethiopia 2005	NA	NA	NA	NA	NA
Ethiopia 2011	4.7	3.0	1.7	37%	Inconsistent
Ethiopia 2016	9.2	3.8	5.3	58%	Inconsistent
Gambia 2013	NA	NA	NA	NA	NA
Ghana 2003	NA	NA	NA	NA	NA
Ghana 2008	19.0	10.6	8.4	44%	Inconsistent
Ghana 2014	NA	NA	NA	NA	NA
Guinea 2005	NA	NA	NA	NA	NA

Continued

Table 4.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months) of preceding survey	Termination ratio in interval closest in time to Interval 1 of preceding survey	Absolute difference	Relative difference	Consistent or Inconsistent [1]
Africa cont'd					
Kenya 1998	NA	NA	NA	NA	NA
Kenya 2003	7.9	4.1	3.8	48%	Inconsistent
Kenya 2008-09	7.9	4.5	3.4	43%	Inconsistent
Kenya 2014	9.5	4.8	4.7	49%	Inconsistent
Lesotho 2009	NA	NA	NA	NA	NA
Lesotho 2014	5.3	9.2	-3.9	-74%	Inconsistent
Liberia 2013	NA	NA	NA	NA	NA
Madagascar 2003-04	NA	NA	NA	NA	NA
Madagascar 2008-09	10.0	5.2	4.9	49%	Inconsistent
Malawi 2000	NA	NA	NA	NA	NA
Malawi 2004	6.4	5.2	1.2	19%	Consistent
Malawi 2010	NA	NA	NA	NA	NA
Malawi 2015-16	7.4	4.6	2.8	38%	Inconsistent
Mali 2001	NA	NA	NA	NA	NA
Mali 2006	10.6	6.6	4.0	38%	Inconsistent
Mali 2012-13	NA	NA	NA	NA	NA
Mozambique 2003	NA	NA	NA	NA	NA
Mozambique 2011	NA	NA	NA	NA	NA
Namibia 2006-07	NA	NA	NA	NA	NA
Namibia 2013	NA	NA	NA	NA	NA
Niger 2006	NA	NA	NA	NA	NA
Niger 2012	NA	NA	NA	NA	NA
Nigeria 2008	NA	NA	NA	NA	NA
Nigeria 2013	8.9	4.9	4.0	45%	Inconsistent
Rwanda 2000	NA	NA	NA	NA	NA
Rwanda 2005	8.5	5.4	3.1	36%	Inconsistent
Rwanda 2010	9.5	5.9	3.6	38%	Inconsistent
Rwanda 2014-15	9.1	9.1	0.0	0%	Consistent
Senegal 2005	NA	NA	NA	NA	NA
Senegal 2010-11	NA	NA	NA	NA	NA
Senegal 2012-13	12.5	8.2	4.3	34%	Inconsistent
Senegal 2014	16.8	11.1	5.7	34%	Inconsistent
Senegal 2015	12.7	11.9	0.9	7%	Consistent
Senegal 2016	11.2	12.0	-0.7	-7%	Consistent
Sierra Leone 2008	NA	NA	NA	NA	NA
Sierra Leone 2013	9.8	5.9	3.8	39%	Inconsistent
Swaziland 2006-07	NA	NA	NA	NA	NA
Tanzania 2004-05	NA	NA	NA	NA	NA
Tanzania 2010	NA	NA	NA	NA	NA
Tanzania 2015-16	14.0	6.7	7.3	52%	Inconsistent
Uganda 2000-01	NA	NA	NA	NA	NA
Uganda 2006	NA	NA	NA	NA	NA
Uganda 2011	13.8	7.6	6.1	44%	Inconsistent
Uganda 2016	11.9	7.0	4.9	41%	Inconsistent
Zambia 2007	NA	NA	NA	NA	NA
Zambia 2013-14	NA	NA	NA	NA	NA
Zimbabwe 1994	NA	NA	NA	NA	NA
Zimbabwe 1999	11.7	5.7	6.0	51%	Inconsistent
Zimbabwe 2005-06	NA	NA	NA	NA	NA

Continued

Table 4.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months) of preceding survey	Termination ratio in interval closest in time to Interval 1 of preceding survey	Absolute difference	Relative difference	Consistent or Inconsistent [1]
Africa cont'd					
Zimbabwe 2010-11	11.0	7.0	4.0	37%	Inconsistent
Zimbabwe 2015	10.0	6.0	4.0	40%	Inconsistent
LAC					
Bolivia 1994	NA	NA	NA	NA	NA
Bolivia 2003	NA	NA	NA	NA	NA
Bolivia 2008	13.3	10.7	2.5	19%	Consistent
Brazil NE 1991	NA	NA	NA	NA	NA
Brazil 1996	NA	NA	NA	NA	NA
Colombia 1990	NA	NA	NA	NA	NA
Colombia 1995	14.5	10.1	4.4	30%	Inconsistent
Colombia 2000	16.3	12.9	3.4	21.0%	Consistent
Colombia 2005	22.1	16.0	6.1	28%	Inconsistent
Colombia 2010	26.7	18.2	8.5	32%	Inconsistent
Colombia 2015	28.7	20.6	8.1	28%	Inconsistent
Dominican Republic 1991	NA	NA	NA	NA	NA
Dominican Republic 1996	17.8	13.1	4.7	26%	Inconsistent
Dominican Republic 1999	22.4	19.2	3.2	14%	Consistent
Dominican Republic 2002	33.9	17.8	16.1	47%	Inconsistent
Guatemala 1995	NA	NA	NA	NA	NA
Guatemala 1998-99	6.7	7.0	-0.2	-3%	Consistent
Guatemala 2014-15	NA	NA	NA	NA	NA
Guyana 2009	NA	NA	NA	NA	NA
Honduras 2005-06	NA	NA	NA	NA	NA
Honduras 2011-12	NA	NA	NA	NA	NA
Nicaragua 1998	NA	NA	NA	NA	NA
Nicaragua 2001	9.8	7.0	2.8	29%	Inconsistent
Paraguay 1990	NA	NA	NA	NA	NA
Peru 1991-92	NA	NA	NA	NA	NA
Peru 1996	12.0	8.2	3.8	31%	Inconsistent
Peru 2000	12.9	8.5	4.4	34%	Inconsistent
Peru 2004-06	NA	NA	NA	NA	NA
Peru 2007-08	20.8	16.4	4.4	21.0%	Consistent
Peru 2009	22.7	17.8	4.9	22%	Inconsistent
Peru 2010	16.6	18.1	-1.5	-9%	Consistent
Peru 2011	26.9	18.6	8.3	31%	Inconsistent
Peru 2012	22.7	18.6	4.1	18%	Consistent
Other Countries					
Albania 2008-09	NA	NA	NA	NA	NA
Armenia 2000	NA	NA	NA	NA	NA
Armenia 2005	155.1	118.3	36.8	24%	Inconsistent
Armenia 2010	120.8	89.8	31.0	26%	Inconsistent
Armenia 2015-16	53.6	53.6	0.0	0%	Consistent
Azerbaijan 2006	NA	NA	NA	NA	NA
Egypt 1992	NA	NA	NA	NA	NA
Egypt 1995	18.5	12.9	5.6	30%	Inconsistent
Egypt 2000	18.6	11.9	6.8	36%	Inconsistent
Egypt 2003	14.9	9.6	5.3	35%	Inconsistent
Egypt 2005	13.1	13.5	-0.4	-3%	Consistent

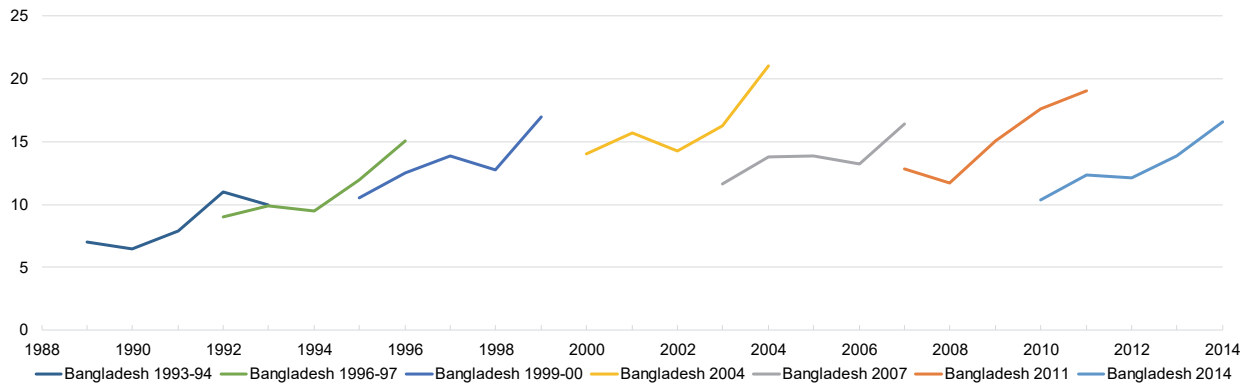
Continued

Table 4.1—*Continued*

Survey	Termination ratio in Interval 1 (0-11 months) of preceding survey	Termination ratio in interval closest in time to Interval 1 of preceding survey	Absolute difference	Relative difference	Consistent or Inconsistent [1]
Other Countries cont'd					
Egypt 2008	16.0	10.7	5.3	33%	Inconsistent
Egypt 2014	NA	NA	NA	NA	NA
Jordan 1990	NA	NA	NA	NA	NA
Jordan 1997	NA	NA	NA	NA	NA
Jordan 2002	24.2	16.8	7.4	31%	Inconsistent
Jordan 2007	19.8	12.1	7.7	39%	Inconsistent
Jordan 2009	25.2	18.9	6.3	25%	Inconsistent
Jordan 2012	21.7	18.8	2.9	13%	Consistent
Kazakhstan 1999	NA	NA	NA	NA	NA
Kyrgyz Republic 2012	NA	NA	NA	NA	NA
Moldova 2005	NA	NA	NA	NA	NA
Morocco 1992	NA	NA	NA	NA	NA
Morocco 2003-04	NA	NA	NA	NA	NA
Tajikistan 2012	NA	NA	NA	NA	NA
Turkey 1993	NA	NA	NA	NA	NA
Turkey 1998	43.5	28.9	14.6	34%	Inconsistent
Turkey 2003	37.4	26.9	10.5	28%	Inconsistent
Turkey 2008	33.2	23.5	9.7	29%	Inconsistent
Turkey 2013	31.8	18.2	13.5	43%	Inconsistent
Ukraine 2007	NA	NA	NA	NA	NA
Yemen 2013	NA	NA	NA	NA	NA

