When Quality Matters:
Linking the Reliability of Demographic and Health Survey Data to Biases in International Mortality, Fertility, and Family Planning Estimates

By

Sarah Elizabeth Bradley

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Demography

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:
Professor Jennifer Johnson-Hanks, Chair
Professor Ronald D. Lee
Professor Jane Mauldon

Spring 2016

Abstract

When Quality Matters:
Linking the Reliability of Demographic and Health Survey Data to Biases in International Mortality, Fertility, and Family Planning Estimates

by

Sarah Elizabeth Bradley

Doctor of Philosophy in Demography

University of California, Berkeley

Professor Jennifer Johnson-Hanks, Chair

In countries without reliable vital registration systems – the majority of low- and middle-income countries – most vital statistical estimates are based on nationally representative household survey data. Such surveys are usually implemented under the USAID-funded Demographic and Health Surveys (DHS) project. Because DHS data are so widely used, the quality of these data is paramount to enable countries to monitor their population growth and health and track progress towards international development goals. This dissertation aims to provide a careful, detailed interrogation of DHS data quality in the areas of fertility, child mortality, and contraceptive use.

The first chapter examines linkages between questionnaire length and data quality. I analyze 238 DHS Surveys to ascertain whether changes in the DHS survey instrument – predominantly increases in length and complexity of the core questionnaire over time – have led to poorer data quality and thus biased fertility and child mortality rates. I explain the likely causes and consequences of one measure of data quality: birth displacement, disaggregated by child survival status. I examine differences in displacement by DHS survey characteristics, including the average number of non-missing variables per woman interviewed in each survey (a proxy measure of questionnaire length) and modules including HIV biomarker testing. Results indicate substantial birth displacement in the majority of DHS surveys, and disproportionate displacement of dead children compared to surviving children. Increases in birth displacement, and differential displacement of deceased children, are associated with increases in questionnaire length. This differential displacement likely biases recent estimates of infant and under-five mortality rates downward which in turn overestimates recent declines in these indicators.

The second chapter focuses on the quality data acquired through one section of the DHS questionnaire: the reproductive calendar, in which women are asked to recall their births, pregnancies, terminations, and episodes of contraceptive use for the last 5-7 years. I compare retrospective contraceptive prevalence rates (CPR) tabulated from the calendar to independently estimated current status CPR from a prior survey for the same point in time among women in the same age groups. The chapter compares estimates of the total CPR as well as the prevalence of each specific contraceptive method for 106 pairs of surveys conducted in 37 countries. I find that calendar data appear to underestimate contraceptive use in most comparisons, often substantially. Total contraceptive prevalence is reported at statistically significantly different levels in 74 percent of

survey pairs analyzed. The average difference in CPR was 4.1 percentage points, resulting in an average discrepancy of 15 percent between the current use CPR and that estimated from retrospective calendar data for the same point in time.

The third chapter builds on the findings from Chapter 2, using the comparisons between retrospective calendar data and current status data and other data quality indicators, to select 16 surveys in which reproductive calendar data appear to be reliable. Contraceptive use data from these 16 countries were pooled together for a sample of 140,529 episodes of contraceptive use collected from 97,094 women's reproductive histories. I use this pooled dataset to estimate cumulative 12-month contraceptive failure rates for each of the most widely-used contraceptive methods. Correlates of contraceptive failure are examined using multilevel survival models. I find that contraceptive failure rates are generally higher when calculated from surveys with reliable data compared to median estimates across all DHS surveys, suggesting that surveys with unreliable calendars underestimate contraceptive failure rates. Contraceptive failure rates vary widely by age, with adolescent women experiencing the highest failure rates. Failure also appears associated with socio-economic status, suggesting that the youngest and poorest women are at highest risk of experiencing unintended pregnancy.

Dedication

Once upon a time, my father was an academic. He studied to become an anthropologist, and completed all of his training up to the writing of his dissertation. Long before I was born, however, he left school ABD and joined the working world. I grew up knowing my father as a car salesman. Without his ever saying so explicitly, I knew that Dad was unhappy and wished his career had gone differently.

When I told my dad that I planned to return to graduate school for a PhD, he decided that he didn't want me to be the only Dr. Bradley in the family and returned to school as well. In one of the proudest moments of my life to date, he told me that I inspired him.

Dad and I returned to school, comparing notes about reading assignments and essays. We faced very different challenges. I struggled with calculus and Bayesian estimation; Dad struggled to compose essays on a computer rather than with a pen and legal pad. We cheered each other on, and told each other repeatedly "I am so proud of you."

Though my dad may never officially bear the title of "Doctor," he has finally achieved a career of which he is proud. He teaches Anthropology and Sociology at Montgomery County Community College, and his students adore him. Every semester they write emails to Professor Bradley, telling him how much they enjoy his classes, how much he has taught them. One of the great pleasures in my life is guest lecturing in his classes and getting to see this admiration firsthand. In front of the classroom, my father is a different man. For possibly the first time in my life, Dad is proud of himself. He glows, and I bask in his light.

Like every other PhD student I've ever known, there were times during this dissertation phase that I wasn't sure I would finish. When I couldn't see the light at the end of the tunnel, I thought about my dad, and let his light help me find my own.

This dissertation is dedicated to my father, with love, gratitude, and an immense amount of pride. This is for both of us.

Table of Contents

Dedication i

List of Tables iii

List of Figures v

Acknowledgements vi

Introduction 1

More questions, more bias? The link between survey length and the quality of data used to measure child mortality 3

Introduction 3

Why expect birth displacement? 4

Consequences of displacement 5

Data and methods 7

Data quality measures: birth displacement ratios 7

Models 10

Alternative models tested 15

The impact of displacement on mortality rates 16

Discussion and Conclusions 16

Assessing the Quality and Consistency of Contraceptive Use Data in DHS Calendars 18

Background 18

A brief history of the calendar in DHS 19

Collecting contraceptive information in the calendar 21

Data and Methods 24

Results 27

Discussion and Recommendations 68

Discussion 68

Summary and recommendations 71

Global contraceptive failure rates: Who is most at risk? 75

Introduction 75

Data and methods 76

Selection of datasets included in analysis 76

Analytic methods 77

Results 80

Failure rates 80

Model results 86

Limitations 87

Discussion and conclusions 88

Conclusions 90

References 92

Appendix A: Evaluation of calendar data quality 97

Appendix B: Estimation of cumulative failure probabilities and confidence intervals 100

Appendix Tables 102

List of Tables

Table 1: Displacement ratios by survey characteristics, 238 DHS surveys 1986-2013 11
Table 2: Poisson regression models 14
Table 3: Summary comparisons between calendar and previous survey by contraceptive method 64
Table 4: Summary comparisons between calendar and previous survey by region 66
Table 5: Summary of comparisons between calendar and previous survey by survey characteristics 67
Table 6: 12-month contraceptive failure rates by sociodemographic characteristics, pooled DHS data 83
Table 7: Hazard Ratios of contraceptive failure within the first year of use by contraceptive method 87

List of Appendix Tables

Appendix Table 1: DHS survey characteristics 102
Appendix Table 2: Summary information by DHS survey 103
Appendix Table 3: Displacement ratios by survey 108
Appendix Table 4: Comparison of calendar and current status data for Ethiopia 2000, 2005, and 2011 113
Appendix Table 5: Comparison of calendar and current status data for Kenya 1993, 1998, 2003, and 2008-09 113
Appendix Table 6: Comparison of calendar and current status data for Lesotho 2004 and 200 114
Appendix Table 7: Comparison of calendar and current status data for Madagascar 2003-04 and 2008-09 114
Appendix Table 8: Comparison of calendar and current status data for Malawi 2000, 2004, and 2010 115
Appendix Table 9: Comparison of calendar and current status data for Namibia 2000, 2006-07, and 2013 115
Appendix Table 10: Comparison of calendar and current status data for Rwanda 2005, 2007-08, and 2010 116
Appendix Table 11: Comparison of calendar and current status data for Tanzania 1999, 2004-05, and 2010 116
Appendix Table 12: Comparison of calendar and current status data for Uganda 2000-01, 2006, and 2011 117
Appendix Table 13: Comparison of calendar and current status data for Zambia 2001-02, 2007, and 2013-14 117
Appendix Table 14: Comparison of calendar and current status data for Zimbabwe 1988, 1994, 1999, 2005-06, and 2010-11 118
Appendix Table 15: Comparison of calendar and current status data for Benin 2006 and 2011-12 119
Appendix Table 16: Comparison of calendar and current status data for Ghana 2003 and 2008 119
Appendix Table 17: Comparison of calendar and current status data for Mali 2006 and 2012-13 120
Appendix Table 18: Comparison of calendar and current status data for Nigeria 2003, 2008, and 2013 120
Appendix Table 19: Comparison of calendar and current status data for Niger 2006 and 2012 121
Appendix Table 20: Comparison of calendar and current status data for Sierra Leone 2008 and 2013 122

Appendix Table 21: Comparison of calendar and current status data for Senegal 2005, 2010-11, 2012-13, and 2014 123
Appendix Table 22: Comparison of calendar and current status data for Armenia 2000, 2005, and 2010 124
Appendix Table 23: Comparison of calendar and current status data for currently married women in Egypt 1988, 1992, 1995, 2000, 2003, 2005, 2008, and 2014 125
Appendix Table 24: Comparison of calendar and current status data for ever-married women in Jordan 1997, 2002, 2007, 2009, and 2012 127
Appendix Table 25: Comparison of calendar and current status data for Kazakhstan 1995 and 1999 128
Appendix Table 26: Comparison of calendar and current status data for ever-married women in Morocco 1987 and 1992 128
Appendix Table 27: Comparison of calendar and current status data for Turkey 1993 and 1998 ... 129
Appendix Table 28: Comparison of calendar and current status data for ever-married women in Bangladesh 1993-94, 1996-97, 1999-00, 2004, 2007, and 2011 130
Appendix Table 29: Comparison of calendar and current status data for Cambodia 2005 and 2010 131
Appendix Table 30: Comparison of calendar and current status data for ever-married women in Indonesia 1987, 1991, 1994, 1997, 2002, 2007, and 2012 132
Appendix Table 31: Comparison of calendar and current status data for ever-married women in Nepal 2001, 2006, and 2011 133
Appendix Table 32: Comparison of calendar and current status data for ever-married women in Pakistan 2006-07 and 2012-13 133
Appendix Table 33: Comparison of calendar and current status data for Philippines 1993, 1998, and 2003 134
Appendix Table 34: Comparison of calendar and current status data for Vietnam 1997 and 2002. 134
Appendix Table 35: Comparison of calendar and current status data for Bolivia 1989, 1994, 2003, and 2008 135
Appendix Table 36: Comparison of calendar and current status data for Colombia 1986, 1990, 1995, 2000, 2005, and 2010 136
Appendix Table 37: Comparison of calendar and current status data for Dominican Republic 1986, 1991, 1996, 1999, and 2002 137
Appendix Table 38: Comparison of calendar and current status data for Guatemala 1995 and 1998-99 139
Appendix Table 39: Comparison of calendar and current status data for Honduras 2005-06 and 2011-12 139
Appendix Table 40: Comparison of calendar and current status data for Peru 1986, 1991-92, 1996, 2000, 2004-06, 2007-08, 2009, 2010, 2011, and 2012 140
Appendix Table 41: Comparison of failure rate estimates between this and previous studies 143

List of Figures

Figure 1: Number of births by calendar year and survival status 5
Figure 2: Average number of variables per survey per year 8
Figure 3: Displacement ratios by survival status, 238 DHS surveys 13
Figure 4: Displacement ratios for deceased children predicted from Model 2 15
Figure 5: Calendar from DHS-7 core questionnaire 21
Figure 6: Total contraceptive prevalence rate among women 15-43, Ethiopia 27
Figure 7: Total contraceptive prevalence rate among women 15-43, Kenya 28
Figure 8: Total contraceptive prevalence rate among women 15-43, Lesotho 29
Figure 9: Total contraceptive prevalence rate among women 15-43, Madagascar 30
Figure 10: Total contraceptive prevalence rate among women 15-43, Malawi 31
Figure 11: Total contraceptive prevalence rate among women 15-43, Namibia 32
Figure 12: Total contraceptive prevalence rate among women 15-43, Rwanda 33
Figure 13: Total contraceptive prevalence rate among women 15-43, Tanzania 34
Figure 14: Total contraceptive prevalence rate among women 15-43, Uganda 35
Figure 15: Total contraceptive prevalence rate among women 15:43, Zambia 36
Figure 16: Total contraceptive prevalence rate among women 15-43, Zimbabwe 37
Figure 17: Total contraceptive prevalence rate among women 15-43, Benin 38
Figure 18: Total contraceptive prevalence rate among women 15-43, Ghana 39
Figure 19: Total contraceptive prevalence rate among women 15-43, Mali 40
Figure 20: Total contraceptive prevalence rate among women 15-43, Nigeria 41
Figure 21: Total contraceptive prevalence rate among women 15-43, Niger 42
Figure 22: Total contraceptive prevalence rate among women 15-43, Sierra Leone 43
Figure 23: Total contraceptive prevalence rate among women 15-43, Senegal 44
Figure 24: Total contraceptive prevalence rate among women 15-43, Armenia 45
Figure 25: Total contraceptive prevalence rate among currently married women 15-43, Egypt 46
Figure 26: Total contraceptive prevalence rate among ever-married women 15-43, Jordan 47
Figure 27: Total contraceptive prevalence rate among women 15-43, Kazakhstan 48
Figure 28: Total contraceptive prevalence rate among ever-married women 15-43, Morocco 49
Figure 29: Total contraceptive prevalence rate among currently married women 15-43, Turkey 50
Figure 30: Total contraceptive prevalence rate among ever-married women 15-43, Bangladesh 51
Figure 31: Total contraceptive prevalence rate among women 15-43, Cambodia 52
Figure 32: Total contraceptive prevalence rate among ever-married women 15-43, Indonesia 53
Figure 33: Total contraceptive prevalence rate among ever-married women 15-43, Nepal 54
Figure 34: Total contraceptive prevalence rate among ever-married women 15-43, Pakistan 55
Figure 35: Total contraceptive prevalence rate among women 15-43, Philippines 56
Figure 36: Total contraceptive prevalence rate among currently married women 15-43, Vietnam 57
Figure 37: Total contraceptive prevalence rate among women 15-43, Bolivia 58
Figure 38: Total contraceptive prevalence rate among women 15-43, Colombia 59
Figure 39: Total contraceptive prevalence rate among women 15-43, Dominican Republic 60
Figure 40: Total contraceptive prevalence rate among women 15-43, Guatemala 61
Figure 41: Total contraceptive prevalence rate among women 15-43, Honduras 62
Figure 42: Total contraceptive prevalence rate among women 15-43, Peru 63
Figure 43: Failure rates by contraceptive method 81
Figure 44: Patterns of contraceptive failure by age 85

Acknowledgements

I write these acknowledgements from Dar es Salaam, Tanzania. I'm in this beautiful place because I have the privilege of working for The Demographic Health Survey (DHS) Program, running a workshop to support my Tanzanian colleagues in analyzing and understanding DHS data. I therefore begin this long list of thanks with my many wonderful DHS colleagues. I'm thankful to Tom Pullum and Sunita Kishor for encouraging me to go back to graduate school mid-career and supporting me in that endeavor. Shea Rutstein was an invaluable source of ideas and feedback, and assurance that my ideas were good and that I understood analytic issues better than I thought I did. Trevor Croft has an incredible depth of knowledge, and I am thankful for his endless patience with my questions, especially when I was able to work out the solution in the process of explaining to him the problem. I'm grateful for his ongoing support as a sounding board, co-author, and friend. Lia Florey, Erica Nybro, Shireen Assaf, Kerry MacQuarie, Cameron Taylor, Bert Themme, Ladys Ortiz, Joy Fishel, Joanna Lowell, Sara Head, and many other DHS staff supported me as both colleagues and friends, and I am grateful to have them in my life. I further thank the many international colleagues I met through my in-country work – too numerous to list here – who have taught me more than I could ever have learned from sitting in front of my computer in the US.