[1] Between-survey inconsistency is indicated if the relative difference in the termination ratio with the overlapping moment of the preceding survey exceeds the cutoff of 21.6%

The second column in Table 4.1 is the value of the termination ratio for the first 12-month interval in the survey preceding the survey named in column 1. Looking at the row for Bangladesh 1996-97, the value of 10.0 that appears in column 2 is the value of termination for the first interval in the survey Bangladesh 1993-94. Column 3 shows the termination ratio for the interval in the Bangladesh 1996-97 survey that most closely aligns with the first interval in Bangladesh 1993-94. Referring to Figure 4.28 on page 65 (and replicated immediately below), it can be seen that this is the fourth interval looking back from the date of the survey and corresponds to 1993. The value is 9.9 for Bangladesh 1996-97. The graph shows that the two curves are almost touching.



Column 4 is the difference between the values in the preceding two columns, or 0.1 in the case of Bangladesh 1996-97. Column 5 is the relative difference presented as a percent; in the example we are following, this is 1%. Finally, consistency is established by whether or not the absolute value of the relative difference is less than 20.6%. In the example we are following, it is clearly consistent, as 1% is less than 20.6%.

This procedure can be followed for most surveys reported on in the table. However, there are many surveys that have notations of "NA." There are three types of cases with NA. The first type includes surveys such as Afghanistan 2015, which are the only DHS surveys implemented with reproductive calendars for a given country. The second type includes DHS surveys that are the first in a series of two or more surveys with reproductive calendars. Bangladesh 1993-94 is an example. As there is no preceding survey, it is impossible to perform the analysis. The third type includes DHS surveys that are preceded by a survey 6 or more years earlier and for which the gap between calendars is greater than 1 year. Burundi 2016-17 is an example. For 78 surveys, there is a preceding survey close enough in time to form a survey pair for the test of between-survey consistency presented in Table 4.1.

Overall, of the 78 surveys pairs, 23 are found to be between-survey consistent by this test, while 55 are between-survey inconsistent. For these surveys the termination ratio at the earlier intervals of the calendar differs by more than 20.6% from the corresponding termination ratio in the more recent intervals of the preceding survey. Two surveys in Africa display the largest between-survey differences. In Benin 2011-12 the relative difference between the overlapping termination ratios is 74%, indicating that the previous survey produces a substantially higher termination ratio. In Lesotho 2014, it is the reverse, with a relative difference of -74%.

Africa is also the region with the greatest proportion of surveys indicating between-survey inconsistency—only four surveys are found to be between-survey consistent compared with 23 inconsistent. In contrast, in Asia nine surveys are found to be between-survey consistent and eight inconsistent. The other two regions are similar to each another, with seven consistent surveys and 11 inconsistent surveys in Latin America and the Caribbean, and three consistent surveys and 13 inconsistent surveys in the Other Countries region.

The case of Bangladesh is instructive. Looking first at the graph from right to left, we see that Bangladesh 2014 and Bangladesh 2007 lie considerably below Bangladesh 2011 and Bangladesh 2004, respectively. Then referring to Table 4.1 we see that the relative difference is 35% in both cases and that both are clearly inconsistent by the standard we have chosen (above or below 20.6%). Next, Bangladesh 2011, Bangladesh 2004, and Bangladesh 1999-00 are moderately below Bangladesh 2007, Bangladesh 1999-2000, and Bangladesh 1996-97, respectively. Looking at Table 4.2, we see that the relative differences are 22%, 17%, and 17%—each close to the cutoff of 20.6%. Then at the far right, Bangladesh 1996-97 looks almost like a continuation, albeit jagged, of Bangladesh 1993-94, with the two curves almost touching at the point of comparison for the relative difference. At least for the case of Bangladesh there is not an evident country pattern to survey consistency or inconsistency by the between-survey mode of analysis. In fact, overall, for 11 of the 16 countries that have two or more pairs of overlapping surveys, there are differing assessments of consistency from survey pair to survey pair.

Additionally, there are some surveys for which the formal test of between-survey consistency differs from the assessment based on graphical analysis. These include Indonesia 2002-03, Philippines 1998, the

Dominican Republic 1999, Bangladesh 2004, Bolivia 2008, and Colombia 2000, which produced graphical analysis suggestive of between-survey inconsistency but whose difference in termination ratios at adjoining moments was not sufficiently large to reject the null hypothesis. It also includes Nicaragua 2001, which was a graphical example of between-survey consistency. Although this survey and its preceding survey produced nearly identical termination ratios for the interval in 1997, the observed termination ratios in each for the adjoining interval in 1998 differ by 29%.

In Chapter 6 of the report we will make reference to how a survey is implemented to see if any patterns emerge for explaining consistency or inconsistency.

5 COMPARING WITHIN-SURVEY AND BETWEEN-SURVEY CONSISTENCY

Table 5.1 brings together the results from the within-survey analysis of Table 3.1 and the between-survey analysis of Table 4.1. The second column of Table 5.1 indicates within-survey consistency or inconsistency based on whether or not the Wald test reported in Table 3.1 is significant at p-value ≤ 0.05. Statistical significance in this case is indicative of inconsistency between the ratio of terminations to births in the first 12-month interval preceding the interview date to the fifth 12-month interval preceding the interview date. The third column pulls the determination of between-survey consistency or inconsistency directly from the final column of Table 4.1 for differences between comparable calendar intervals across surveys with overlapping reproductive calendars. The fourth column provides a synthesis of the previous two columns.

Table 5.1 Comparison of within-survey consistency and between-survey consistency measures

Survey	Within-survey consistency	Between-survey consistency	Overall consistency classification
Asia			
Afghanistan 2015	●	NA	●
Bangladesh 1993-94	●	NA	●
Bangladesh 1996-97	●	○	○
Bangladesh 1999-00	●	○	○
Bangladesh 2004	●	○	○
Bangladesh 2007	●	●	●
Bangladesh 2011	●	●	●
Bangladesh 2014	●	●	●
Cambodia 2010	●	NA	●
Cambodia 2014	●	○	○
India 2005-06	●	NA	●
India 2015-16	●	NA	●
Indonesia 1991	●	NA	●
Indonesia 1994	●	●	●
Indonesia 1997	●	●	●
Indonesia 2002-03	●	○	○
Indonesia 2007	●	●	●
Indonesia 2012	●	●	●
Maldives 2009	●	NA	●
Myanmar 2015-16	●	NA	●
Nepal 2006	○	NA	○
Nepal 2011	●	○	○
Nepal 2016	●	○	○
Pakistan 2012-13	○	NA	○
Philippines 1993	●	NA	●
Philippines 1998	●	○	○
Philippines 2003	●	●	●
Timor-Leste 2009-10	○	NA	○
Vietnam 1997	●	NA	●
Vietnam 2002	○	○	○

Notes: ○ Consistent; ● Inconsistent

Continued

Table 5.1—*Continued*

Survey	Within-survey consistency	Between-survey consistency	Overall consistency classification
Africa			
Angola 2015-16	●	NA	●
Benin 2006	○	NA	○
Benin 2011-12	●	●	●
Burkina Faso 2003	○	NA	○
Burkina Faso 2010	○	NA	○
Burundi 2010	●	NA	●
Burundi 2016-17	●	NA	●
Comoros 2012	●	NA	●
Ethiopia 2005	●	NA	●
Ethiopia 2011	●	●	●
Ethiopia 2016	●	●	●
Gambia 2013	○	NA	○
Ghana 2003	●	NA	●
Ghana 2008	●	●	●
Ghana 2014	●	NA	●
Guinea 2005	●	NA	●
Kenya 1998	●	NA	●
Kenya 2003	●	●	●
Kenya 2008-09	●	●	●
Kenya 2014	●	●	●
Lesotho 2009	○	NA	○
Lesotho 2014	○	●	○
Liberia 2013	●	NA	●
Madagascar 2003-04	●	NA	●
Madagascar 2008-09	●	●	●
Malawi 2000	●	NA	●
Malawi 2004	○	○	○
Malawi 2010	●	NA	●
Malawi 2015-16	●	●	●
Mali 2001	●	NA	●
Mali 2006	●	●	●
Mali 2012-13	○	NA	○
Mozambique 2003	○	NA	○
Mozambique 2011	●	NA	●
Namibia 2006-07	○	NA	○
Namibia 2013	●	NA	●
Niger 2006	○	NA	○
Niger 2012	●	NA	●
Nigeria 2008	●	NA	●
Nigeria 2013	●	●	●
Rwanda 2000	●	NA	●
Rwanda 2005	●	●	●
Rwanda 2010	●	●	●
Rwanda 2014-15	○	○	○
Senegal 2005	●	NA	●
Senegal 2010-11	●	NA	●
Senegal 2012-13	●	●	●
Senegal 2014	●	●	●
Senegal 2015	●	○	○
Senegal 2016	●	○	○
Sierra Leone 2008	●	NA	●

Notes: ○ Consistent; ● Inconsistent

Continued

Table 5.1—*Continued*

Survey	Within-survey consistency	Between-survey consistency	Overall consistency classification
Africa cont'd			
Sierra Leone 2013	●	●	●
Swaziland 2006-07	●	NA	●
Tanzania 2004-05	○	NA	○
Tanzania 2010	●	NA	●
Tanzania 2015-16	●	●	●
Uganda 2000-01	●	NA	●
Uganda 2006	●	NA	●
Uganda 2011	●	●	●
Uganda 2016	●	●	●
Zambia 2007	●	NA	●
Zambia 2013-14	●	NA	●
Zimbabwe 1994	●	NA	●
Zimbabwe 1999	●	●	●
Zimbabwe 2005-06	●	NA	●
Zimbabwe 2010-11	●	●	●
Zimbabwe 2015	●	●	●
LAC			
Bolivia 1994	●	NA	●
Bolivia 2003	●	NA	●
Bolivia 2008	●	○	○
Brazil NE 1991	●	NA	●
Brazil 1996	●	NA	●
Colombia 1990	●	NA	●
Colombia 1995	●	●	●
Colombia 2000	●	○	○
Colombia 2005	●	●	●
Colombia 2010	●	●	●
Colombia 2015	○	●	○
Dominican Republic 1991	●	NA	●
Dominican Republic 1996	●	●	●
Dominican Republic 1999	●	○	○
Dominican Republic 2002	●	●	●
Guatemala 1995	●	NA	●
Guatemala 1998-99	○	○	○
Guatemala 2014-15	○	NA	○
Guyana 2009	●	NA	●
Honduras 2005-06	●	NA	●
Honduras 2011-12	●	NA	●
Nicaragua 1998	○	NA	○
Nicaragua 2001	○	●	○
Paraguay 1990	○	NA	○
Peru 1991-92	●	NA	●
Peru 1996	●	●	●
Peru 2000	●	●	●
Peru 2004-06	●	NA	●
Peru 2007-08	●	○	○
Peru 2009	●	●	●
Peru 2010	●	○	○
Peru 2011	●	●	●
Peru 2012	●	○	○

Notes: ○ Consistent; ● Inconsistent

Continued

Table 5.1—*Continued*

Survey	Within-survey consistency	Between-survey consistency	Overall consistency classification
Other Countries			
Albania 2008-09	○	NA	○
Armenia 2000	○	NA	○
Armenia 2005	○	●	○
Armenia 2010	●	●	●
Armenia 2015-16	○	○	○
Azerbaijan 2006	●	NA	●
Egypt 1992	●	NA	●
Egypt 1995	●	●	●
Egypt 2000	●	●	●
Egypt 2003	●	●	●
Egypt 2005	○	○	○
Egypt 2008	●	●	●
Egypt 2014	○	NA	○
Jordan 1990	●	NA	●
Jordan 1997	●	NA	●
Jordan 2002	○	●	○
Jordan 2007	●	●	●
Jordan 2009	○	●	○
Jordan 2012	●	○	○
Kazakhstan 1999	●	NA	●
Kyrgyz Republic 2012	○	NA	○
Moldova 2005	○	NA	○
Morocco 1992	●	NA	●
Morocco 2003-04	○	NA	○
Tajikistan 2012	●	NA	●
Turkey 1993	●	NA	●
Turkey 1998	●	●	●
Turkey 2003	●	●	●
Turkey 2008	●	●	●
Turkey 2013	●	●	●
Ukraine 2007	●	NA	●
Yemen 2013	●	NA	●

Notes: ○ Consistent; ● Inconsistent

In the second column the statistical measure was relatively rigorous concerning whether or not the termination ratio for the first interval is different from the termination ratio for the fifth interval. The difference between intervals could be due to errors in reporting, or it could represent a true change in the termination ratio.[12] The third column has the advantage of comparing the termination ratio in two different surveys for the same 12-month interval. With perfect sampling, recall, reporting, and recording, the values would be expected to be the same in both surveys. Any differences between the two values would be due to recall, reporting, or recording within statistical bounds. We compare percent difference relative to a cutoff point of 20.6%.

[12] Recall that the termination ratio can change over time due to many factors: changes in contraceptive use, changes in the propensity to terminate unwanted pregnancies, changes in the availability or social acceptance of induced abortion, etc.

In combining the two measures of consistency, we adopt the following set of rules for an overall classification of consistency.

- If assessments both within-survey and between-survey are made:
  - Both inconsistent: survey assessed to be inconsistent (e.g., Bangladesh 2007)
  - One or both are consistent: survey assessed to be consistent (e.g., Bangladesh 1996-97)
- If only within-survey assessment is made:
  - Assessment of the within-survey test is taken as the overall assessment (e.g., Afghanistan 2015)

These results on whether the surveys are consistent or inconsistent in reporting of terminated pregnancies in the DHS calendar are noted in the fourth column of Table 5.1.

Table 5.2 presents counts of surveys assessed as consistent or inconsistent based on our three criteria—within-survey, between-survey, and overall classification. The counts for the within-survey and the between-survey tests indicate that the within-survey test is more likely to show inconsistency than the between-survey test. However, we note that the difference is not large and that both measures are more likely to show inconsistency than consistency.

Table 5.2 Summary counts of within-survey, between-survey, and overall classification of consistency, by region

	Within-survey consistency			Between-survey consistency			Overall consistency classification		
	Consistent n (%)	Inconsistent n (%)	Total	Consistent n (%)	Inconsistent n (%)	Total	Consistent n (%)	Inconsistent n (%)	Total
Asia	4 (13%)	26 (87%)	30	9 (53%)	8 (47%)	17	12 (40%)	18 (60%)	30
Africa	13 (19%)	54 (81%)	67	4 (15%)	23 (85%)	27	15 (22%)	52 (78%)	67
LAC	6 (18%)	27 (82%)	33	7 (39%)	11 (61%)	18	12 (36%)	21 (64%)	33
Other Countries	11 (34%)	21 (66%)	32	3 (19%)	13 (81%)	16	12 (38%)	20 (63%)	32
Total	**30 (21%)**	**128 (79%)**	**162**	**23 (29%)**	**55 (71%)**	**78**	**51 (31%)**	**111 (69%)**	**162**

On the other hand, the regional disaggregation shows some interesting patterns. For both measures in Africa, more than 8 in 10 surveys indicate inconsistency. For the surveys in Asia and in Latin America and the Caribbean, inconsistency is more likely to be indicated in the within-survey measure than the between-survey measure. The reverse is found for surveys in the region of Other Countries: the between-survey test is more likely to find inconsistency than the within-survey test.

6 CONSISTENCY OF THE REPRODUCTIVE CALENDAR BY SURVEY CHARACTERISTICS

6.1 Classification of Survey Consistency

Table 6.1 summarizes the overall classification of consistency used in this chapter to disaggregate the 162 surveys by survey characteristics. Overall, about 70% of the surveys (111) are classified as inconsistent across all regions. Africa has higher counts of inconsistency, at 78% (52 surveys), whereas about two-thirds of surveys in Other Countries, Latin America and the Caribbean, and Asia are classified as inconsistent.

Table 6.1 Consistency classification of surveys

Survey	Inconsistent	Consistent	Survey	Inconsistent	Consistent
Asia					
Afghanistan 2015	●		Indonesia 2007	●	
Bangladesh 1993-94	●		Indonesia 2012	●	
Bangladesh 1996-97		●	Maldives 2009	●	
Bangladesh 1999-00		●	Myanmar 2015-16	●	
Bangladesh 2004		●	Nepal 2006		●
Bangladesh 2007	●		Nepal 2011		●
Bangladesh 2011	●		Nepal 2016		●
Bangladesh 2014	●		Pakistan 2012-13		●
Cambodia 2010	●		Philippines 1993	●	
Cambodia 2014		●	Philippines 1998		●
India 2005-06	●		Philippines 2003	●	
India 2015-16	●		Timor-Leste 2009-10		●
Indonesia 1991	●		Vietnam 1997	●	
Indonesia 1994	●		Vietnam 2002		●
Indonesia 1997	●		SUBTOTAL	18	12
Indonesia 2002-03		●			
Africa					
Angola 2015-16	●		Lesotho 2014		●
Benin 2006		●	Liberia 2013	●	
Benin 2011-12	●		Madagascar 2003-04	●	
Burkina Faso 2003		●	Madagascar 2008-09	●	
Burkina Faso 2010		●	Malawi 2000	●	
Burundi 2010	●		Malawi 2004		●
Burundi 2016-17	●		Malawi 2010	●	
Comoros 2012	●		Malawi 2015-16	●	
Ethiopia 2005	●		Mali 2001	●	
Ethiopia 2011	●		Mali 2006	●	
Ethiopia 2016	●		Mali 2012-13		●
Gambia 2013		●	Mozambique 2003		●
Ghana 2003	●		Mozambique 2011	●	
Ghana 2008	●		Namibia 2006-07		●
Ghana 2014	●		Namibia 2013	●	
Guinea 2005	●		Niger 2006		●
Kenya 1998	●		Niger 2012	●	
Kenya 2003	●		Nigeria 2008	●	
Kenya 2008-09	●		Nigeria 2013	●	
Kenya 2014	●		Rwanda 2000	●	
Lesotho 2009		●	Rwanda 2005	●	