I am incredibly grateful to my stellar committee, Jenna Johnson-Hanks, Ron Lee, and Jane Mauldon, for supporting me in writing the dissertation that I wanted to write. Doctoral programs abound with horror stories from students whose advisors "made" them change their approach, analysis, and even their topic. My experience could not have been more different from those tales. Jenna completely supported my choices, even when those choices led this dissertation in a direction other than what I'd originally planned. Jenna, Ron, and Jane encouraged me and gave constructive, helpful, and reassuring feedback at every step.

This dissertation would not exist had it not been for weekly Skype check-ins with my fellow students Paulette Cha and, when she wasn't busy having a baby, Alison Gemmill. These two amazing women kept me going with excellent, timely suggestions of how to keep moving forward, and reminded me not to allow the perfect to be the enemy of the good. Their encouragement and support is the reason this dissertation exists as anything more than a collection of continually re-edited files.

I thank my fellow Demography students, past and present, for helping me through my re-entry into grad school and for showing me the multiple paths that a PhD in Demography could take. Robert Pickett and Pamela Jiménez Fontana got me through my first year, and Paul Chung, Monica Howlett, Byron Villacis, Carl Boe, and Carl Mason made the process more fun. Maggie Frye, Sarah Cowen, Sara Lopus, and Amal Harrati led with fabulous examples. Robert Chung generously allowed me to be his Graduate Student Instructor for Demography 110, which was one of the most educational and thoroughly enjoyable learning experiences in my time at Berkeley. I thank my excellent undergraduate students who impressed me with their dedication and many, many thoughtful questions. I appreciate the leeway Robert gave me in changing around his tried-and-true teaching formula, and I hope we are both better teachers as a result. I further thank both Robert and Magali Barbieri for their generous help in the nerve-wracking process of preparing for oral exams, and for their kindness in inviting me to their amazing dinner table on multiple occasions.

An early draft of Chapter 1 was presented at the 2015 Population Association of America Conference and benefitted from the comments of the discussant, Theresa Osypuk, and questions from attendees. Bruno Schoemaker kindly shared Stata code that I was able to adapt to automate

the otherwise tedious process of estimating questionnaire length. I gratefully acknowledge feedback and comments from Tom Pullum, Trevor Croft, Stan Becker, Caroline Moreau, and especially Saifuddin Ahmed on earlier versions of this analysis. I also thank The DHS Program for allowing me to present this analysis to the staff. This paper is better for the feedback I gained from multiple DHS staff members, particularly those who gave input from their depth of experience in collecting the data I analyzed.

Chapter 2 benefitted immensely from feedback and comments given by Bill Winfrey, Trevor Croft, Tom Pullum, Stan Becker, Sunita Kishor, and Fred Arnold. I gratefully acknowledge Justin Archer's assistance with compiling the appendix tables, and Natalie La Roche's help with troublesome formatting. Approximately 90 percent of this chapter was written from a table at the Red Canoe Café, and I am very grateful to the owners and staff who cheerfully supported my caffeine addiction and allowed me to make their shop my temporary office. I am also thankful to The DHS Program for financial support of the analysis presented in this chapter.

The third chapter grew out of a combination of coursework with the brilliant Leontine Alkema, Chapter 2, and a separate consultation project with fabulous colleagues at the Guttmacher Institute. I am grateful to my colleagues at Guttmacher for their interest, brainstorming, and assistance with interpretation: Susheela Singh, Chelsea Polis, Akin Bankole, Yoshi Onda, and again to Trevor Croft. I also thank the Guttmacher Institute for their financial support of this analysis. Special thanks again to Leontine Alkema for her suggestion of the Delta Method for uncertainty interval calculations, assistance in implementing this suggestion, and extraordinary teaching. I'm very thankful to have had the privilege of studying with Leontine, if only for a short time.

I have been fortunate to have several wonderful mentors through my career and graduate work. Karen Hardee, Charlie Westoff, Clémentine Rossier, Amy Tsui, David Bishai, and John Casterline have all been extremely influential as teachers, co-authors, and friends.

I have also been fortunate to have a loving and supportive family throughout this process. George Bradley has been an inspiration; Sharon Bradley, Francie Rubin, Jennifer Beck, and Brian Mack have been relentless in their love and support; and Margot Bradley offered to hire a dominatrix to ensure that I continued to write until this dissertation was finished.

I am proud to have been a National Institutes of Child Health and Development trainee, and am thankful to NICHD for generously supporting my graduate experience.

I am so grateful that DHS data and The DHS Program exist. While this dissertation discusses several issues with DHS data quality, I do not in any way intend to diminish the incredible contribution that The DHS Program makes to our understanding of crucial health and demographic indicators. I hope it is clear that my criticism comes from a desire to make our data even more reliable, and of even more use to stakeholders around the world. I am proud to call myself a member of The DHS Program. My final thanks go to the millions of people – interviewers, editors, managers, samplers, data processors, and the interviewees themselves who brought into existence the hundreds of datasets I used in this analysis. I especially thank the hundreds of thousands of women who sat through lengthy questionnaires, taking the time to recall detailed events from their past and answer possibly intrusive questions about their lives. Thank you, one and all.

Introduction

In the US and most European countries, "we take it for granted that all children are registered at birth and that all people are registered when they die with a medically assigned cause of death," (Mikkelsen, Lopez, and Phillips 2015). Every child's birth must, by law, be documented with a birth certificate. Every death is recorded with a death certificate. These documents feed into massive vital registration systems that form the primary information source for estimates of fertility, mortality, and population growth.

Countries with reliable vital registration systems are a rarity across the globe. In 2014, the UN estimated that only one out of every four people lives in a country where at least 90% of births and deaths are registered (United Nations Statistics Division 2016; Mikkelsen, Lopez, and Phillips 2015). In sub-Saharan African countries, only 44% of births are documented in vital registration systems (UNICEF 2013). Even when combined with census data, vital statistics registration systems in low- and middle-income countries generally do a poor job of tracking fertility and mortality rates (Bryce et al. 2016; Hill et al. 2015).

In the absence of reliable vital registration systems, most low- and middle-income countries rely on nationally representative household surveys for vital statistical estimates (United Nations Statistics Division 2016). The Demographic and Health Surveys (DHS) Program, a USAID-funded project to provide technical assistance to countries to collect nationally representative sample data, provides the primary data source in such countries for measures of fertility and child mortality (Corsi et al. 2012; Hill et al. 2012). DHS data are also widely used to track Millennium Development Goal (MDG) indicators including child nutritional status, education, access to clean water and sanitation facilities, maternal health, sexual activity, knowledge about HIV, malaria prevention and treatment, immunization, contraceptive use, and unmet need for family planning.

Because DHS data are so widely used, the quality of these data is paramount for countries to be able to monitor their population growth and health and track progress towards international heath and development goals. This dissertation provides a careful, detailed interrogation of DHS data quality. In the chapters that follow, I critically examine the reliability of data used to calculate child mortality rates, fertility rates, and contraceptive use dynamics.

The first chapter poses the question, *is there a link between survey length and data quality?* It seems logical that data quality would be expected to decrease as questionnaire length increases, but I was unable to find any evidence clearly demonstrating this effect. This chapter aims to fill that gap with an analysis of every DHS survey with available data – 238 surveys conducted between 1988 and 2014. This chapter examines whether changes in the DHS survey instrument – predominantly increases in length and complexity of the core questionnaire over time – have led to poorer data quality and thus biased fertility and child mortality rates. I explain the likely causes and consequences of one measure of data quality: birth displacement, disaggregated by child survival status. I examine differences in displacement by DHS survey characteristics, including the average number of non-missing variables per woman interviewed in each survey (a proxy measure of questionnaire length) and modules including HIV biomarker testing. Findings from this chapter will inform the interpretation of recent estimates of infant and under-five mortality rates, which could potentially be underestimated in surveys with longer questionnaires due to birth displacement.

The second chapter focuses on the quality data acquired through one section of the DHS questionnaire: the reproductive calendar, in which women are asked to recall their births, pregnancies, terminations, and episodes of contraceptive use for the last 5-7 years. I compare retrospective contraceptive prevalence rates (CPR) tabulated from the calendar to independently estimated current status CPR from a prior survey for the same point in time among women in the same age groups. The chapter compares estimates of the total CPR as well as the prevalence of each specific contraceptive method for 106 pairs of surveys conducted in 37 countries. The results of this analysis indicate whether or not retrospective calendar data is reliable when compared with independent estimates of CPR, and informs the interpretation of contraceptive discontinuation rates calculated from surveys with unreliable calendar data.

The third chapter builds on findings from Chapter 2, using the comparisons between retrospective calendar data and current status data and other data quality indicators to select 16 surveys in which reproductive calendar data appear to be reliable. Contraceptive use data from these 16 countries were pooled together for a sample of 140,529 episodes of contraceptive use collected from 97,094 women's reproductive histories. I use this pooled dataset to estimate cumulative 12-month contraceptive failure rates for each of the most widely-used contraceptive methods. Correlates of contraceptive failure are examined using multilevel survival models. Results from this analysis indicate 1) whether failure rates estimated from unreliable calendar data are in fact biased, as well as the potential magnitude of that bias, and 2) which women are most at risk for experiencing unintended pregnancies following contraceptive failure. This information is relevant for decisionmakers using calendar-based estimates, as well as policies and programs that aim to prevent unwanted childbearing in low- and middle-income countries.

Findings from these three studies contribute to our understanding about one of the most widely-used data sources in the world. This dissertation has two primary goals. The first is to inform the work of the DHS Program, highlighting potential problems and suggesting areas of improvement. The second goal is to inform people who use these data around the globe about how to better understand about the results, and where to be cautious in interpretation and analysis.

In the absence of reliable vital registration data, population-based household surveys remain the gold standard for estimates of crucial health and demographic indicators in many countries around the world. This dissertation carefully examines the reliability of this data with the aim of improving the quality and understanding of indicators used to guide policies and programs throughout low- and middle-income countries around the world.

More questions, more bias? The link between survey length and the quality of data used to measure child mortality

Abstract: Expansion of the length and complexity of Demographic and Health Surveys (DHS) in recent decades has been hypothesized to affect data quality. I analyze 238 DHS Surveys to ascertain whether changes in the DHS survey instrument have led to poorer data quality and thus biased infant and under-five mortality estimates. I explain the likely causes and consequences of one measure of data quality: birth displacement, disaggregated by child survival status. I then examine differences in displacement by DHS survey characteristics, including the average number of non-missing variables per woman interviewed in each survey (a proxy measure of questionnaire length) and modules including HIV biomarker testing. Results indicate substantial birth displacement in the majority of DHS surveys, and disproportionate displacement of dead children compared to surviving children. Increases in birth displacement, and differential displacement of deceased children, are associated with increases in questionnaire length. This differential displacement likely biases recent estimates of infant and under-five mortality rates downward which in turn overestimates recent declines in these indicators.

Introduction

In many countries around the world, where childbirth often takes place outside of hospitals, most children never receive a birth certificate. Childhood deaths often go unrecorded, and vital registration systems and censuses do a poor job of tracking fertility and mortality rates (Bryce et al. 2016; Hill et al. 2015). Many low- and middle-income countries instead rely on nationally representative household surveys, typically Demographic and Health Surveys (DHS), as the primary data source for measures of fertility and child mortality (Corsi et al. 2012; Hill et al. 2012). This article demonstrates the systematic displacement of children's birthdates by interviewers in the majority of DHS surveys; that displacement occurs more frequently for the birthdates of deceased versus living children; and that this displacement can affect estimated levels and trends in crucial indicators of infant and under-five mortality.

DHS surveys have experienced a vast increase in scope over the past three decades. First implemented in 1984 as a follow-on to the World Fertility Surveys, (Short Fabic, Choi, and Bird 2012) the original mandate of the DHS was to provide accurate demographic indicators, focusing predominantly on fertility and child mortality. In the past quarter-century, governments and funding agencies have added many questions about nutrition, disease prevalence, sexual risk behaviors, knowledge about HIV/AIDS, and in some countries, detailed modules about domestic violence, obstetric fistula, female genital cutting, maternal mortality, and biomarkers including blood collection for anemia and HIV testing.