Continued

Table 6.1—*Continued*

Survey	Inconsistent	Consistent	Survey	Inconsistent	Consistent
Africa cont'd			Tanzania 2015-16	●	
Rwanda 2010	●		Uganda 2000-01	●	
Rwanda 2014-15		●	Uganda 2006	●	
Senegal 2005	●		Uganda 2011	●	
Senegal 2010-11	●		Uganda 2016	●	
Senegal 2012-13	●		Zambia 2007	●	
Senegal 2014	●		Zambia 2013-14	●	
Senegal 2015		●	Zimbabwe 1994	●	
Senegal 2016		●	Zimbabwe 1999	●	
Sierra Leone 2008	●		Zimbabwe 2005-06	●	
Sierra Leone 2013	●		Zimbabwe 2010-11	●	
Swaziland 2006-07	●		Zimbabwe 2015	●	
Tanzania 2004-05		●	SUBTOTAL	52	15
Tanzania 2010	●				
LAC					
Bolivia 1994	●		Guyana 2009	●	
Bolivia 2003	●		Honduras 2005-06	●	
Bolivia 2008		●	Honduras 2011-12	●	
Brazil NE 1991	●		Nicaragua 1998		●
Brazil 1996	●		Nicaragua 2001		●
Colombia 1990	●		Paraguay 1990		●
Colombia 1995	●		Peru 1991-92	●	
Colombia 2000		●	Peru 1996	●	
Colombia 2005	●		Peru 2000	●	
Colombia 2010	●		Peru 2004-06	●	
Colombia 2015		●	Peru 2007-08	●	
Dominican Republic 1991	●		Peru 2009	●	
Dominican Republic 1996	●		Peru 2010		●
Dominican Republic 1999	●		Peru 2011	●	
Guatemala 1995	●		Peru 2012		●
Guatemala 1998-99		●	SUBTOTAL	22	11
Guatemala 2014-15		●			
Other Countries					
Albania 2008-09		●	Jordan 2009		●
Armenia 2000		●	Jordan 2012		●
Armenia 2005		●	Kazakhstan 1999	●	
Armenia 2010	●		Kyrgyz Republic 2012		●
Armenia 2015-16		●	Moldova 2005		●
Azerbaijan 2006	●		Morocco 1992	●	
Egypt 1992	●		Morocco 2003-04		●
Egypt 1995	●		Tajikistan 2012	●	
Egypt 2000	●		Turkey 1993	●	
Egypt 2003	●		Turkey 1998	●	
Egypt 2005		●	Turkey 2003	●	
Egypt 2008	●		Turkey 2008	●	
Egypt 2014		●	Turkey 2013	●	
Jordan 1990	●		Ukraine 2007	●	
Jordan 1997	●		Yemen 2013	●	
Jordan 2002		●	SUBTOTAL	20	12
Jordan 2007	●		**TOTAL**	112	50

6.2 Consistency in Termination Ratios and Type of History

The type of history accompanying the reproductive calendar in DHS surveys is disproportionately the birth history. The birth history is used in 142 of the study's 162 surveys, and a pregnancy history in only 20 surveys. Table 6.2 shows the summary of survey consistency by type of history. A detailed tabulation of all surveys by consistency and type of history can be found in Appendix Table A.1.

Table 6.2 Consistency of surveys by type of history

	Birth history		Pregnancy history		
Survey	**Inconsistent**	**Consistent**	**Inconsistent**	**Consistent**	**Total**
Asia	15	6	3	6	30
Africa	52	15	0	0	67
LAC	22	11	0	0	33
Other Countries	15	6	5	6	32
Total	**104**	**38**	**8**	**12**	**162**

Note: A birth history collects data on every live birth, whether still alive or not. A pregnancy history collects data on all pregnancies, including those which ended in a live birth, an induced abortion, a miscarriage, and a stillbirth.

The skewed distribution of history type makes it difficult to find patterns in survey consistency with confidence. However, some overall patterns are suggested. While most of surveys with a birth history are inconsistent—at more than 70%— the converse is true of surveys with a pregnancy history—about 60% are consistent. Regional patterns are even more difficult to discern, both because of the skewed distribution and because pregnancy histories are only applied in some surveys in two regions. They are not used in either Latin America and the Caribbean or Africa, the region with the greatest proportion of inconsistent surveys. The pattern in consistency by history type may be attributed to either the type of history or to the region and specific countries that use the pregnancy history.

6.3 Consistency in Termination Ratios and Direction of History

As with type of history, the direction of reporting is similarly skewed—153 of the 162 surveys employ a forward reported history and just 10 employ a backward reported history. No surveys in Africa or Latin America and the Caribbean employ a backward reported history. This skew makes apparent patterns inconclusive. Table 6.3 provides evidence tentatively suggesting that, while a large proportion of surveys with a forward reported history are inconsistent, those with a backward reported history are roughly equally likely to be inconsistent as consistent in reporting termination ratios in the reproductive calendar.

Table 6.3 Consistency of surveys by direction of reporting in the history

	Forward reported		Backward reported		
Survey	**Inconsistent**	**Consistent**	**Inconsistent**	**Consistent**	**Total**
Asia	17	11	1	1	30
Africa	52	15	0	0	67
LAC	22	11	0	0	33
Other Countries	16	9	4	3	32
Total	**107**	**46**	**5**	**4**	**162**

Note: A forward reported history collects data beginning with the first birth/pregnancy moving through each subsequent one until the most recent, whereas a backward reported history collects data beginning with the most recent birth/pregnancy moving backward until the first birth/pregnancy.

Attribution is nearly impossible, however, as these differences may be associated with the region or the type of history, or may not be significant at all. A detailed tabulation of all surveys by consistency and reporting direction of history can be found in Appendix Table A.2.

6.4 Consistency in Termination Ratios and Questions Distinguishing Pregnancy Outcome

Table 6.4 presents a summary of survey consistency by whether the survey questionnaire includes questions that explicitly distinguish between types of terminations, namely between miscarriage and induced abortion. Among the DHS surveys in this study, 138 do not include such questions. Twenty-four surveys do, concentrated in Asia and Other Countries. A detailed list of surveys, their consistency classification, and inclusion of such questions can be found in Appendix Table A.3.

Table 6.4 Consistency of surveys by questions distinguishing miscarriage and induced abortion

	No questions distinguish miscarriage & induced abortion		Questions distinguish miscarriage & induced abortion		
Survey	**Inconsistent**	**Consistent**	**Inconsistent**	**Consistent**	**Total**
Asia	15	7	3	5	30
Africa	52	15	0	0	67
LAC	22	11	0	0	33
Other Countries	10	6	10	6	32
Total	**99**	**39**	**13**	**11**	**162**

The proportion of surveys that are inconsistent (about 70%) is higher among surveys that do not include questions that distinguish between miscarriage and induced abortion than among surveys that do make a distinction. However, this finding comes with the same caveats as the findings related to type of history and direction of reporting.

6.5 Consistency in Termination Ratios and Mode of Data Collection

Table 6.5 shows summary information related to survey consistency and mode of data collection, with a detailed list of survey presented in Appendix Table A.4.

Table 6.5 Consistency of surveys by mode of data collection

	PAPI		CAFÉ or CAPI		
Survey	**Inconsistent**	**Consistent**	**Inconsistent**	**Consistent**	**Total**
Asia	15	10	3	2	30
Africa	39	10	11	7	67
LAC	16	8	6	3	33
Other Countries	20	11	0	1	32
Total	**90**	**39**	**20**	**13**	**162**

Notes: PAPI: pen and paper personal interview; CAFÉ: computer-assisted field editing; CAPI: computer assisted personal interview

While the number of surveys that collect data via computer-assisted personal interview (CAPI) has increased rapidly over time, interviewing with pen and paper remains a popular option in DHS surveys. All of the surveys in the earliest DHS phases used PAPI, with the first CAPI surveys used in 2004 in Peru. Only

three surveys in this study used computer-assisted field editing (CAFÉ), which is grouped with CAPI in Table 6.5.

The majority of study surveys (129) collected data using PAPI, and 43 surveys using CAPI or CAFÉ. Overall, a slightly higher proportion of surveys using PAPI (7 in 10) are classified as inconsistent compared with surveys using CAPI (6 in 10), though this difference is not likely to be significant. In no region are CAFÉ or CAPI surveys more likely to be consistent compared with PAPI surveys.

6.6 Consistency in Termination Ratios and Survey Length

Table 6.6 shows survey consistency disaggregated by length of survey. Details can be found in Appendix Table A.5. The likelihood of a survey being inconsistent in reporting termination ratios is equivalent (69%) between surveys with short or long questionnaire length. This pattern holds within Asia, Africa, and Latin America and the Caribbean. However, in the Other Countries region, some evidence suggests that a greater proportion of long surveys are consistent and a greater proportion of short surveys are inconsistent.

Table 6.6 Consistency of surveys by length of survey

	Long		Short		
Survey	**Inconsistent**	**Consistent**	**Inconsistent**	**Consistent**	**Total**
Asia	5	3	13	9	30
Africa	37	10	15	5	67
LAC	7	4	15	7	33
Other Countries	5	7	15	5	32
Total	**54**	**24**	**58**	**26**	**162**

Note: The survey is categorized as long if the number of questions exceeds the median number of questions across all surveys, and short if the number of questions is fewer than the median number of questions across all surveys.

6.7 Consistency in Termination Ratios and DHS Phase

Table 6.7 shows survey consistency as it relates to DHS phase. Details are found in Appendix Table A.6. It appears that the consistency of termination ratios in DHS surveys improves with successive phases between DHS-2 and DHS-4. In phases DHS-5 through DHS-7, termination ratios vary between 64% and 75% inconsistent. The small numbers of surveys studied within each DHS phase prevent us from drawing any conclusions about patterns in consistency by region across DHS phases.

Table 6.7 Consistency of surveys by DHS phase

Survey	Asia	Africa	LAC	Other Countries	Total
DHS-2					
Inconsistent	2	0	4	4	**10**
Consistent	0	0	1	0	**1**
DHS-3					
Inconsistent	4	2	6	4	**16**
Consistent	3	0	3	0	**6**
DHS-4					
Inconsistent	1	12	4	3	**20**
Consistent	3	4	2	6	**15**
DHS-5					
Inconsistent	5	12	5	6	**28**
Consistent	2	4	1	2	**9**
DHS-6					
Inconsistent	4	19	3	3	**29**
Consistent	3	7	3	3	**16**
DHS-7					
Inconsistent	2	7	0	0	**9**
Consistent	1	0	1	1	**3**
Total	30	67	33	32	**162**

7 DISCUSSION AND CONCLUSIONS

This study examined the consistency of reporting of terminated pregnancies in DHS calendars, using two measures of consistency: within-survey consistency and between-survey consistency. We find that overall about 70% of surveys are classified as inconsistent by either or both of these measures. About 80% (128 of 162 surveys) indicate within-survey inconsistency, while about 70% (55 of 78 surveys) indicate between-survey inconsistency. The largest group of surveys shows within-survey and between-survey inconsistency with no evidence of a change in the underlying termination ratio over time. Next in number are surveys showing within-survey and between-survey inconsistency accompanied by a change (usually an increase) in termination ratios over time. However, the magnitude of the trend is insufficient to fully explain the inconsistency observed in reported termination ratios.