Increases in questionnaire length are hypothesized to affect data quality by decreasing the interviewer training time and attention devoted to the original elements of the DHS core questionnaire, specifically the birth history, which is used as the basis for both fertility and child mortality estimates. Fieldwork monitors must also check the accuracy of a greater quantity and complexity of data. In surveys with longer questionnaires and complex modules, the burden on interviewers and fieldwork monitors is higher, and any problems with data quality may be exacerbated.

Prior research on questionnaire design and data quality have found question and item ordering (Kalton and Schuman 1982; Bertrand and Mullainathan 2001; Galesic and Bosnjak 2009), question phrasing (Schuman and Presser 1979; Kalton and Schuman 1982), questionnaire format (Sanchez 1992), and questionnaire framing (Galesic and Bosnjak 2009), to affect survey responses. Response rates in self-administered surveys are known to be affected by expected questionnaire length, as explained or shown to potential participants before the interview begins (Jepson et al. 2005; Galesic and Bosnjak 2009; Sahlqvist et al. 2011), and one study found a significant impact of the expected length of in-person interviews on participation rates (Burchell and Marsch 1992). The impact of questionnaire length once the respondent agrees to be interviewed has received less attention. Existing data are drawn from small-scale studies that have been unable to draw clear conclusions about the effect of questionnaire length on interviewee's responses, showing the impact to be mixed (Burchell and Marsch 1992) or insignificant (Sharp and Frankel, 1983). This paper directly quantifies the association between the length of the survey instrument and the quality of the resulting data based on interviewer actions in 238 large-scale nationally representative surveys.

This analysis exploits a feature of DHS survey design to examine the relationship between the length of the survey instrument and data quality as measured by *birth displacement*, described below. In the paragraphs that follow I describe the causes and consequences of birth displacement, test the link between birth displacement and survey length, and estimate the impact of birth displacement on the estimation of trends in the widely-used measure of under-five mortality.

Why expect birth displacement?

In the standard or "core" questionnaire implemented in every DHS survey, the first section after the respondent's demographic characteristics is a complete birth history, recording the dates of birth and, if the child has died, age at death, for every child a woman has ever delivered. In later sections of the questionnaire, women who have given birth in the year of interview or the five preceding calendar years are asked a long series of questions about the prenatal care, delivery, postnatal care, vaccination record, recent illnesses, and feeding practices for their youngest child. Many of these questions are repeated for each child born in the five calendar years prior to the survey[1] so that a woman with multiple recent births would be asked many of the same questions multiple times. For example, for a survey conducted in 2012, women are asked more than 100 questions about every one of their children who was born since the "boundary year" of 2007. It is important to note that women are asked the dates of their birth before the section of repeating questions about each birth in the past five years, so the interviewees cannot discern the pattern and misreport the dates of their births to shorten the questionnaire[2]. The source of this bias must therefore be savvy interviewers who quickly learn that the questionnaire can be shortened by displacing births over this boundary year. With more and more questions added to the child health sections in recent years, the incentive to displace births has increased.

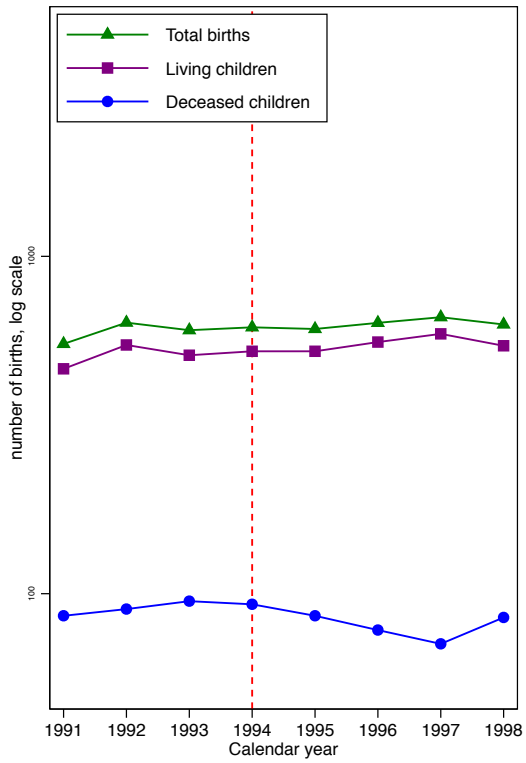
[1] In some surveys these questions applied to the most recent 3 years; this is accounted for in analysis.

[2] There is a slim chance that an interviewee could observe the interview of a second woman of reproductive age in her
[2] There is a slim chance that an interviewee could observe the interview of a second woman of reproductive age in her household and discover this pattern. This is extremely unlikely, given that the vast majority of households only contain one woman of reproductive age, and that the skip pattern based on child birth dates only appears once in the questionnaire.

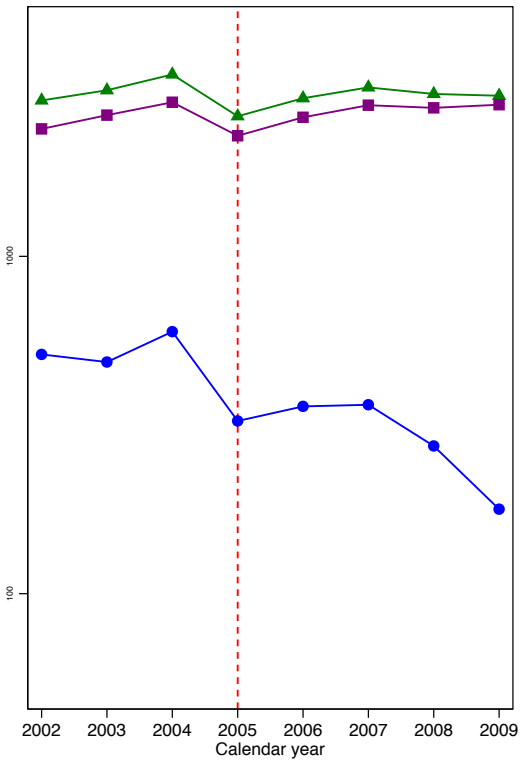
Barring any dramatic, sudden changes in fertility rates, we would expect to see the number of births recorded in each calendar year to be roughly the same across the years immediately preceding the survey, as depicted in Figure 1a. In this example from the Tanzania 1999 DHS, the top line shows a relatively smooth distribution of births occurring between 1991 and 1998. By contrast, Figure 1b shows the Burkina Faso 2010 survey in which a spike of births were reported to have occurred in 2004, followed by a sharp drop in the number of births in 2005, and then resumption of a relatively flat trend in 2006 through 2009. (In both graphs, the data are incomplete for the year of survey, thus the graph is truncated at the year of survey -1.) The Burkina Faso example is particularly striking because we would expect reported birthdates to be heaped on 2005 due to digit preference for years ending in 0 and 5 (Myers 1954; Pullum 2006): if a child's precise birthdate is unknown, one would expect birthdates near 2005 to be disproportionately reported as occurring in 2005 rather than 2004 or 2006. The unusual pattern shown in Figure 1b strongly suggests that interviewers selectively displaced births out of the five-year reference period, across the "boundary year" of 2005 and into 2004.

Figure 1: Number of births by calendar year and survival status

a: Tanzania 1999, cutoff year 1994



b: Burkina Faso 2010, cutoff year 2005



Consequences of displacement

This displacement affects the estimation of both fertility and mortality rates. Both rates use data from the most recent time period: the five- (or, depending on the level of estimation and degree of precision required, a three- or ten-) year period prior to survey. Age-specific and total fertility rates

are typically calculated over the three years prior to the survey, and births in this period form the numerator for these rates. If births are displaced out of the recent time period and into the prior one, the numerator will be reduced and fertility rates underestimated.[3] In infant and under-five mortality rate calculation, the number of children surviving until the beginning of the age interval during the period of observation form the denominator, and the number of children who died in the age interval form the numerator (details of this calculation are described elsewhere (Rutstein and Rojas 2003). If displacement affected surviving and deceased children equally, mortality estimates would be largely unaffected by displacement (Curtis 1995). As Figure 1b shows, however, the birth dates of deceased children are displaced at a higher rate than those of living children.

It may seem surprising that the births of children who have died are displaced more frequently than those of surviving children, because there are fewer questions asked about dead children than surviving children. Questionnaire sections on feeding practices, child health status, and vaccination history are all skipped if the child is not alive at the date of interview. This differential displacement of children's birth dates by survival status is, however, understandable for two reasons. One, dates of birth for deceased children are more difficult to recall than for living children because the date of birth cannot be approximated from the child's current age. Uncertainty about children's dates of birth likely allows interviewers more leeway to displace the birth over the boundary year. Two, interviewers may feel reluctant to ask women more questions about a child they know has died. If the interviewer displaces a birth outside the boundary year, the interviewer no longer needs to ask women questions about their dead children's prenatal care, delivery, birth weight, and breastfeeding. Thus, despite the fact that fewer questions are skipped for dead children than for surviving children, interviewers are consistently more likely to displace the birth dates for deceased children, as demonstrated below. The idea that interviewer discomfort with specific questions affects their coding of responses is consistent with literature on role-independent interviewer effects (Bignami-van Assche, Reniers, and Weinreb 2003; Fowler and Mangione 1990). Note that this differential displacement is in itself evidence that interviewers do consistently ask questions in the questionnaire order, as they are instructed. The living status of the child is supposed to be asked after the child's date of birth. In order for dead children's birthdates to be displaced more frequently than those of living children, interviewers must know the survival status of that child before recording their birth date.

The differential displacement of births by child survival status has clear consequences for mortality estimation, particularly because a standard way to examine trends in mortality is to calculate and compare under-five mortality rates in the 0-4 years, 5-9 years, and 10-14 years prior to survey, using birth histories collected in a single survey. Though there are clear limitations to this approach due to truncation of maternal age[4] and increased exposure to the risk of mortality for births further back in time, this approach is widely used to examine mortality trends. The displacement shown in the figure above will clearly underestimate mortality in the most recent period and overestimate mortality in the prior period. Comparing these estimates to each other would, in turn, overestimate the downward slope of any real decline in child mortality. Even if this approach is not used to calculate trends, any estimate of infant and/or under-five mortality rates calculated using data from

[3] Omission, rather than displacement, of births is probably a more serious issue affecting fertility calculations. (Schoumaker 2014)

[4] DHS surveys typically interview women ages 15-49. In periods 10-14 years in the past, interviewed women were 1-29 years old. Thus any births that occurred when mothers were ages 30+ will be omitted from estimates for earlier time periods. Recall of the timing of births and deaths may also be less accurate for periods further back in time.

the five years prior to survey (the standard indicator used in DHS reports, STATcompiler, etc.) will be underestimated if differential displacement exists.

This analysis aims to assess whether increasing the length and complexity of the DHS survey instrument is associated with poorer data quality, measured by displacement of births out of the five years prior to each survey.

Data and methods

I analyzed every available DHS since the inception of the project, for a total of 238 surveys,[5] and use the survey as the unit of analysis.

Data quality measures: birth displacement ratios

To identify the level of displacement in each survey and by survey characteristics, I create a *displacement ratio* defined as $100 * (B_t/B_{t-1})$, where B is the reported number of births in the calendar year, and t is the boundary year defined in the survey questionnaire, usually the year of survey minus five.[6] If births were evenly distributed across years, the measure would equal 100. Minor fluctuations are expected due to random noise, but unless birth rates are changing quite dramatically, the number of births in two adjacent years should be approximately equal. Ratios under 100 therefore indicate displacement or bias. I calculate ratios for all births, and separately for surviving and deceased children. The difference in these ratios indicates the amount of differential displacement of deceased children compared to surviving children. I measure this difference with the ratio of displacement ratios of deceased over living children, i.e.

$$100 * \frac{B_{deceased_t} / B_{deceased_{t-1}}}{B_{surviving_t} / B_{surviving_{t-1}}}$$

Values of this *deceased:surviving ratio* that are <100 indicate higher levels of displacement of deceased compared to surviving children.

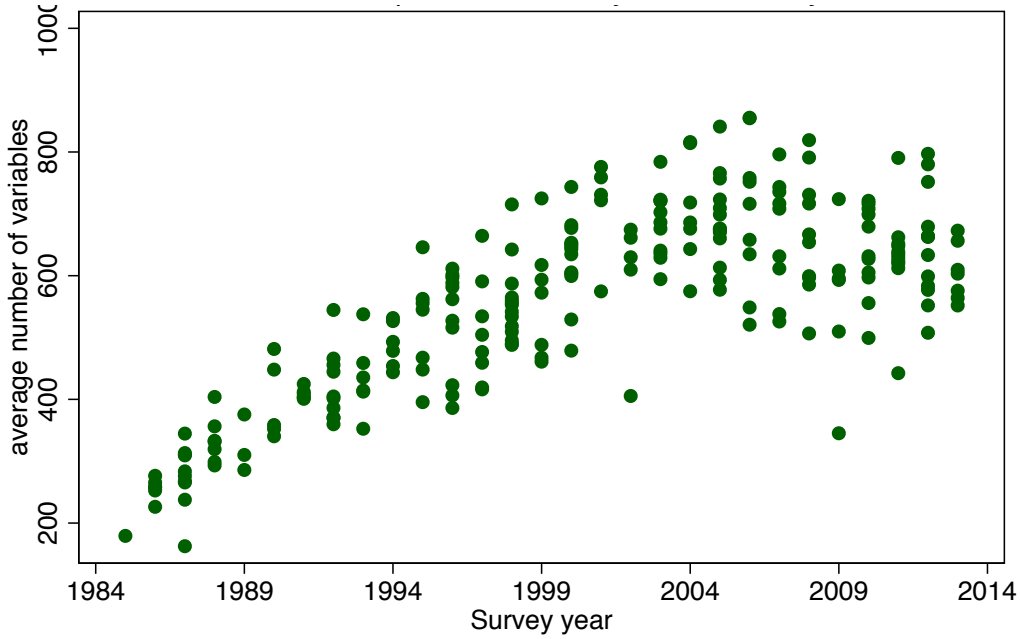
Survey characteristics: To see if, as hypothesized, data quality (as measured by displacement ratios) changes with the survey instrument, I first approximate the length of the questionnaire for each survey. Counting questions asked is not straightforward due to complex skip patterns, multiple responses, and follow-up questions. For example, a single woman with no children is skipped out of many sections of the questionnaire, and thus is asked far fewer questions than a married woman who has had multiple children in the five years prior to the survey, despite the same survey instrument being used. I therefore approximate the number of survey questions asked to the average woman by summing the number of responses to each variable in the women's (individual recode

[5] Surveys that did not include a boundary year for the maternal and child health sections of the questionnaire are excluded from analysis (e.g. Yemen 1991-92), as are surveys with data that are not publicly available (e.g. Samoa 2009).