Africa has a higher proportion of inconsistent surveys (78%), whereas in each of the other three regions about two-thirds of surveys are classified as inconsistent. The proportion of surveys marked by between-survey inconsistency was substantially lower than that with within-survey inconsistency in Asia. The highest proportion of consistent surveys occurred during DHS-4. Consistency of reporting of terminated pregnancies in the DHS calendar appears to be somewhat more likely with pregnancy histories, backward reported histories, and the inclusion of questions that distinguish miscarriage and induced abortion, though the potential for confounding exists. Survey length and mode of data collection appear unrelated to the consistency or inconsistency of a survey in reporting pregnancy termination.

Almost without exception, our graphical analysis of within-survey consistency indicates higher termination ratios reported closer to the date of interview. This finding reinforces the finding of a U.S.-based study that underreporting of induced abortion increases with each year that passes since the abortion occurred (Udry et al. 1996). It contradicts findings from the National Survey of Family Growth (NSFG) that reporting improves for such events farther in the past (Fu et al. 1998). Our study's results regarding terminated pregnancies also parallel results related to contraceptive use in the DHS calendar that found higher prevalence of method use in the most recent periods of the calendar (Bradley, Winfrey, and Croft 2015).

Similarly, this study also finds that inconsistency in reports of terminated pregnancies varies regionally, with inconsistency highest in Africa, where underreporting of contraceptive use is highest, and somewhat better elsewhere (Bradley, Winfrey, and Croft 2015). Whereas reporting of contraceptive use also appears to be problematic in Asia, our study finds the consistency of reporting of terminated pregnancies to be moderately better in Asia.

As with an older study based on the World Fertility Survey in Bangladesh (Becker and Mahmud 1984), our study finds tentative evidence preferring a backward reported pregnancy history versus a forward reported history for consistent reporting of terminated pregnancies. A study of perinatal mortality also found that a pregnancy history results in more reports of stillbirths than does a birth history (Bradley, Winfrey, and Croft 2015). However, further research is needed before making any strong recommendations. Unlike previous studies of contraceptive use and infant and child mortality, our study does not find evidence that survey length or mode of data collection adversely affects consistency of reporting terminated pregnancies (Bradley 2015; Bradley, Winfrey, and Croft 2015).

The present study has several limitations that deserve mention. First, it has no externally validated estimate of the true termination ratio. Therefore, we are unable to quantify the degree of underreporting of terminated pregnancies in either consistent or inconsistent surveys. Such underreporting may remain even in the surveys with high levels of within-survey consistency and between-survey consistency.

Second, our statistical test of within-survey consistency assesses consistency at the two endpoints—the interval 0-11 months preceding the interview and the interval 48-59 months preceding the interview—rather than throughout the entire duration of the calendar. If the observed termination ratios vary over the course of the calendar but not in a clearly monotonic, linear fashion (e.g., Dominican Republic 1991), it is possible that the existing inconsistency could escape detection if the arbitrarily selected comparison points by chance produced similar termination ratios. We compared this test of within-survey consistency with alternate specifications testing the relationship of termination ratios to time measured (a) continuously and (b) in multiple intervals, and found discordance in the assessment of inconsistency in a few surveys. Overall, the test used in this study proved to be the more conservative test, producing slightly fewer surveys classified as inconsistent. We opted for this more conservative test along with the increased risk of type II error in order to reduce the risk of type I errors.

We were able to assess all study surveys for within-survey consistency. For the assessment of between-survey consistency, however, 21 surveys were the only surveys conducted in the country, and another 32 surveys in 20 countries were conducted too far apart to be assessed for between-survey consistency. For these surveys, we are unable to assess whether trends in the underlying termination ratios might explain some or all of the observed within-survey inconsistency. Overall, 78 survey pairs in 21 countries could be assessed for between-survey consistency.

Additionally, our study assessed between-survey consistency at just two points rather than at all adjoining or overlapping points in the calendar between two surveys. This could impair the ability to detect (or reject) inconsistency between the two surveys. Finally, the graphical analysis of between-survey inconsistency permits us to infer trends in the underlying termination ratios reported in the calendar. However, where trends of a changing termination ratio are evident, we are unable to quantify the share of the observed inconsistency that can be attributed to the trend versus reporting error.

This study has described the distribution of consistent and inconsistent surveys in relation to several survey characteristics. However, the analysis of survey characteristics is descriptive only. Our ability to make inferences with confidence about the patterns of consistency across survey characteristics is hampered by the small number of surveys in each category and the skewed distribution of some survey characteristics. It is further limited by potential confounding of characteristics. Surveys that adopt pregnancy histories, backward reported histories, and questions that differentiate types of terminations are tightly clustered in Asia and in the Other Countries region. Similarly, data collection using CAFÉ and longer surveys is associated with more recent surveys. It is not possible to disentangle which of these characteristics, if any, might help to increase consistency in the reporting of terminated pregnancies, or whether they might be related to an unobserved selection effect in the countries selecting such modifications to the standard application of the calendar. For example, in some Asian and Other Countries, the greater likelihood of surveys using a forward reported pregnancy history with survey-specific questions differentiating miscarriage and induced abortion Other Countries to be classified as “consistent” could be due to the

characteristics of these surveys, or could reflect greater social acceptability of discussing terminated pregnancies in the context of a survey in countries that select these modifications in their surveys.

Should The DHS Program decide to promote experimentation in some of the survey modifications (e.g., type and direction of history, inclusion of questions distinguishing type of termination), these survey characteristics might become less skewed and less subject to potential selection bias. Furthermore, a quasi-experimental design could be adopted such that these or other modifications are randomly assigned to households or enumeration areas within a survey. A previous recommendation was made to test differences in data quality between PAPI and CAPI modes of data collection (Bradley, Winfrey, and Croft 2015). Such a study design would allow more rigorous analysis of the association between selected survey characteristics and consistency in reporting of terminated pregnancies.

Our study was unable to consider all the survey-related factors that might influence the consistency of reporting of terminated pregnancies in the calendar. For example, we did not consider the language in which the interview was administered, although responses are known to be sensitive to the wording of questions on reproductive events (Haws et al. 2010). We also did not have available to us a measure on interviewer training, although presumably interviewer skill in administering probing questions and completing the calendar could improve the accuracy and completeness of reporting pregnancy termination. Finally, we did not assess fieldworker characteristics, although interviewers' attributes and social distance between interviewer and respondent may exacerbate rapport and social desirability bias (Pullum et al. 2018).

A final limitation of our study is that we examine only survey-related characteristics. We do not examine other contextual factors that could influence the underlying termination ratio. These include measurable factors such as the total fertility rate, prevalence of contraceptive use, or the level of unmet need for family planning, as well as other factors that are more difficult to measure—such as the distribution of terminations that are miscarriages, induced abortions, and stillbirths; the legality (and perceived legality) of induced abortion; and the degree to which induced abortion and pregnancy loss are stigmatized or taboo. Exploring the effect of these factors could be a rich area for further research.

Previous assessment of the quality or consistency of DHS calendar data has related to contraception, perinatal mortality, age displacement, and births (Bradley, Winfrey, and Croft 2015; Goldman, Moreno, and Westoff 1989a; Pullum and Becker 2014; Westoff, Goldman, and Moreno 1990). The present study is the first known to the authors to undertake a focused assessment of reporting of terminated pregnancies in the DHS reproductive calendar. We find high levels of inconsistency in termination ratios within and between surveys, and evidence indicating that reporting of terminated pregnancies deteriorates in earlier periods of the calendar. We conclude that the DHS reproductive calendar remains a valuable source of data on terminated pregnancies. However, researchers should acknowledge the possibility of underreporting of terminated pregnancies, particularly in earlier periods of the calendar. Our findings, and the study's limitations, suggest more experimentation with modifications to the calendar (including type and direction of histories, mode of data collection, and more), perhaps with survey characteristics being randomly assigned within or across surveys, and accompanied by rigorous assessment.

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APPENDICES

Appendix Table A.1 List of surveys by type of history and consistency classification

Surveys with a birth history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Afghanistan 2015	●		India 2015-16	●	
Bangladesh 1993-94	●		Indonesia 1991	●	
Bangladesh 1996-97		●	Indonesia 1994	●	
Bangladesh 1999-00		●	Indonesia 1997	●	
Bangladesh 2004		●	Indonesia 2002-03		●
Bangladesh 2007	●		Indonesia 2007	●	
Bangladesh 2011	●		Indonesia 2012	●	
Bangladesh 2014	●		Maldives 2009	●	
Cambodia 2010	●		Myanmar 2015-16	●	
Cambodia 2014		●	Timor-Leste 2009-10		●
India 2005-06	●		India 2015-16	●	
Africa					
Angola 2015-16	●		Mozambique 2011	●	
Benin 2006		●	Namibia 2006-07		●
Benin 2011-12	●		Namibia 2013	●	
Burkina Faso 2003		●	Niger 2006		●
Burkina Faso 2010		●	Niger 2012	●	
Burundi 2010	●		Nigeria 2008	●	
Burundi 2016-17	●		Nigeria 2013	●	
Comoros 2012	●		Rwanda 2000	●	
Ethiopia 2005	●		Rwanda 2005	●	
Ethiopia 2011	●		Rwanda 2010	●	
Ethiopia 2016	●		Rwanda 2014-15		●
Gambia 2013		●	Senegal 2005	●	
Ghana 2003	●		Senegal 2012-13	●	
Ghana 2008	●		Senegal 2014	●	
Ghana 2014	●		Senegal 2015		●
Guinea 2005	●		Senegal 2016		●
Kenya 1998	●		Sierra Leone 2008	●	
Kenya 2003	●		Sierra Leone 2013	●	
Kenya 2008-09	●		Swaziland 2006-07	●	
Kenya 2014	●		Tanzania 2004-05		●
Lesotho 2009		●	Tanzania 2010	●	
Lesotho 2014		●	Tanzania 2015-16	●	
Liberia 2013	●		Uganda 2000-01	●	
Madagascar 2003-04	●		Uganda 2006	●	
Madagascar 2008-09	●		Uganda 2011	●	
Malawi 2000	●		Uganda 2016	●	
Malawi 2004		●	Zambia 2007	●	
Malawi 2010	●		Zambia 2013-14	●	
Malawi 2015-16	●		Zimbabwe 1994	●	
Mali 2001	●		Zimbabwe 1999	●	
Mali 2006	●		Zimbabwe 2005-06	●	
Mali 2012-13		●	Zimbabwe 2010-11	●	
Mozambique 2003		●	Zimbabwe 2015	●	

Continued

Appendix Table A.1—*Continued*

Surveys with a birth history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
LAC					
Bolivia 1994	●		Guatemala 2014-15		●
Bolivia 2003	●		Guyana 2009	●	
Bolivia 2008		●	Honduras 2005-06	●	
Brazil NE 1991	●		Honduras 2011-12	●	
Brazil 1996	●		Nicaragua 1998		●
Colombia 1990	●		Nicaragua 2001		●
Colombia 1995	●		Paraguay 1990		●
Colombia 2000		●	Peru 1991-92	●	
Colombia 2005	●		Peru 1996	●	
Colombia 2010	●		Peru 2000	●	
Colombia 2015		●	Peru 2004-06	●	
Dominican Republic 1991	●		Peru 2007-08	●	
Dominican Republic 1996	●		Peru 2009	●	
Dominican Republic 1999		●	Peru 2010		●
Dominican Republic 2002	●		Peru 2011	●	
Guatemala 1995	●		Peru 2012		●
Guatemala 1998-99		●			
Other Countries					
Egypt 1992	●		Jordan 2007	●	
Egypt 1995	●		Jordan 2009		●
Egypt 2000	●		Jordan 2012		●
Egypt 2003	●		Morocco 1992	●	
Egypt 2005		●	Morocco 2003-04		●
Egypt 2008	●		Turkey 1993	●	
Egypt 2014		●	Turkey 1998	●	
Jordan 1990	●		Turkey 2003	●	
Jordan 1997	●		Turkey 2008	●	
Jordan 2002		●	Turkey 2013	●	

Surveys with a pregnancy history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Nepal 2006		●	Philippines 1998		●
Nepal 2011		●	Philippines 2003	●	
Nepal 2016		●	Timor-Leste 2009-10		
Pakistan 2012-13		●	Vietnam 1997	●	
Philippines 1993	●		Vietnam 2002		●
Other Countries					
Albania 2008-09 [1]		●	Kazakhstan 1999	●	
Armenia 2000		●	Kyrgyz Republic 2012		●
Armenia 2005		●	Moldova 2005		●
Armenia 2010	●		Tajikistan 2012	●	
Armenia 2015-16		●	Ukraine 2007	●	
Azerbaijan 2006	●				

Notes: A birth history collects data on every live birth, whether still alive or not. A pregnancy history collects data on all pregnancies, including those which ended in a live birth, an induced abortion, a miscarriage, and a stillbirth.

[1] The Albania 2008-09 DHS administers a birth history for all births, but a pregnancy history for the last 5 years. For the purposes of this study it is categorized as having a pregnancy history, since that is the history type completing the period of time covered by the calendar.

Appendix Table A.2 List of surveys by direction of reporting in the history and consistency classification

Surveys with a forward reported history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Afghanistan 2015	●		Indonesia 1997	●	
Bangladesh 1993-94	●		Indonesia 2002-03		●
Bangladesh 1996-97		●	Indonesia 2007	●	
Bangladesh 1999-00		●	Indonesia 2012	●	
Bangladesh 2004		●	Maldives 2009	●	
Bangladesh 2007	●		Myanmar 2015-16	●	
Bangladesh 2011	●		Nepal 2006		●
Bangladesh 2014	●		Nepal 2011		●
Cambodia 2010	●		Nepal 2016		●
Cambodia 2014		●	Pakistan 2012-13		●
India 2005-06	●		Philippines 1993	●	
India 2015-16	●		Philippines 1998		●
Indonesia 1991	●		Philippines 2003	●	
Indonesia 1994	●		Timor-Leste 2009-10		●
Africa					
Angola 2015-16	●		Mozambique 2011	●	
Benin 2006		●	Namibia 2006-07		●
Benin 2011-12	●		Namibia 2013	●	
Burkina Faso 2003		●	Niger 2006		●
Burkina Faso 2010		●	Niger 2012	●	
Burundi 2010	●		Nigeria 2008	●	
Burundi 2016-17	●		Nigeria 2013	●	
Comoros 2012	●		Rwanda 2000	●	
Ethiopia 2005	●		Rwanda 2005	●	
Ethiopia 2011	●		Rwanda 2010	●	
Ethiopia 2016	●		Rwanda 2014-15		●
Gambia 2013		●	Senegal 2005	●	
Ghana 2003	●		Senegal 2010-11	●	
Ghana 2008	●		Senegal 2012-13	●	
Ghana 2014	●		Senegal 2014	●	
Guinea 2005	●		Senegal 2015		●
Kenya 1998	●		Senegal 2016		●
Kenya 2003	●		Sierra Leone 2008	●	
Kenya 2008-09	●		Sierra Leone 2013	●	
Kenya 2014	●		Swaziland 2006-07	●	
Lesotho 2009		●	Tanzania 2004-05		●
Lesotho 2014		●	Tanzania 2010	●	
Liberia 2013	●		Tanzania 2015-16	●	
Madagascar 2003-04	●		Uganda 2000-01	●	
Madagascar 2008-09	●		Uganda 2006	●	
Malawi 2000	●		Uganda 2011	●	
Malawi 2004		●	Uganda 2016	●	
Malawi 2010	●		Zambia 2007	●	
Malawi 2015-16	●		Zambia 2013-14	●	
Mali 2001	●		Zimbabwe 1994	●	
Mali 2006	●		Zimbabwe 1999	●	
Mali 2012-13		●	Zimbabwe 2005-06	●	
Mozambique 2003		●	Zimbabwe 2010-11	●	

Continued

Appendix Table A.2—*Continued*

Surveys with a forward reported history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
LAC					
Bolivia 1994	●		Guatemala 2014-15		●
Bolivia 2003	●		Guyana 2009	●	
Bolivia 2008		●	Honduras 2005-06	●	
Brazil NE 1991	●		Honduras 2011-12	●	
Brazil 1996	●		Nicaragua 1998		●
Colombia 1990	●		Nicaragua 2001		●
Colombia 1995	●		Paraguay 1990		●
Colombia 2000		●	Peru 1991-92	●	
Colombia 2005	●		Peru 1996	●	
Colombia 2010	●		Peru 2000	●	
Colombia 2015		●	Peru 2004-06	●	
Dominican Republic 1991	●		Peru 2007-08	●	
Dominican Republic 1996	●		Peru 2009	●	
Dominican Republic 1999		●	Peru 2010		●
Dominican Republic 2002	●		Peru 2011	●	
Guatemala 1995	●		Peru 2012		●
Guatemala 1998-99		●			
Other Countries					
Albania 2008-09		●	Jordan 1997	●	
Armenia 2015-16		●	Jordan 2002		●
Egypt 1992	●		Jordan 2007	●	
Egypt 1995	●		Jordan 2009		●
Egypt 2000	●		Jordan 2012		●
Egypt 2003	●		Kyrgyz Republic 2012		●
Egypt 2005		●	Morocco 1992	●	
Egypt 2008	●		Morocco 2003-04		●
Egypt 2014		●	Tajikistan 2012	●	
Jordan 1990	●		Turkey 1993	●	

Surveys with a backward reported history					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Vietnam 1997	●		Vietnam 2002		●
Other Countries					
Armenia 2000		●	Kazakhstan 1999	●	
Armenia 2005		●	Moldova 2005		●
Armenia 2010	●		Ukraine 2007	●	
Azerbaijan 2006	●				

Note: A forward reported history collects data beginning with the first birth/pregnancy moving through each subsequent one until the most recent, whereas a backward reported history collects data beginning with the most recent birth/pregnancy moving backward until the first birth/pregnancy.