[6] Curtis used a measure with the same numerator, but used as the denominator the average of B_{t-1} and B_{t+1} (Curtis 1995). This averaged denominator would be appropriate if we anticipated the births were heaped on the boundary year, rather than displaced only from one direction. As I see no evidence of displacement from the later (B_{t+1}) time period into the boundary year, this averaged measure appears to conceal some of the displacement, and I believe the displacement ratio used here to be more appropriate.

[IR]) dataset and dividing this count by the number of women interviewed. This is referred to as the *average number of variables*. Figure 2 graphs the average number of variables from each of the 238 surveys analyzed by the year in which the survey was conducted. The curvilinear trend shows the increases in questionnaire length over time followed by a slight decrease in recent years.

Figure 2: Average number of variables per survey per year



Each dot represents one survey, N=238 surveys

Counting the average number of variables per woman approximates the burden of the survey on the interviewer and interviewee – a great advantage over attempting to count the number of questions in each survey, which varies based on the core questionnaire used, any country-specific questions added, and any additional modules used. It is also impossible to assess the actual survey burden from the questionnaire as not all questions are asked of all women, or even to all women sharing the same demographic characteristics. For example, if a woman has never heard of HIV/AIDS, she is skipped out of all subsequent questions about HIV. Two examples further elucidate the problems of determining how many questions women are asked and the advantages of counting the average number of non-empty variables per woman. The first example relates to repeating sections in the questionnaire. For example, the maternal mortality module is repeated for every sibling the respondent has, and the number of questions asked about each sibling varies according to the sex of the sibling and whether they are currently dead or alive (MEASURE DHS 2013b). There are several other such repeating sections in the core questionnaire (for children/births) and in the female genital cutting module, for living daughters (MEASURE DHS 2013a). If a woman has no siblings, births, or surviving daughters, she is skipped out of these sections, and thus would have 0 non-blank variables in these sections. Counting the average number of variables used per woman captures all of this variation; simply looking at the survey questionnaire does not allow this. The second example relates to multiple-response questions. For example, women are asked to list all the

places they know to obtain condoms (MEASURE DHS 2012). The questionnaire shows that women can list up to 16 places to obtain condoms, but it is clear from the data that few, if any, women list that many. Counting the number of responses given to this set of questions and dividing that by the number of women interviewed gives a better measure of the number of responses an average woman gives, including women who do not know any place to find condoms and so skip out of the section resulting in 0 responses.

There are admitted limitations to using the average number of variables as a proxy for survey burden. First, some variables in DHS IR datasets do not represent a question asked to women, but are instead constructed in data processing. These kinds of variables include the wealth index, constructed from questions about household assets; unmet need for family planning, constructed from women's responses to fifteen survey questions; unique identifiers for the woman and, if applicable, index variables for the birth history, maternity history, and sibling roster. These variables are repeated for each woman and do not, for the most part, vary across surveys.[7] The average count of variables may therefore be greater than the number of questions answered per woman, but the variation in the counts between surveys should still accurately capture differences in the average number of questions asked to women. Second, the measure is correlated with the outcome variable of birth displacement ratios. If a birth is displaced across the boundary year, the mother will no longer be asked questions about that child's nutrition, vaccination status, etc.. Any birth displacement will therefore reduce the average number of variables measure. This bias could be substantial, but the direction of the bias would be towards a finding of no association between questionnaire length and data quality. Any finding of a statistically significant association would therefore be evidence of a strong relationship that is robust to this source of bias, and suggest that the actual, unbiased relationship between the two measures would be larger than the magnitude shown here.

To examine whether or not the addition of biomarker collection to the survey affects displacement, I create dummy variables for whether the survey included the collection of HIV biomarkers, anemia biomarkers, or blood pressure and/or malaria biomarkers. I also disaggregate data by region of survey, which accounts for a great deal of variation in fertility. Variations in fertility level could affect interviewers' incentive for displacement, as interviewers in higher-fertility countries may have more incentive to displace births as the interview burden increases with the number of children per woman. Survey region also accounts for a great deal of variation in date reporting. I also explore whether repeated surveys in the same country are associated with improved measures of data quality. It seems plausible that countries with repeated DHSs are able to learn from their prior experience and improve data quality in subsequent surveys. I therefore include the number of prior surveys conducted in a country +1, such that the value ranges from 1 for the first survey in a country to 10 for the most recent Peru continuous survey. Note that in the descriptive tables the number of rounds is presented categorically, but the variable is used in continuous form in the multivariable models.

[7] Two exceptions include the index variables for siblings in the maternal mortality module and for daughters in the female genital cutting module, which are only created for surveys that included these modules. Some slight overestimation of the survey burden may therefore be expected for surveys that included these modules. Because these indices are repeated for each sibling/daughter, a high fertility country will have more index variables than a low fertility country. Such indices are generally limited to one variable per sibling/daughter, however, and so the overestimation associated with such indices is likely very small.

In the multivariable regression models shown below, I include two controls relating to the accuracy of date reporting. It is possible that interviewers are more likely to displace births of less educated women, in large part because such women are less likely to know the exact dates of birth of their children (Pullum 2006), giving the interviewer a larger role in determining the child's birth date. To adjust for this possibility, I include as a covariate the percentage of women with no education in each survey. If a child's birth date is not recorded, the data are imputed using a standardized random imputation procedure described in Croft 1991. To account for any differences brought about by such imputation, I also control for the percentage of births for which the month or year of birth are imputed. Summaries of these characteristics are shown in Appendix Table 1, with details for each survey in Appendix Table 2.

Models

Four regression models are shown below using **1** the displacement ratio for all children, **2** the displacement ratio for deceased children, **3** the displacement ratio for living children, and **4** the deceased: surviving ratio as the outcome variables. Because the outcomes are not normally distributed and approximate counts, they are modeled using Poisson distributions, with robust standard errors to control for mild violations of the underlying model assumptions (Cameron and Trivedi 2005). The total number of variables is modeled on the log scale; all other variables are not transformed. Because the displacement ratios for deceased children are unstable in countries with very few child deaths, I limit regression models **2** and **4** to surveys with at least 50 deceased children in both the numerator and the denominator of the deceased displacement ratio. This excludes 50 surveys from low-child mortality countries from these models.

Results

As shown in Table 1, there is great variation in data quality, as measured with the displacement ratios described above, by survey characteristics. It is clear that birth displacement is not a rare event: on average, 86 births are recorded in the boundary year for every 100 births recorded in the boundary year-1 (average displacement ratio, all children).

For descriptive analysis, I show the displacement ratios by DHS survey phase, which roughly corresponds with the questionnaire length because the standard, or "core" questionnaire used by the DHS changes approximately every five years with the survey "phase".[8] Displacement ratios were closest to 100, indicating the least amount of bias, in the earliest DHS phase, which also had the shortest questionnaire. The total displacement ratios (column 1) decrease fairly linearly, indicating greater displacement with increasing survey phase until the most recent completed phase in which the core questionnaire was reduced in size. The reduction in questionnaire size is demonstrated in Appendix Table 1 the average number of variables per woman was 289 in Phase 1, increasing to 668 by Phase 5, and decreasing to 621 in Phase 6. It is important to note, however, that some data from this survey phase were still being processed at the time of this analysis, and thus the analysis does not provide a complete picture of all data from Phase 6.

[8] Phase 1 corresponded to approximately 1984-1989; Phase 2, 1989-93; Phase 3, 1993-97; Phase 4, 1997-2003; Phase 5, 2003-08; and Phase 6, 2008-13.

Table 1: Displacement ratios by survey characteristics, 238 DHS surveys 1986-2013

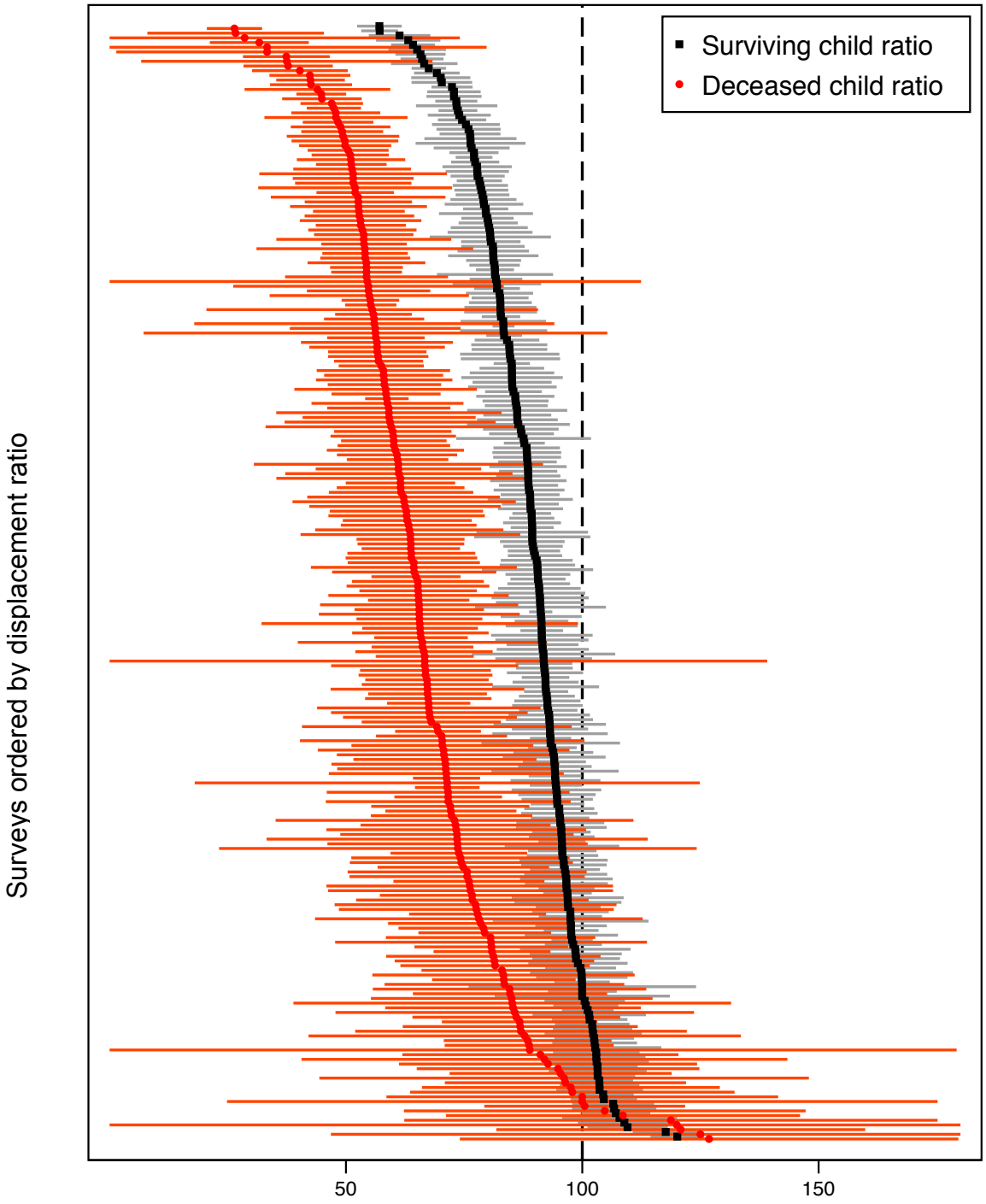
	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of Displacement ratios (deceased/ surviving)	Number of surveys
Survey phase					
Phase 1: 1984-99	90.43	92.93	72.25	0.78	27
Phase 2: 1989-93	85.74	88.81	67.89	0.77	27
Phase 3: 1993-97	84.95	88.49	63.48	0.72	51
Phase 4: 1997-2003	85.93	89.36	64.20	0.72	50
Phase 5: 2003-08	85.51	87.67	64.39	0.73	48
Phase 6: 2008-13	87.79	90.10	72.13	0.80	35
Region					
Latin America & Caribbean	92.78	94.86	69.27	0.73	48
North Africa/West and Central Asia/Europe	90.99	92.56	71.42	0.77	34
South & Southeast Asia	87.73	89.71	68.69	0.76	37
Eastern Africa	85.07	88.75	66.86	0.75	49
Western Africa	78.14	82.57	59.73	0.73	47
Central/Southern Africa	83.84	86.95	63.82	0.73	23
Number of survey rounds in country					
1-2	87.69	90.32	67.07	0.74	58
3-4	81.76	85.29	61.76	0.73	80
5-6	88.99	91.65	72.46	0.79	69
7+	90.18	92.37	65.00	0.70	31
Survey includes HIV testing					
no	87.42	90.17	67.28	0.75	189
yes	82.46	85.87	63.88	0.74	49
Survey includes Anemia testing					
no	87.11	90.07	67.07	0.74	145
yes	85.29	88.05	65.82	0.75	93
Survey includes BP or Malaria biomarkers					
no	86.53	89.55	66.46	0.74	214
yes	85.19	86.86	67.70	0.78	24
Average	**86.40**	**89.28**	**66.58**	**0.75**	**238**

The displacement ratio is defined as $100 * (B_t/B_{t-1})$, where B is the reported number of births in the calendar year, and t is the boundary year defined in the survey questionnaire

Consistent with other analyses of survey data quality (Curtis 1995; Pullum 2006), the displacement ratios generally detect the least amount of bias in the Latin American and Caribbean surveys, and the most bias in sub-Saharan African surveys. There is not a clear pattern in displacement ratios by the number of surveys conducted in a country, though the measures are generally better in countries with high numbers of surveys. Data quality appears lower in surveys that included HIV testing, and, to a lesser extent, anemia and other biomarker testing.