Appendix Table A.3 List of surveys by questions that distinguish miscarriage and induced abortion and consistency classification

Surveys with no questions that distinguish miscarriage and induced abortion					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Afghanistan 2015	●		Indonesia 1994	●	
Bangladesh 1993-94	●		Indonesia 2002-03		●
Bangladesh 1999-00		●	Indonesia 2007	●	
Bangladesh 2004		●	Maldives 2009	●	
Bangladesh 2007	●		Myanmar 2015-16	●	
Bangladesh 2011	●		Philippines 1993	●	
Bangladesh 2014	●		Philippines 1998		●
Cambodia 2010	●		Philippines 2003	●	
Cambodia 2014		●	Timor-Leste 2009-10		●
India 2005-06	●		Vietnam 1997	●	
Indonesia 1991	●		Vietnam 2002		●
Africa					
Angola 2015-16	●		Namibia 2006-07		●
Benin 2006		●	Namibia 2013	●	
Benin 2011-12	●		Niger 2006		●
Burkina Faso 2003		●	Niger 2012	●	
Burkina Faso 2010		●	Nigeria 2008	●	
Burundi 2010	●		Nigeria 2013	●	
Burundi 2016-17	●		Rwanda 2000	●	
Comoros 2012	●		Rwanda 2005	●	
Ethiopia 2005	●		Rwanda 2010	●	
Ethiopia 2011	●		Rwanda 2014-15		●
Ethiopia 2016	●		Senegal 2005	●	
Gambia 2013		●	Senegal 2010-11	●	
Ghana 2003	●		Senegal 2012-13	●	
Ghana 2008	●		Senegal 2014	●	
Ghana 2014	●		Senegal 2015		●
Guinea 2005	●		Senegal 2016		●
Kenya 1998	●		Sierra Leone 2008	●	
Kenya 2003	●		Sierra Leone 2013	●	
Kenya 2008-09	●		Swaziland 2006-07	●	
Kenya 2014	●		Tanzania 2004-05		●
Lesotho 2009		●	Tanzania 2010	●	
Lesotho 2014		●	Tanzania 2015-16	●	
Liberia 2013	●		Uganda 2000-01	●	
Madagascar 2003-04	●		Uganda 2006	●	
Madagascar 2008-09	●		Uganda 2011	●	
Malawi 2000	●		Uganda 2016	●	
Malawi 2004		●	Zambia 2007	●	
Malawi 2010	●		Zambia 2013-14	●	
Malawi 2015-16	●		Zimbabwe 1994	●	
Mali 2001	●		Zimbabwe 1999	●	
Mali 2006	●		Zimbabwe 2005-06	●	
Mali 2012-13		●	Zimbabwe 2010-11	●	
Mozambique 2003		●	Zimbabwe 2015	●	
Mozambique 2011	●				

Continued

Appendix Table A.3—*Continued*

Surveys with no questions that distinguish miscarriage and induced abortion					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
LAC					
Bolivia 1994	●		Guatemala 2014-15		●
Bolivia 2003	●		Guyana 2009	●	
Bolivia 2008		●	Honduras 2005-06	●	
Brazil NE 1991	●		Honduras 2011-12	●	
Brazil 1996	●		Nicaragua 1998		●
Colombia 1990	●		Nicaragua 2001		●
Colombia 1995	●		Paraguay 1990		●
Colombia 2000		●	Peru 1991-92	●	
Colombia 2005	●		Peru 1996	●	
Colombia 2010	●		Peru 2000	●	
Colombia 2015		●	Peru 2004-06	●	
Dominican Republic 1991	●		Peru 2007-08	●	
Dominican Republic 1996	●		Peru 2009	●	
Dominican Republic 1999		●	Peru 2010		●
Dominican Republic 2002	●		Peru 2011	●	
Guatemala 1995	●		Peru 2012		●
Guatemala 1998-99 [1]		●			
Other Countries					
Azerbaijan 2006	●		Kyrgyz Republic 2012		●
Egypt 1992	●		Moldova 2005		●
Jordan 1990	●		Morocco 1992	●	
Jordan 1997	●		Morocco 2003-04		●
Jordan 2002		●	Tajikistan 2012	●	
Jordan 2007	●		Turkey 1998	●	
Jordan 2009		●	Ukraine 2007	●	
Jordan 2012		●	Yemen 2013	●	

Surveys with questions that distinguish miscarriage and induced abortion					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Bangladesh 1996-97		●	Nepal 2006		●
India 2015-16	●		Nepal 2011		●
Indonesia 1997	●		Nepal 2016		●
Indonesia 2012	●		Pakistan 2012-13		●
Other Countries					
Albania 2008-09		●	Egypt 2005		●
Armenia 2000		●	Egypt 2008	●	
Armenia 2005		●	Egypt 2014		●
Armenia 2010	●		Kazakhstan 1999	●	
Armenia 2015-16		●	Turkey 1993	●	
Egypt 1995	●		Turkey 2003	●	
Egypt 2000	●		Turkey 2008	●	
Egypt 2003	●		Turkey 2013	●	

[1] The Guatemala 1998-99 DHS does not distinguish between miscarriage and induced abortion, but does differentiate between early neonatal death and stillbirth.

Appendix Table A.4 List of surveys by mode of data collection and consistency classification

Surveys with data collected by PAPI					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
Afghanistan 2015	●		Indonesia 1997	●	
Bangladesh 1993-94	●		Indonesia 2002-03		●
Bangladesh 1996-97		●	Indonesia 2007	●	
Bangladesh 1999-00		●	Indonesia 2012	●	
Bangladesh 2004		●	Nepal 2006		●
Bangladesh 2007	●		Pakistan 2012-13		●
Bangladesh 2011	●		Philippines 1993	●	
Bangladesh 2014	●		Philippines 1998		●
Cambodia 2010	●		Philippines 2003	●	
Cambodia 2014		●	Timor-Leste 2009-10		●
India 2005-06	●		Vietnam 1997	●	
Indonesia 1991	●		Vietnam 2002		●
Indonesia 1994	●				
Africa					
Benin 2006		●	Namibia 2013	●	
Burkina Faso 2003		●	Niger 2006		●
Burkina Faso 2010		●	Niger 2012	●	
Burundi 2010	●		Nigeria 2008	●	
Comoros 2012	●		Nigeria 2013	●	
Ethiopia 2005	●		Rwanda 2000	●	
Ethiopia 2011	●		Rwanda 2005	●	
Gambia 2013		●	Rwanda 2010	●	
Ghana 2003	●		Rwanda 2014-15		●
Ghana 2008	●		Senegal 2005	●	
Guinea 2005	●		Sierra Leone 2008	●	
Kenya 1998	●		Sierra Leone 2013	●	
Kenya 2003	●		Swaziland 2006-07	●	
Kenya 2008-09	●		Tanzania 2004-05		●
Kenya 2014	●		Tanzania 2010	●	
Liberia 2013	●		Tanzania 2015-16	●	
Madagascar 2003-04	●		Uganda 2000-01	●	
Madagascar 2008-09	●		Uganda 2006	●	
Malawi 2000	●		Uganda 2011	●	
Malawi 2004		●	Zambia 2007	●	
Malawi 2010	●		Zambia 2013-14	●	
Mali 2001	●		Zimbabwe 1994	●	
Mali 2006	●		Zimbabwe 1999	●	
Mozambique 2003		●	Zimbabwe 2005-06	●	
Namibia 2006-07		●			
LAC					
Bolivia 1994	●		Guatemala 1995	●	
Bolivia 2003	●		Guatemala 1998-99		●
Bolivia 2008		●	Guatemala 2014-15		●
Brazil NE 1991	●		Guyana 2009	●	
Brazil 1996	●		Honduras 2005-06	●	
Colombia 1990	●		Honduras 2011-12	●	
Colombia 1995	●		Nicaragua 1998		●
Colombia 2000		●	Nicaragua 2001		●
Dominican Republic 1991	●		Paraguay 1990		●
Dominican Republic 1996	●		Peru 1991-92	●	
Dominican Republic 1999		●	Peru 1996	●	
Dominican Republic 2002	●		Peru 2000	●	

Continued

Appendix Table A.4—*Continued*

Surveys with data collected by PAPI					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Other Countries					
Armenia 2000		●	Jordan 2009		●
Armenia 2005		●	Jordan 2012		●
Armenia 2010	●		Kazakhstan 1999	●	
Armenia 2015-16		●	Kyrgyz Republic 2012		●
Azerbaijan 2006	●		Moldova 2005		●
Egypt 1992	●		Morocco 1992	●	
Egypt 1995	●		Morocco 2003-04		●
Egypt 2000	●		Tajikistan 2012	●	
Egypt 2003	●		Turkey 1993	●	
Egypt 2005		●	Turkey 1998	●	
Egypt 2008	●		Turkey 2003	●	
Egypt 2014		●	Turkey 2008	●	
Jordan 1990	●		Turkey 2013	●	
Jordan 1997	●		Ukraine 2007	●	
Jordan 2002		●	Yemen 2013	●	
Jordan 2007	●				

Surveys with data collected by CAFÉ or CAPI					
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia					
India 2015-16	●		Nepal 2011		●
Maldives 2009	●		Nepal 2016		●
Myanmar 2015-16	●				
Africa					
Angola 2015-16	●		Mozambique 2011	●	
Benin 2011-12	●		Senegal 2010-11	●	
Burundi 2016-17	●		Senegal 2012-13	●	
Ethiopia 2016	●		Senegal 2014	●	
Ghana 2014	●		Senegal 2015		●
Lesotho 2009		●	Senegal 2016		●
Lesotho 2014		●	Uganda 2016	●	
Malawi 2015-16	●		Zimbabwe 2010-11	●	
Mali 2012-13		●	Zimbabwe 2015	●	
LAC					
Colombia 2005	●		Peru 2009	●	
Colombia 2010	●		Peru 2010		●
Colombia 2015		●	Peru 2011	●	
Peru 2004-06	●		Peru 2012		●
Peru 2007-08	●				
Other Countries					
Albania 2008-09		●		●	

Notes: PAPI: pen and paper personal interview; CAFÉ: computer-assisted field editing; CAPI: computer-assisted personal interview

Appendix Table A.5 List of surveys by length of survey and consistency classification

Long surveys			Short surveys		
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Asia			**Asia**		
Afghanistan 2015	●		Bangladesh 1993-94	●	
Cambodia 2014		●	Bangladesh 1996-97		●
India 2005-06	●		Bangladesh 1999-00		●
India 2015-16	●		Bangladesh 2004		●
Indonesia 2012	●		Bangladesh 2007	●	
Myanmar 2015-16	●		Bangladesh 2011	●	
Nepal 2016		●	Bangladesh 2014	●	
Timor-Leste 2009-10		●	Cambodia 2010	●	
Africa			Indonesia 1991	●	
Angola 2015-16	●		Indonesia 1994	●	
Benin 2006		●	Indonesia 1997	●	
Benin 2011-12	●		Indonesia 2002-03		●
Burkina Faso 2010		●	Indonesia 2007	●	
Burundi 2016-17	●		Maldives 2009	●	
Comoros 2012	●		Nepal 2006		●
Ethiopia 2005	●		Nepal 2011		●
Ethiopia 2016	●		Pakistan 2012-13		●
Gambia 2013		●	Philippines 1993	●	
Ghana 2008	●		Philippines 1998		●
Ghana 2014	●		Philippines 2003	●	
Guinea 2005	●		Vietnam 1997	●	
Kenya 2008-09	●		Vietnam 2002		●
Kenya 2014	●		**Africa**		
Lesotho 2009		●	Burkina Faso 2003		●
Lesotho 2014		●	Burundi 2010	●	
Madagascar 2003-04	●		Ethiopia 2011	●	
Madagascar 2008-09	●		Ghana 2003	●	
Malawi 2010	●		Kenya 1998	●	
Malawi 2015-16	●		Kenya 2003	●	
Mali 2006	●		Liberia 2013	●	
Mali 2012-13		●	Malawi 2000	●	
Mozambique 2011	●		Malawi 2004		●
Namibia 2006-07		●	Mali 2001	●	
Namibia 2013	●		Mozambique 2003		●
Niger 2006		●	Rwanda 2000	●	
Niger 2012	●		Senegal 2010-11	●	
Nigeria 2008	●		Senegal 2012-13	●	
Nigeria 2013	●		Senegal 2014	●	
Rwanda 2005	●		Senegal 2015		●
Rwanda 2010	●		Senegal 2016		●
Rwanda 2014-15		●	Uganda 2000-01	●	
Senegal 2005	●		Zimbabwe 1994	●	
Sierra Leone 2008	●		Zimbabwe 1999	●	
Sierra Leone 2013	●		**LAC**		
Swaziland 2006-07	●		Bolivia 1994	●	
Tanzania 2004-05		●	Brazil NE 1991	●	
Tanzania 2010	●		Brazil 1996	●	
Tanzania 2015-16	●		Colombia 1990	●	
Uganda 2006	●		Colombia 1995	●	
Uganda 2011	●		Colombia 2000		●
Uganda 2016	●		Dominican Republic 1991	●	
Zambia 2007	●		Dominican Republic 1996	●	

Continued

Appendix Table A.5—*Continued*

Long surveys			Short surveys		
Survey	**Inconsistent**	**Consistent**	**Survey**	**Inconsistent**	**Consistent**
Africa cont'd			**LAC cont'd**		
Zambia 2013-14	●		Guatemala 1995	●	
Zimbabwe 2005-06	●		Guatemala 1998-99		●
Zimbabwe 2010-11	●		Nicaragua 1998		●
Zimbabwe 2015	●		Nicaragua 2001		●
LAC			Paraguay 1990		●
Bolivia 2003	●		Peru 1991-92	●	
Bolivia 2008		●	Peru 1996	●	
Colombia 2005	●		Peru 2000	●	
Colombia 2010	●		Peru 2004-06	●	
Colombia 2015		●	Peru 2007-08	●	
Dominican Republic 1999		●	Peru 2009	●	
Dominican Republic 2002	●		Peru 2010		●
Guatemala 2014-15		●	Peru 2011	●	
Guyana 2009	●		Peru 2012		●
Honduras 2005-06	●		**Other Countries**		
Honduras 2011-12	●		Egypt 1992	●	
Other Countries			Egypt 1995	●	
Albania 2008-09		●	Egypt 2000	●	
Armenia 2000		●	Egypt 2003	●	
Armenia 2005		●	Egypt 2008	●	
Armenia 2010	●		Egypt 2014		●
Armenia 2015-16		●	Jordan 1990	●	
Azerbaijan 2006	●		Jordan 1997	●	
Egypt 2005		●	Jordan 2002		●
Kyrgyz Republic 2012		●	Jordan 2007	●	
Moldova 2005		●	Jordan 2009		●
Tajikistan 2012	●		Jordan 2012		●
Turkey 2003	●		Kazakhstan 1999	●	
Ukraine 2007	●		Morocco 1992	●	
			Morocco 2003-04		●
			Turkey 1993	●	
			Turkey 1998	●	
			Turkey 2008	●	
			Turkey 2013	●	
			Yemen 2013	●	

Note: The survey is categorized as long if the number of questions exceeds the median number of questions across all surveys, and short if the number of questions is fewer than the median number of questions across all surveys.

Appendix Table A.6 List of surveys by DHS phase and consistency classification

Survey	Inconsistent	Consistent
DHS-2		
Asia		
Indonesia 1991	●	
Philippines 1993	●	
LAC		
Brazil NE 1991	●	
Colombia 1990	●	
Dominican Republic 1991	●	
Paraguay 1990		●
Peru 1991-92	●	
Other Countries		
Egypt 1992	●	
Jordan 1990	●	
Morocco 1992	●	
Turkey 1993	●	
DHS-3		
Asia		
Bangladesh 1993-94	●	
Bangladesh 1996-97		●
Bangladesh 1999-00		●
Indonesia 1994	●	
Indonesia 1997	●	
Philippines 1998		●
Vietnam 1997	●	
Africa		
Kenya 1998	●	
Zimbabwe 1994	●	
LAC		
Bolivia 1994	●	
Brazil 1996	●	
Colombia 1995	●	
Dominican Republic 1996	●	
Dominican Republic 1999		●
Guatemala 1995	●	
Guatemala 1998-99		●
Nicaragua 1998		●
Peru 1996	●	
Other Countries		
Egypt 1995	●	
Jordan 1997	●	
Kazakhstan 1999	●	
Turkey 1998	●	
DHS-4		
Asia		
Bangladesh 2004		●
Indonesia 2002-03		●
Philippines 2003	●	
Vietnam 2002		●

Continued

Appendix Table A.6—*Continued*

Survey	Inconsistent	Consistent
DHS-4 cont'd		
Africa		
Burkina Faso 2003		●
Ethiopia 2005	●	
Ghana 2003	●	
Guinea 2005	●	
Kenya 2003	●	
Madagascar 2003-04	●	
Malawi 2000	●	
Malawi 2004		●
Mali 2001	●	
Mozambique 2003		●
Rwanda 2000	●	
Rwanda 2005	●	
Senegal 2005	●	
Tanzania 2004-05		●
Uganda 2000-01	●	
Zimbabwe 1999	●	
LAC		
Bolivia 2003	●	
Colombia 2000		●
Colombia 2005	●	
Dominican Republic 2002	●	
Nicaragua 2001		●
Peru 2000	●	
Other Countries		
Armenia 2000		●
Armenia 2005		●
Egypt 2000	●	
Egypt 2003	●	
Egypt 2005		●
Jordan 2002		●
Moldova 2005		●
Morocco 2003-04		●
Turkey 2003	●	
DHS-5		
Asia		
Bangladesh 2007	●	
Cambodia 2010	●	
India 2005-06	●	
Indonesia 2007	●	
Maldives 2009	●	
Nepal 2006		●
Timor-Leste 2009-10		●
Africa		
Benin 2006		●
Ghana 2008	●	
Kenya 2008-09	●	
Lesotho 2009		●
Madagascar 2008-09	●	
Malawi 2010	●	
Mali 2006	●	

Continued

Appendix Table A.6—*Continued*

Survey	Inconsistent	Consistent
DHS-5, Africa cont'd		
Namibia 2006-07		●
Niger 2006		●
Nigeria 2008	●	
Sierra Leone 2008	●	
Swaziland 2006-07	●	
Tanzania 2010	●	
Uganda 2006	●	
Zambia 2007	●	
Zimbabwe 2005-06	●	
LAC		
Bolivia 2008		●
Colombia 2010	●	
Guyana 2009	●	
Honduras 2005-06	●	
Peru 2004-06	●	
Peru 2007-08	●	
Other Countries		
Albania 2008-09		●
Azerbaijan 2006	●	
Egypt 2008	●	
Jordan 2007	●	
Jordan 2009		●
Turkey 2008	●	
Ukraine 2007	●	
DHS-6		
Asia		
Bangladesh 2011	●	
Bangladesh 2014	●	
Cambodia 2014		●
India 2015-16	●	
Indonesia 2012	●	
Nepal 2011		●
Pakistan 2012-13		●
Africa		
Benin 2011-12	●	
Burkina Faso 2010		●
Burundi 2010	●	
Comoros 2012	●	
Ethiopia 2011	●	
Gambia 2013		●
Ghana 2014	●	
Kenya 2014	●	
Lesotho 2014		●
Liberia 2013	●	
Mali 2012-13		●
Mozambique 2011	●	
Namibia 2013	●	
Niger 2012	●	
Nigeria 2013	●	
Rwanda 2010	●	
Rwanda 2014-15		●
Senegal 2010-11	●	

Continued

Appendix Table A.6—*Continued*

Survey	Inconsistent	Consistent
DHS-6, Africa cont'd		
Senegal 2012-13	●	
Senegal 2014	●	
Senegal 2015		●
Senegal 2016		●
Sierra Leone 2013	●	
Uganda 2011	●	
Zambia 2013-14	●	
Zimbabwe 2010-11	●	
LAC		
Guatemala 2014-15		●
Honduras 2011-12	●	
Peru 2009	●	
Peru 2010		●
Peru 2011	●	
Peru 2012		●
Other Countries		
Armenia 2010	●	
Egypt 2014		●
Jordan 2012		●
Kyrgyz Republic 2012		●
Tajikistan 2012	●	
Turkey 2013	●	
Yemen 2013	●	
DHS-7		
Asia		
Afghanistan 2015	●	
Myanmar 2015-16	●	
Nepal 2016		●
Africa		
Angola 2015-16	●	
Burundi 2016-17	●	
Ethiopia 2016	●	
Malawi 2015-16	●	
Tanzania 2015-16	●	
Uganda 2016	●	
Zimbabwe 2015	●	
LAC		
Colombia 2015		●
Other Countries		
Armenia 2015-16		●