Columns 2 and 3 disaggregate the displacement ratios by the survival status of the child, and column 4 shows the ratio of these two ratios. The difference in displacement ratios by survival status is rather damning of the birth history data quality: on average, there is a gap of 23 percentage points between the ratios for surviving and deceased children, indicating strong differential displacement by child survival status. In some cases, this difference is likely the result of small sample sizes: in the Armenia 2010 survey, for example, this gap is 59 percentage points, but this is primarily because of the small total sample and low child mortality resulting in an absurdly low displacement ratio of 29 for deceased children (survey-specific data are in Appendix Table 1). In many cases, however, this marker of poor data quality cannot be explained by small sample sizes and low levels of mortality. The Mozambique 1997 survey had a sample of almost 30,000 births, and an estimated under-five mortality rate of 201 deaths per 1,000 live births. The total displacement ratio for this survey is 70, and among deceased children, the displacement ratio drops to 26. Overall, the quality of date-of-birth reporting appears lowest in the Western African surveys, with an average total displacement ratio of 78 and deceased displacement ratio of 60.

Figure 3: Displacement ratios by survival status, 238 DHS surveys



Note: displacement ratios are defined as 100 * (B_{st}/B_{st-1}), where *B* is the reported number of births in the calendar year of current survival status *s*, and *t* is the boundary year defined in the survey questionnaire.

Figure 3 summarizes displacement ratios by survival status. The horizontal lines represent 95% confidence intervals around each ratio estimate. Deceased boundary ratios are shown in red and surviving child boundary ratios are shown in black. The figure clearly summarizes patterns in boundary ratios across the 238 surveys analyzed here: in the majority of surveys, the displacement ratios for both living and deceased children are well below the expected value of 100, and the confidence intervals do not include the 100 value. Displacement ratios for deceased children are substantially lower than those for surviving children, with many ratios estimated at 50 or lower.

Table 2: Poisson regression models

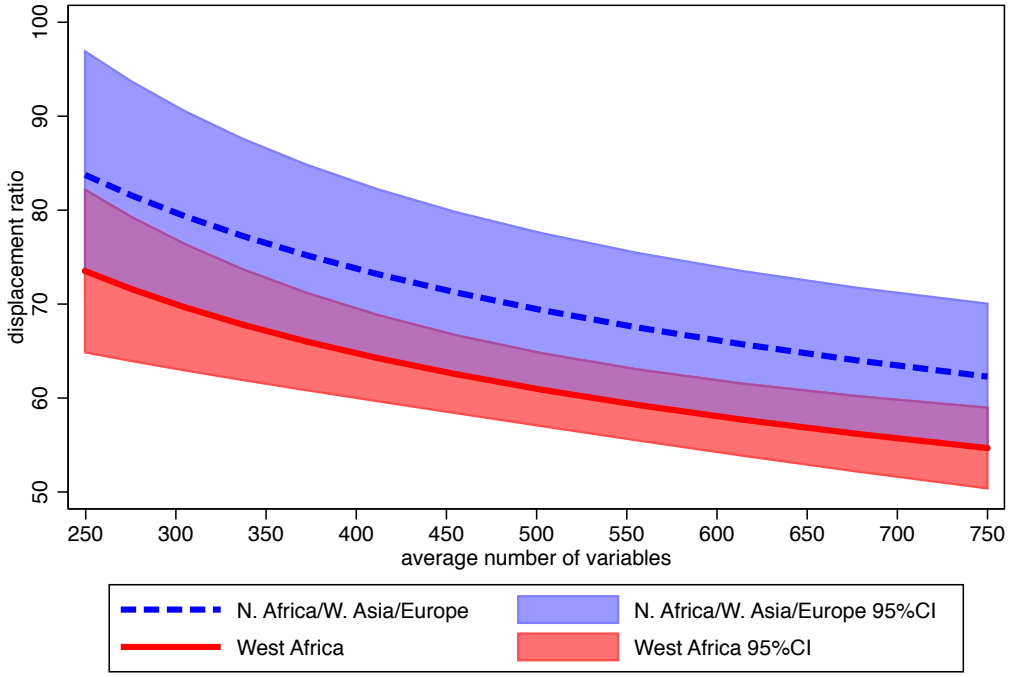
	Displacement ratio, all children		Displacement ratio, deceased children		Displacement ratio, surviving children		Deceased:surviving ratio	
	Model 1		Model 2		Model 3		Model 4	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI
log(total variables)	-0.078***	-0.132,-0.025	-0.269***	-0.402,-0.137	-0.057**	-0.112,-0.002	-0.192***	-0.327, -0.058
Region (ref = N. Africa/W. Asia/Europe)								
Latin Amer. & Caribbean	-0.020	-0.062,0.022	-0.071	-0.210,0.068	-0.004	-0.045,0.038	-0.068	-0.215,0.079
South & SE Asia	-0.047*	-0.100,0.006	0.008	-0.123,0.140	-0.043	-0.096,0.010	0.040	-0.085,0.166
Eastern Africa	-0.067***	-0.112,-0.022	-0.012	-0.141,0.116	-0.045*	-0.090,0.000	0.016	-0.121,0.153
Western Africa	-0.106***	-0.175,-0.037	-0.025	-0.158,0.108	-0.088**	-0.159,-0.018	0.043	-0.081,0.166
Cent./Southern Africa	-0.073***	-0.119,-0.028	-0.013	-0.157,0.130	-0.054**	-0.100,-0.009	0.005	-0.146,0.155
Number of survey rounds in country	0.013**	0.003,0.024	0.018	-0.007,0.043	0.010*	-0.001,0.020	0.008	-0.017,0.033
HIV biomarker testing	0.004	-0.036,0.044	0.044	-0.032,0.120	0.002	-0.040,0.043	0.037	-0.031,0.105
Anemia biomarker testing	-0.018	-0.051,0.016	-0.001	-0.070,0.068	-0.016	-0.050,0.019	0.006	-0.057,0.070
BP or malaria biomarker testing	-0.022	-0.065,0.021	-0.005	-0.097,0.088	-0.031	-0.075,0.013	0.045	-0.045,0.135
Percent of women with no education	-0.001**	-0.002,-0.000	-0.003***	-0.005,-0.001	-0.001	-0.002,0.000	-0.002***	-0.004,-0.001
Percent of births with imputed information	0.000	-0.002,0.001	-0.001	-0.003,0.002	0.000	-0.002,0.001	0.000	-0.003,0.002
Constant	5.015***	4.689,5.342	5.947***	5.148,6.747	4.893***	4.555,5.230	0.946**	0.157,1.735
Number of observations	238		187		238		187	

* p<0.1, ** p<0.05, *** p<0.01

In Table 2, factors associated with (1) the displacement ratio for all children, (2) the displacement ratio for deceased children, (3) the displacement ratio for surviving children, and (4) the ratio of deceased: surviving displacement ratios, are examined. Net of other variables in the models, increases in the total number of variables in each survey are associated with a substantial decrease in the measure of data quality (the displacement ratio or the ratio of displacement ratios) in all four models. Surveys in sub-Saharan Africa, compared to those in Middle Eastern and North African countries, are associated with decreases in the displacement ratios for surviving and all children only. One explanation for this finding could be that dead children are consistently displaced across regions, such that differences between regions are only apparent when living children are included. In other words, the birth dates of surviving children are displaced at substantially higher levels in sub-Saharan Africa than in the Middle East and North Africa, but the birth dates of deceased children are displaced in both regions. Figure 4 elucidates this relationship, showing the displacement ratios for deceased children by average number of variables that are predicted from

Model 1 for these two regions. In these predictions, all other variables are held at the mean values for that region. As shown, the confidence intervals for the two regions overlap, explaining why the coefficient on West Africa is non-significant. Figure 4 also demonstrates how the predicted displacement ratio decreases as the average number of variables increase. In West Africa, the predicted deceased displacement ratio is 74 when there are 250 variables in a survey (the smallest average number of variables in a survey was 163). With 100 more variables, the predicted displacement ratio is 70. At 550 variables, just over the median survey length, the boundary ratio drops to 65. At 750 variables, the predicted ratio for West Africa is 54: just over half as many births (of children who later died) recorded in the boundary year for every 100 recorded in the year prior.

Figure 4: Displacement ratios for deceased children predicted from Model 2



The number of survey rounds conducted in a country is associated with increases in the data quality measures, suggesting improvements in data quality with repeated surveys, though the coefficients are only statistically significant in Models 1 and 3. None of the biomarker modules were found to be statistically significantly associated with the data quality indicators. The percent of women with no education in each survey is negatively associated with boundary ratios in all models except Model 3. This is expected: women with lower levels of education generally have poorer recall of dates (Pullum 2006), and so may be more easily "guided" by interviewers to an earlier birthdate for their child.

Alternative models tested

The results shown in Table 2, namely the large, statistically significant negative relationship between the total number of variables and the displacement ratios, were consistent across a number of models investigated. Using a linear ordinary least squares model in place of a Poisson model, using the non-log-transformed version of the total number of variables, and the exclusion of outliers did not substantially change these results. Testing for interaction terms between HIV testing and survey region (because most surveys conducting HIV testing are in sub-Saharan Africa) did not yield any

statistically significant results, even when the three sub-Saharan African regions were collapsed into one region to preserve degrees of freedom.

The impact of displacement on mortality rates

The impact of displacement on biases in infant and under-five mortality rates can be best estimated by simulating a smooth distribution of births, essentially "un-displacing" the displaced births back across the boundary ratio. These kinds of simulations were conducted by Sullivan, Bicego, and Rutstein in 1990 and recently by Pullum and Becker (2014) (Pullum and Becker 2014; Rutstein et al. 1990). Both groups found that displacement of deceased children over the boundary year biases estimates of infant and under-five mortality downwards in the most recent period (0-4 years prior to survey) and upwards in the prior period (5-9 years prior to survey). For example, in the aforementioned Mozambique 1997 survey, Pullum and Becker estimate that at least 3.8 percent of under-five deaths have been displaced. As they describe, this indicates that the ratio of the under-five mortality rate 0-4 years ago: the under-five mortality rate 5-9 years ago would be biased downward by approximately 15 percent. The authors explain that a bias of even 12 percent "would be considered a serious bias by most standards," ((Pullum and Becker 2014, p. 50). Applying Pullum and Becker's back-of-the-envelope calculations to the data analyzed here, I estimate that in approximately one-third of surveys, the ratio of the under-five mortality rate 0-4 years ago to the under-five mortality rate 5-9 years ago is biased downwards by 10 percent or more, underestimating mortality in the most recent period and overestimating mortality in the prior period. This bias results in an overestimation of recent decreases in infant and under-five mortality in many settings.

Discussion and Conclusions

This paper demonstrates that birth displacement exists in the majority of DHS surveys, and that the displacement is substantial in a large number of surveys, particularly in sub-Saharan Africa. Of particular issue for the estimation of infant and under-five mortality rates is the disproportionate displacement of dead children compared to surviving children, which occurs in the vast majority of surveys. Using the survey as the unit of analysis and investigating characteristics associated with these data quality measures, I find that higher levels of birth displacement, and differential displacement of deceased children, are associated with increases in questionnaire length, as proxied by the average number of non-missing variables per woman in each DHS Individual Recode dataset.

The fact that displacement ratios—particularly the ratio for deceased children—and the deceased: surviving ratio are all associated with questionnaire length is encouraging. It is encouraging because the problem can presumably be remedied, in large part, by reducing questionnaire length. This seems to be happening already: the core questionnaire length was reduced in DHS Phase 6, beginning in 2008. As shown in Table 1, the displacement ratios are higher in Phase 6 than in the previous phases. Most encouragingly, the deceased:surviving ratio is 0.8, the highest from any survey round, indicating that the differential displacement of deceased children is lowest in the most recent surveys.

The finding that displacement is higher in surveys where fewer women are educated suggests that more attention should perhaps be paid to fieldwork monitoring in these settings. It may also indicate that as female education continues to increase, uncertainty about the birth dates of children will decrease and thus opportunities for the displacement of births will lessen.

Other ways to improve the problem of birth displacement may include questionnaire changes, such as asking the child health questions for the two most recent births regardless of when the children were born, which would eliminate the boundary year and thus the incentive to displace births. In addition, or as an alternative, estimation strategies could be altered, to use a shorter reference period of 4 or 3 years when sample sizes allow (note that the shorter reference period would be used ONLY for estimation, and would not apply to data collection[9]). Neither of these changes would completely eliminate the problems. Interviewers will still want to shorten their burden, and especially avoid asking mothers about their dead children, even if the clear incentive identified by the boundary year is removed. Additionally, if births are displaced by more than one year (as seems likely for deceased children in the Uganda example), shortening the reference period will not avoid bias entirely. But such changes, in addition to decreasing questionnaire length and increasing fieldworker training, would go a long way in improving the quality of vital estimates.

This analysis demonstrates that longer questionnaires are strongly associated with reduced quality of data used to estimate infant and under-five mortality rates and fertility rates. As DHS data are the primary source for vital statistics in low- and middle-income countries, the quality of DHS data is of the utmost importance. This is especially true in light of the new findings that efforts to collect under-five mortality data using shorter summary birth history questions in place of a full DHS produces substantially poorer quality results (Hill et al. 2015; Bryce et al. 2016). The DHS Program has already taken steps to reduce the length of the core questionnaire in recent surveys, which seems to result in less bias. This analysis provides evidence that these changes are indeed moving in the right direction, and indicates that further reductions in the quantity of questions asked are likely to continue to improve the quality of vital demographic and health data in the future.

[9] The DHS Program experimented with a shorter period for collection of maternity and child health information in previous surveys in an attempt to avoid birth displacement across the maternity history boundary. The shorter reference period was found to simply move the problem of displacement nearer to the date of interview and created more problems for fertility rate calculations, which use a 3-year reference period.

Assessing the Quality and Consistency of Contraceptive Use Data in DHS Calendars[10]

Abstract: This article assesses the reliability of contraceptive use reporting in DHS retrospective reproductive calendars. We compare retrospective contraceptive prevalence rates tabulated from the calendar with independently estimated current status contraceptive prevalence rates from a prior survey for the same point in time among women in the same age groups. We analyzed all DHS surveys with available data, for a sample of 106 survey pairs from 37 countries. We compared estimates of the total CPR as well as the prevalence of each contraceptive method for 106 pairs of surveys conducted in 36 countries. We find that calendar data appear to underestimate contraceptive use in most comparisons, often substantially. Total contraceptive prevalence is reported at statistically significantly different levels in 74 percent of survey pairs analyzed. The average difference in CPR was 4.1 percentage points, resulting in an average discrepancy of 15 percent between the current use CPR and that estimated from retrospective calendar data for the same point in time. We recommend experiments with shorter calendars and potentially alternative methods of electronic data collection to assess the impact of these changes on reporting of contraceptive use and discontinuation.

Information collected in DHS calendars form the primary data source for the study of contraceptive use dynamics, particularly rates of contraceptive discontinuation, failure, and switching, in low- and middle-income countries (Ali, Cleland, and Shah 2012). Calendar data are retrospective month-by-month histories of women's reproductive events (births, pregnancies, and terminations) and episodes of contraceptive use that occurred in the six years prior to interview. The process of filling in the contraceptive calendar (described in detail below) asks women to recall episodes of contraceptive use that may have occurred up to six years in the past. Women using long-term methods such as sterilization, IUD, or implants may be able to accurately recall the start and, if applicable, end dates of use. It is unclear, however, whether retrospective recall of short-term episodes of use, particularly for methods that are coitus dependent (condom, diaphragm, spermicides, withdrawal, periodic abstinence, and other traditional methods) are reliable. This chapter assesses the quality and consistency of episodes of contraceptive use collected in the calendar (hereafter referred to as the "contraceptive calendar").

Background

An ideal way to assess the reliability of retrospectively collected data would be to interview the same women multiple times. At the first point of data collection, interviewers would ask women what, if any, contraceptive method they are currently using. Several—perhaps five—years later, the same women would be re-interviewed and asked to retrospectively recall their contraceptive use histories using the calendar survey instrument for the past five or more years, including the time point in which they were first interviewed. The two sources of information—current and retrospective for the same time point—could then be compared to see if women accurately recalled the method they were using when the current status data were collected. If retrospective recall is accurate, the two data sources (the calendar and the current status data) would match. If they did not match, we could assess the degree to which the reports are different and assess whether there appears to be under- or

[10] An earlier version of this chapter was published in Bradley, Winfrey, and Croft 2015. The full report contains separate chapters written by co-authors. This chapter represents my solo work.

over-reporting of contraceptive use in the calendar, assuming the current status data were accurately recorded.

DHS surveys do not interview the same women over time (with the exception of the Morocco Panel survey in 1995), but the surveys do interview nationally representative samples of reproductive-aged women. In many countries, DHS surveys are conducted approximately every five years, providing repeated nationally representative cross-sections drawn from the same population of women. Because the samples are all nationally representative, the women who were ages 15-44 in one survey should be representative of women ages 20-49 in the next survey. After ensuring that data are limited to the same age groups in both data sources, the current status contraceptive use reported by women in one survey can therefore be compared to contraceptive use reported in the calendar in a later survey, tracked back in time to the date of the prior survey. In this chapter, we use this approach of comparing repeated DHS surveys in the same country to assess the reliability of contraceptive use as reported in the calendar compared with current status data from an earlier survey.

Few studies to date have examined the quality of the contraceptive information collected in DHS calendars. Most of the existing studies focus on the first few calendars collected: the 1986 Peru and Dominican Republic DHS and the 1995 DHS Panel survey in Morocco (Goldman, Moreno, and Westoff 1989a; Strickler et al. 1997) (Goldman, Moreno, and Westoff 1989a; Goldman, Moreno, and Westoff 1989b; Westoff, Goldman, and Moreno 1990; Moreno, Goldman, and Babakol 1991; Strickler et al. 1997). At present, the majority of DHS surveys are now conducted in sub-Saharan Africa and include the contraceptive calendar. We are aware of only two prior studies that assessed the quality of calendar data in any sub-Saharan African countries: Curtis and Blanc 1997 and Bradley, Schwandt, and Khan 2009.[11] In this chapter, we aim to broaden the understanding of the quality and consistency of DHS calendar data on contraceptive use by analyzing data from 106 pairs of DHS surveys conducted in 37 countries, including 18 countries in sub-Saharan Africa.

In this chapter, we first review the history of the calendar in DHS surveys and summarize how contraceptive use is recorded in the calendar. Next, we examine consistency of contraceptive use reporting in each calendar. Finally, we assess patterns in contraceptive reporting across contraceptive methods, geographic regions, and survey characteristics.

A brief history of the calendar in DHS

The calendar was first developed for DHS in the experimental surveys conducted in Peru and Dominican Republic in 1986. These surveys examined "the potential of a six-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 information from the calendar format questionnaire in the experimental questionnaire compared with the previously used tabular format. Goldman, Moreno and Westoff (1989b) noted that "several different comparisons indicate

[11] The 1997 study included Zimbabwe data, and the 2009 study included data from Kenya and Zimbabwe. As explained below, calendars were only included in high contraceptive prevalence countries in early rounds of the DHS; most sub-Saharan African surveys were not considered high contraceptive prevalence and so calendar data were not collected.

that reporting of information on contraceptive histories in the experimental questionnaire is superior to that in the standard one." Moreno and colleagues found other major advantages to using the calendar: "it obtains more complete reports of use for periods prior to the survey; it allows for a detailed study of contraceptive use patterns; and it obtains information which is more internally consistent with other types of information," (Moreno, Goldman, and Babakol 1991, p. 13)

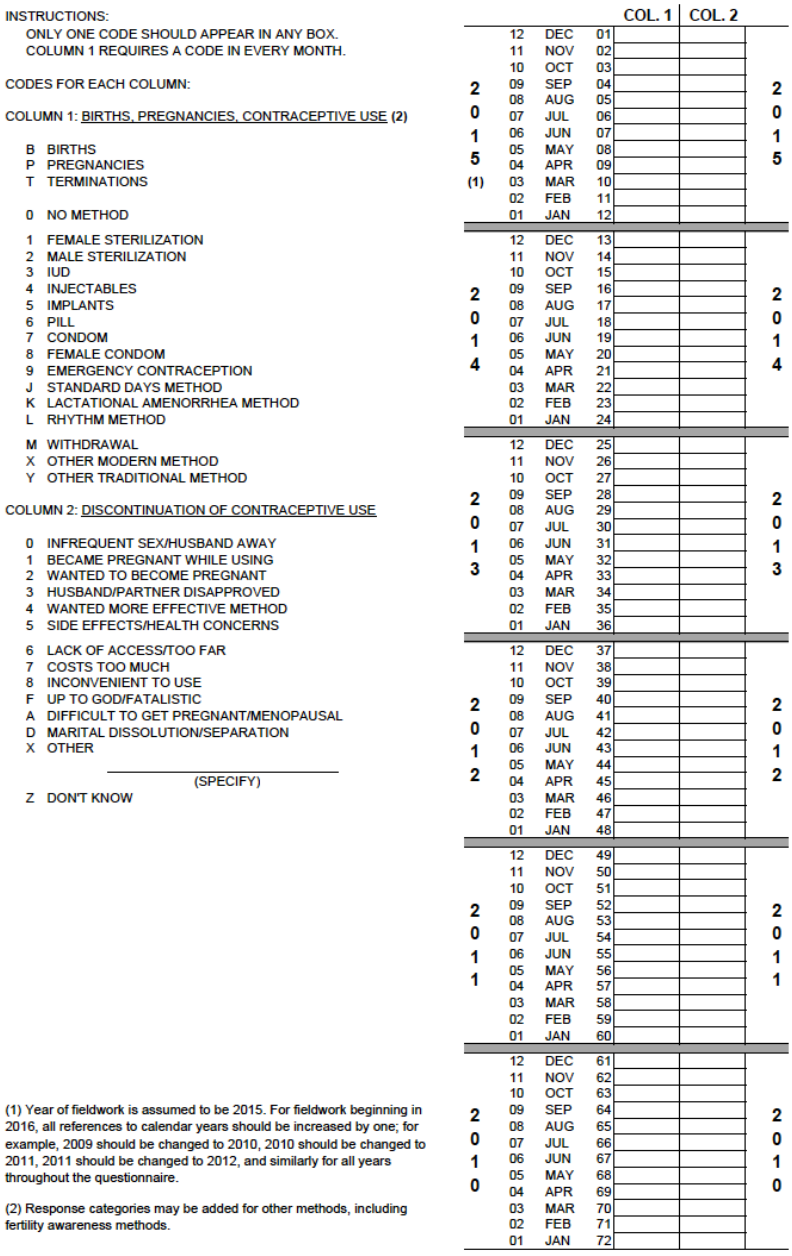
On the basis of these experimental surveys and the analyses that followed, the use of the calendar became a standard part of the DHS Model A questionnaire for use in high contraceptive prevalence countries in the second phase of DHS (DHS II), starting in 1990. DHS phase I corresponded to approximately 1984-1989; phase II, 1989-93; phase III, 1993-97; phase IV, 1997-2003; phase V, 2003-08; and phase VI, 2008-13. The DHS Program is currently in the seventh phase of data collection.

Implementation of the DHS calendar has varied over survey phases. In phases II-IV, the calendar was included only in high contraceptive prevalence countries, which used the Model A questionnaire. In these phases, the calendar included columns that collected reasons for discontinuation (shown in Figure 5), as well as a column tracking women's marital/in-union status in each month of the calendar. Some calendars also included columns to capture additional information such as the source of contraception. Low contraceptive prevalence countries used the Model B questionnaire during phases II-IV, which did not include the calendar.

In DHS phase V starting around 2003, the use of separate questionnaires for high- and low-contraceptive prevalence countries was discontinued, and all countries used the same core questionnaire that included a calendar collecting births, pregnancies, terminations, and episodes of contraceptive use. Note that not all countries included the calendar in their questionnaires immediately. In some countries the calendar was not included until later phases of DHS, based on the data needs and interests of the country, sometimes preferring to maintain comparability with approaches used in prior surveys. Additionally, some countries adapted the calendar to collect only births, pregnancies, and terminations, excluding episodes of contraceptive use.[12] The current DHS-7 core questionnaire uses a two-column calendar collecting month- by-month information on births, pregnancies and contraceptive use in column 1 and the reason for discontinuation in column 2, as pictured in Figure 5. The calendar collects a complete history of women's reproduction and contraceptive use for five to seven years prior to the survey. The exact length of the period covered by the contraceptive calendar varies depending on the duration of data collection and the month in which the respondent was interviewed.

[12] Calendars that did not collect contraceptive use data are not analyzed in this chapter.

Figure 5: Calendar from DHS-7 core 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
	08	AUG	05			
0	07	JUL	06			0
1	06	JUN	07			1
5	05	MAY	08			5
	04	APR	09			
(1)	03	MAR	10			
	02	FEB	11			
	01	JAN	12			
	12	DEC	13			
	11	NOV	14			
	10	OCT	15			
2	09	SEP	16			2
	08	AUG	17			
0	07	JUL	18			0
1	06	JUN	19			1
	05	MAY	20			
4	04	APR	21			4
	03	MAR	22			
	02	FEB	23			
	01	JAN	24			
	12	DEC	25			
	11	NOV	26			
	10	OCT	27			
2	09	SEP	28			2
	08	AUG	29			
0	07	JUL	30			0
1	06	JUN	31			1
	05	MAY	32			
3	04	APR	33			3
	03	MAR	34			
	02	FEB	35			
	01	JAN	36			
	12	DEC	37			
	11	NOV	38			
	10	OCT	39			
2	09	SEP	40			2
	08	AUG	41			
0	07	JUL	42			0
1	06	JUN	43			1
	05	MAY	44			
2	04	APR	45			2
	03	MAR	46			
	02	FEB	47			
	01	JAN	48			
	12	DEC	49			
	11	NOV	50			
	10	OCT	51			
2	09	SEP	52			2
	08	AUG	53			
0	07	JUL	54			0
1	06	JUN	55			1
	05	MAY	56			
1	04	APR	57			1
	03	MAR	58			
	02	FEB	59			
	01	JAN	60			
	12	DEC	61			
	11	NOV	62			
	10	OCT	63			
2	09	SEP	64			2
	08	AUG	65			
0	07	JUL	66			0
1	06	JUN	67			1
	05	MAY	68			
0	04	APR	69			0
	03	MAR	70			
	02	FEB	71			
	01	JAN	72			

Collecting contraceptive information in the calendar

From the top of the page to the bottom, the calendar typically includes 72 boxes (each box representing one month of time) divided into six sections (each representing one year or 12 months of time) in which to record information about the woman's experiences with childbearing and contraceptive use. In the current standard DHS-7 questionnaire the calendar consists of two columns:

1. Births, pregnancies, terminations and contraceptive use

2. Reasons for discontinuation of contraceptive use

For each month in the calendar a single letter or digit code is filled in from the list shown in Figure 5. For each birth that the respondent had during the period of the calendar, a letter B (Birth) is recorded in the month of birth. For each preceding month of pregnancy a letter P (Pregnancy) is recorded in the corresponding months in the calendar. If the respondent had a miscarriage, abortion, or stillbirth in the period covered by the calendar, a letter T (Termination) is recorded in the month the pregnancy ended, and a letter P (Pregnancy) is recorded for each preceding month of pregnancy.

After recording all births and other pregnancies in the corresponding boxes in the calendar, the interviewer asks about contraception. If the respondent is currently using a contraceptive method, the interviewer asks for the month and year the respondent started using the method – that is the start of continuous use of the method, not the first time she used the method. The interviewer fills in the code for the contraceptive method currently used in column 1 in the row corresponding to the month of interview and in the month started using the method using the codes shown to the left of the calendar. If the respondent started using the method prior to the start of the calendar, the interviewer records the code in the first (bottom) row of the calendar. The interviewer then connects the first and last month of contraceptive use with a line showing continuous use of the method between these two dates. Using the calendar shown in Figure 7, if a woman who was interviewed in June 2015 reported current pill use and said she started using that episode of use in January 2015, the interviewer would record a "1" in the seventh row of the calendar form marked 2015 June,[13] a "1" in the 12th row of the calendar form marked 2015 January, and a line connecting the two indicating continuous use.

The interviewer then asks the respondent about other episodes of contraceptive use that may have occurred in any remaining open periods in the calendar (open periods refer to months in which no code has yet been filled in, i.e., the period between a birth and the beginning of contraceptive use, or between one birth and the following pregnancy). For each open period, the interviewer asks a series of questions to ascertain the date and duration of use of contraception, if any, during that period using questions such as:

- When was the last time you used a method? Which method was that?
- *Between the (EVENT1) in (MONTH AND YEAR) and the (EVENT2) in (MONTH AND YEAR) did you use a method of contraception?* Note that EVENT1 may be the birth of a child, the termination of a pregnancy, the end of a prior episode of contraceptive use, and EVENT2 may be the start of a pregnancy or the beginning of a later episode of contraceptive use.
- When did you start using that method?
- How long after (EVENT1) did you start using that method?
- How long did you use the method then?

[13] Note the label for June 2015 of "06 JUN 07". The first number, 06, corresponds to the numeric month of June. The second number, 07, corresponds to the number of months since December 2015, working backwards in time.

- What happened when you stopped using that method: did you not use any method, did you start using a different method, or did you become pregnant?

For each episode of contraceptive use recorded in column 1 of the calendar, the interviewer asks additional questions to ascertain the reason for discontinuing use of the contraceptive method and records the code for the reason for discontinuation in column 2 of the calendar in the row corresponding to the month of ending use of the contraceptive method. At the end of each episode of contraceptive use the respondent is asked:

- Why did you stop using the (METHOD)?

Followed by probing questions, including:

- IF A PREGNANCY FOLLOWED: Did you become pregnant while using (METHOD), did you stop to get pregnant, or did you stop for some other reason?

Only the main reason for discontinuation is recorded.

While filling in the episodes of contraceptive use in between each birth or pregnancy, any periods in which the respondent was neither pregnant nor using a contraceptive method are filled with code '0' meaning that no method was used in that month.

After completing the data collection for the calendar, column 1 of the calendar will have a single code recorded in every row, except for those rows after the month of interview. Column 2 will have a single code in the same month as the month of discontinuation of each episode of contraceptive use. Other months in column 2 are left blank.

For many respondents completing the calendar is quite straightforward. For example, a woman who has never been sexually active, a woman who used no contraception and had no pregnancies in the last five years, or a woman who used the same contraceptive method throughout the calendar period (e.g. sterilization or IUD) would have the same code in all months of column 1 and no codes in column 2 of the calendar.

For women with more complex reproductive histories, particularly women who experienced multiple episodes of contraceptive use and discontinuations during the calendar period, filling in the calendar is more complicated. Filling in multiple episodes of use in the calendar requires excellent recall on the part of the respondent, who may need to give dates for the beginning and end of episodes of contraceptive use that occurred up to six years prior to interview,[14] as well as the reason for each discontinuation. Filling in a complex history in the calendar also requires skill and patience on the part of the interviewer, to help the respondent recall dates and reasons for discontinuation, and record this information accurately on the questionnaire. Previous panel studies have found that more complex reproductive histories are associated with poorer reliability of contraceptive reporting in calendars (Callahan and Becker 2012).

[14] All calendars collect up at least five full years of information for all women interviewed, described in detail below. In most surveys, at least six years of information is collected, and in some cases the calendar covers seven years.

Data and Methods

We analyze all DHS surveys that collected a contraceptive calendar (hereafter referred to as a calendar survey) that overlaps in time with a previous DHS in that country. Because the calendar collects approximately six years of data, this roughly means that we analyze all pairs of surveys in which a calendar survey was preceded by a DHS conducted up to six years prior. We allow for a gap of up to one year between the first month covered by the calendar and the median date of interview in the prior survey. This selection gives us a sample of 37 countries, many of which have multiple DHS surveys with multiple calendars.

To compare retrospective results from one survey to current status results from another, we restrict the age groups to be comparable. Women who were ages 15-49 in 2011 would have been between ages 8-43 in January 2005, depending on exactly when their birthday falls in relation to the date of interview. We therefore exclude months before women's 15th birthdays and after the end of their 43rd year (i.e., from their 44th birthday on) from the calendar data, and exclude data from women over ages 43 from the current status data.[15] In surveys that only interviewed ever-married women, there is an additional complication: women who were married at the time of interview may not have been married for the entire period covered by the calendar. To be able to compare calendar data to current-status estimates in which all women had been married, we restrict the calendar data to months that fall after the woman was first married. In Egypt, Turkey, and Vietnam, we have information from an additional column in all of the calendar surveys analyzed that tracks whether or not the woman was married in each month of the calendar. In these three countries, we restrict the estimates in each month of the calendar, and in the current-status data, to women who were currently married at that time.[16] For comparability, if any analyzed survey in a country interviewed only ever-married women in a country, we limit all analyses to ever-married women in that country even if more recent surveys included never-married women.

Because reporting about something a person is currently doing (i.e., current contraceptive use) is not subject to recall biases or other problems associated with reporting of events that occurred in the past, we generally assume that reports of current contraceptive use are more likely to be accurate than retrospective reports in the calendar. We therefore consider the current use estimates to be the best estimate of contraceptive prevalence at that time, and consider the calendar data to not

[15] Depending on exactly when women's birthdays fall in relation to the month in which they were interviewed, women who were turning 50 in 2011 could have been 43 or 44 in a specific month of 2005, and women who were 15 at the date of interview in 2011 could have been 8 or 9 in January 2005. To ensure that age groups are completely comparable, we restrict all estimates to women ages 15-43. In surveys that interviewed women under age 15, all data are restricted to women ages 15 and older. Note that the age restrictions mean that slightly different groups of women are included in each month of the restricted calendar data. The graphs of calendar data therefore do not follow precisely the same cohort of women over time; they instead represent repeated monthly cross-sections of all women ages 15-43 in each month depicted in the calendar.

[16] Note that in some early ever-married surveys, only currently married women were asked if they were using contraception and formerly married women were assumed not to be using contraception. We follow this assumption in analyses when necessary, but limit analyses to currently married women whenever possible. In countries with at least one ever-married survey, but in which the marriage column in the calendar is not available for all surveys, limiting analyses to ever-married rather than currently married women may lead to some unavoidable discrepancies in comparability between surveys. We have run calculations for surveys with the marriage column both ways, limiting to ever-married versus currently married women, wherever possible, and found no notable differences, except in Vietnam where the calendar data matched far better with the current status data when both data sources were limited to currently married women.

accurately capture contraceptive use if estimates of the CPR from the calendar are statistically significant from those from current use estimates for the same date.

The graphs below plot the total CPR for women ages 15-43 years old, or the percentage of women using any form of contraception, reported in each month from the calendar and in the median month of interview from current status data. In each graph, the calendar data are represented as a line over time, with a shaded region representing 95% confidence intervals. Current status data are presented as circles, also with 95% confidence intervals. The black line in each graph connects the current status CPR estimates using linear interpolation, and the dashed lines connect the ends of the 95% confidence intervals for the current status CPR estimates. Note that although the scales are constant within each graph, different scales are used across graphs according to the level of the CPR in each country.

The point estimates for current status data are plotted in the median month of interview for that survey. For example, Figure 6 plots the CPR from the 2011 and 2005 surveys in Ethiopia, along with current status CPRs from the 2011, 2005, and 2000 surveys, the earliest of which did not collect calendar data. The green and blue lines represent data from the 2005 and 2011 calendars, respectively. The red circle is the CPR from the 2000 data. This is the percentage of all women 15-43 years old who said they were currently using contraception at the time of interview. The women were all interviewed between February and May 2000, with a median date of interview of April 2000.[17] The red circle is therefore plotted at April 2000 on the horizontal axis. The current status estimates for the 2005 and 2011 surveys are plotted at their median dates of interview: June 2005 and February 2011, respectively. There is a gap of a few months between the most recent time point in each calendar and the current status estimate. This is because we have only estimated the CPR in months when data are available for all women. For example, the Ethiopia 2005 data were collected between April and August 2005. Beginning in May, there are no data for women who were interviewed in April, so we no longer have calendar data for all women in the sample. We therefore do not present data from the calendar for months in which we do not have information for all women, which leaves a gap between the end of the calendar data and the current status point estimate at the median date of interview.

Appendix tables that accompany each graph compare the reported method mix from the current status data with calendar data collected in the corresponding month. Appendix Table 4, the first column shows the contraceptive methods reported by women interviewed in Ethiopia in 2000 (median date of interview April 2000), followed by the 95% confidence intervals for these percentages. The next column shows the distribution of methods that women interviewed in 2005 reported they were using in April 2000. Because the surveys are representative of all women in Ethiopia, the reports should be the same if the calendar perfectly records women's retrospective contraceptive use (no recall error on the part of the woman interviewed and no interviewer errors recording the information). We also compare the method mix from current-status data in 2005 (median date of interview June 2005) to calendar data from January 2006, which was the first month in which calendar data were collected in the 2011 survey. Although these data are not from exactly the same time point, we believe they are close enough to warrant comparison.

In comparing the CPR and method mix from current-status and calendar data, we test whether differences in reporting are statistically significant. The null hypothesis for each test is that the level

[17] The Ethiopia calendar data were collected using the Ethiopian calendar, which was converted to the Gregorian calendar. All dates in this paper refer to the Gregorian calendar.

of contraceptive use, whether comparing the total CPR or the prevalence of specific methods, is the same in the calendar and the current status data. If the reported levels of use are not statistically significantly different, we judge that the calendar matches the reporting of current contraceptive use in the previous survey with a reasonable degree of accuracy. In the results section below, we only discuss discrepancies between current status and calendar data that are statistically significant.[18]

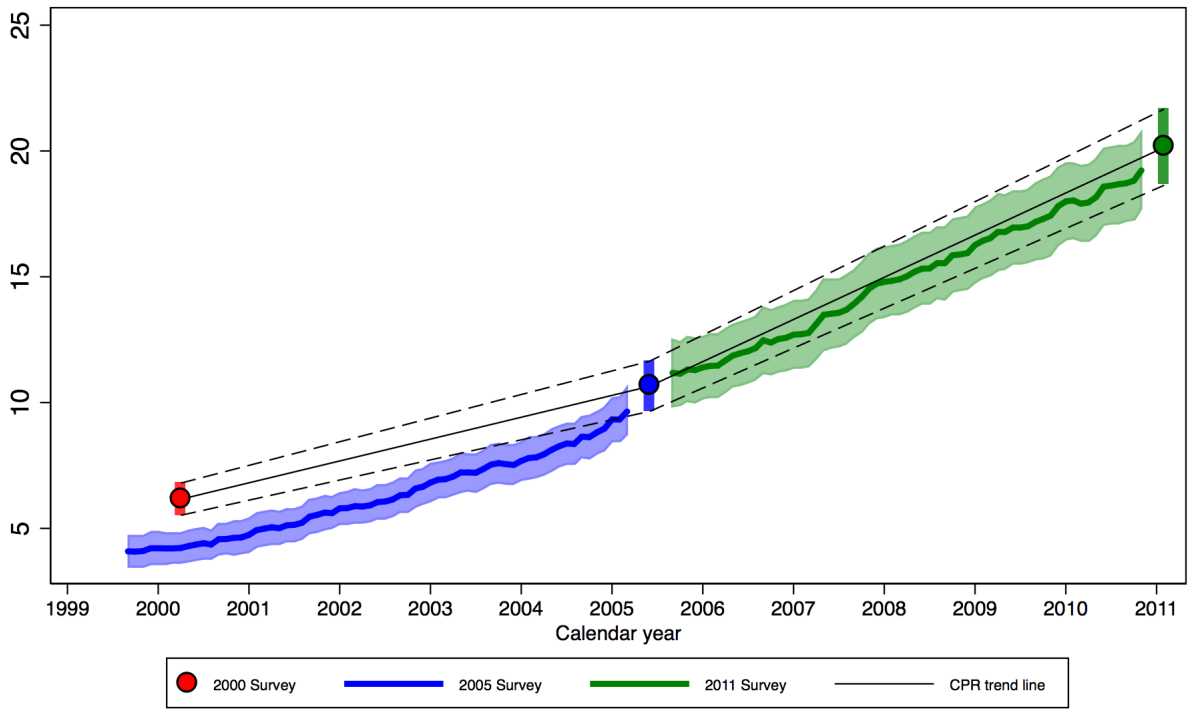
All analyses in this chapter were conducted and graphs created in Stata 13. All estimates are weighted using sampling weights, and the sampling errors and confidence intervals were estimated accounting for the clustered, two-stage stratified sample designs of each DHS survey.

[18] Note that even though confidence intervals for two estimates may overlap in graphs, the estimates may still be statistically significantly different.

Results

East and Southern Africa

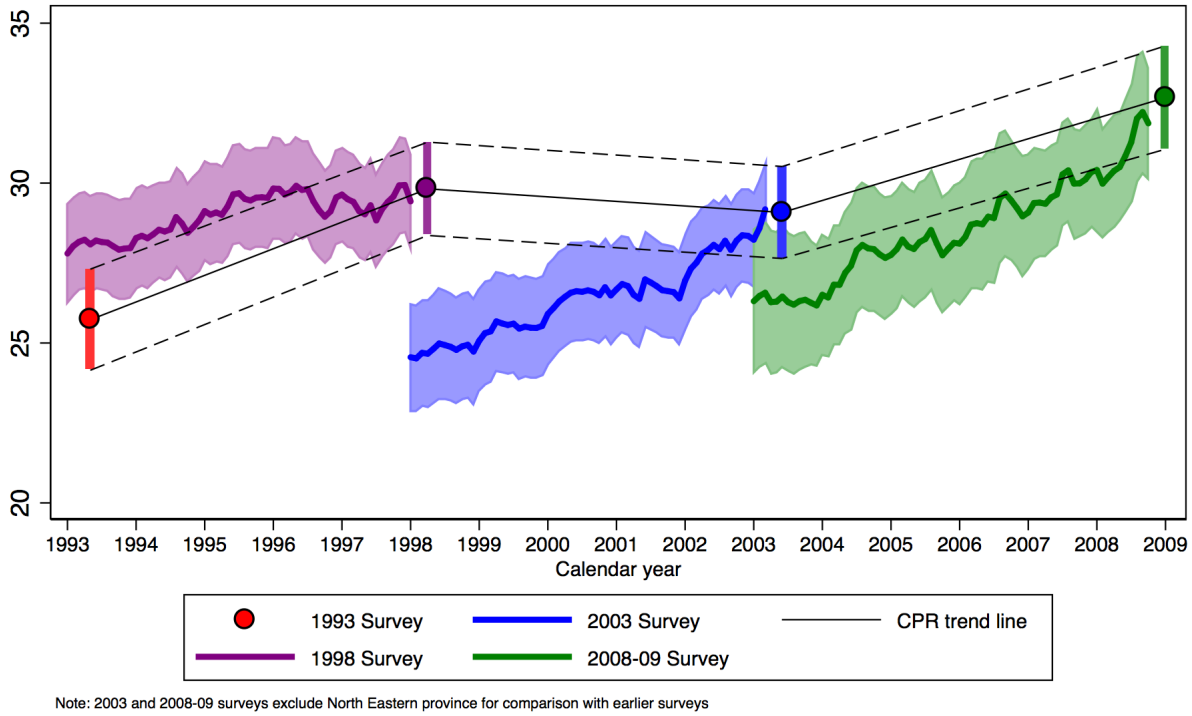
Figure 6: Total contraceptive prevalence rate among women 15-43, Ethiopia



Contraceptive prevalence among women ages 15-43 in the Ethiopia 2000 survey was reported at 6.2 percent, 95% CI 5.6-6.8 (Appendix Table 4). For the same time point from Ethiopia's 2005 calendar data the CPR is reported to be 2 percentage points lower, at 4.2 percent (CI 3.7-4.8) than 2000. This difference was found to be statistically significant and can also be clearly seen in the non-overlapping confidence intervals between the 2000 current status and 2005 calendar data in Figure 6. Although the gap between estimates is only two percentage points, this represents two-thirds of the current status CPR in Ethiopia at the time. Condoms and periodic abstinence appear particularly underreported in the 2005 calendar.

The total CPR in the 2011 calendar data is consistent with the 2005 current status estimate, with CPRs of 11.2 (CI 9.9-12.6) and 10.6 (CI 9.7-11.7) respectively, and also follows the current status CPR trend line precisely. Use of the pill and the lactational amenorrhea method (LAM) are both underreported in the 2011 calendar compared with current status data, but overall the 2011 calendar in Ethiopia appears to capture contraceptive use more accurately than the 2005 calendar.

Figure 7: Total contraceptive prevalence rate among women 15-43, Kenya



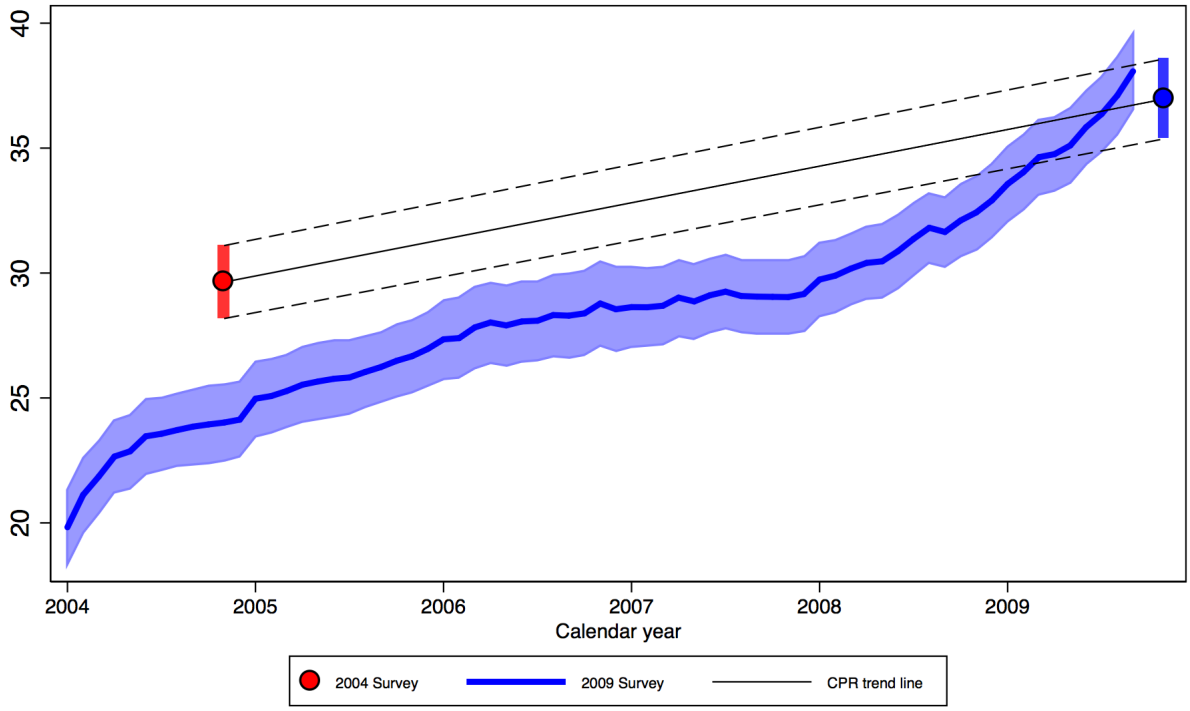
Note: 2003 and 2008-09 surveys exclude North Eastern province for comparison with earlier surveys

Although the confidence intervals from the 1993 current status data (in red) overlap the calendar estimate of CPR from the subsequent calendar (in purple), as do the confidence intervals for the 2003 current status (blue) and 2008-09 calendar (green) estimates, further statistical testing shows that none of the calendars from Kenya appear to accurately capture contraceptive use as reported in current status data. The calendar from 1998 produces a slightly higher CPR than the current status data: 28.2, percent (CI 26.7-29.8) in the calendar vs. 25.7 percent (CI 24.2-27.3) from the 1993 survey (Appendix Table 5). The vast majority of this difference is due to higher reporting of periodic abstinence in the calendar than in the 1993 survey.

The CPR in 1998 estimated from Kenya's 2003 calendar is 6 percentage points lower than the current status estimate for the same time point, with a CPR of 23.8 percent (CI 22.2-25.5) in the calendar versus 29.8 (CI 28.4-31.3) in the current status data. Sterilization, injections, condoms, and periodic abstinence all appear underreported in the 2003 calendar.

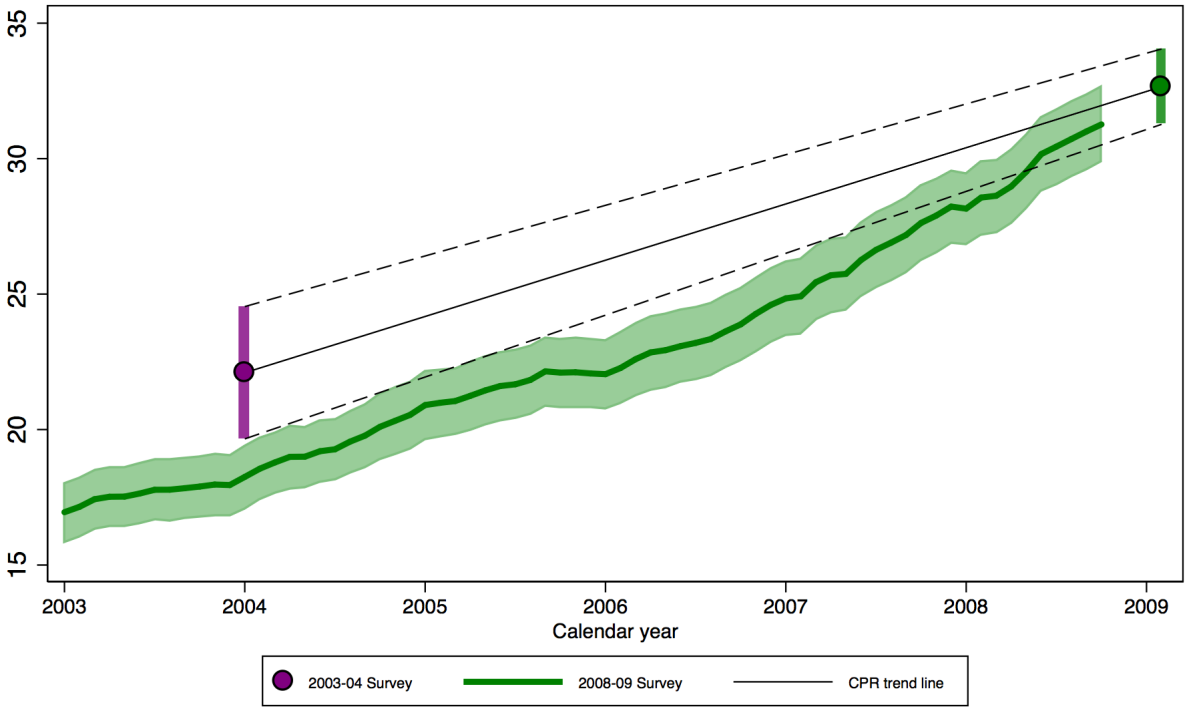
Kenya's current CPR was estimated to be 29.1 percent among women 15-43 in 2003 (CI 27.7-30.5), and 25.9 percent from the 2008-09 calendar (CI 23.8-28.2), which is statistically significantly lower. Much of this difference is due to reporting of periodic abstinence, at 4.6 percent in the current status data and 2.9 percent in the calendar. Surprisingly, given that we generally expect better reporting of long-term methods, both IUD and implant use appear underreported in the 2008-09 calendar, assuming the levels of use in the 2003 current status data are accurate.

Figure 8: Total contraceptive prevalence rate among women 15-43, Lesotho



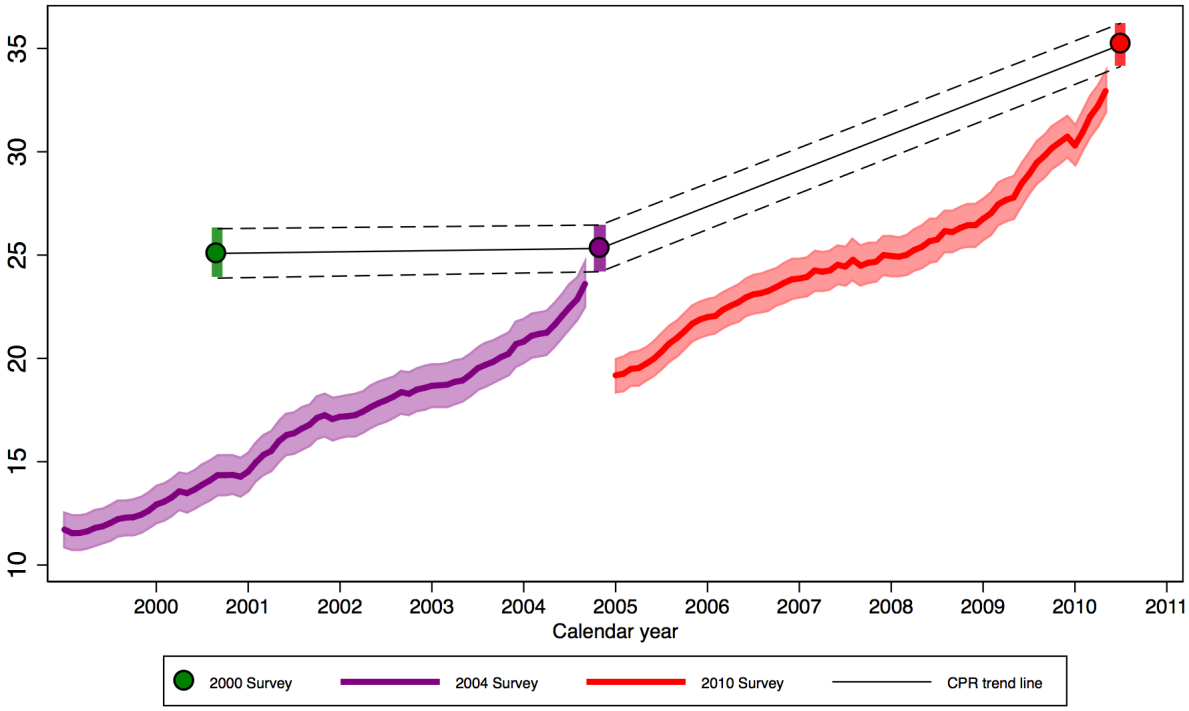
The 2009 Lesotho calendar data CPR for November 2004 is 5.7 percentage points lower than the CPR estimated from 2004 current status data: 23.9 percent in the calendar (CI 22.4-25.4) and 29.6 percent in current status data (CI 28.2-31.1) (Appendix Table 6). The majority of the difference is due to underreporting of injectable use: 11.3 percent in current status data (CI 10.3-12.3) versus 7.8 percent from the 2009 calendar data (CI 6.9-8.7). Pill use and use of "other traditional methods" (other than withdrawal and periodic abstinence) also appear underreported in the calendar compared with the current status data.

Figure 9: Total contraceptive prevalence rate among women 15-43, Madagascar



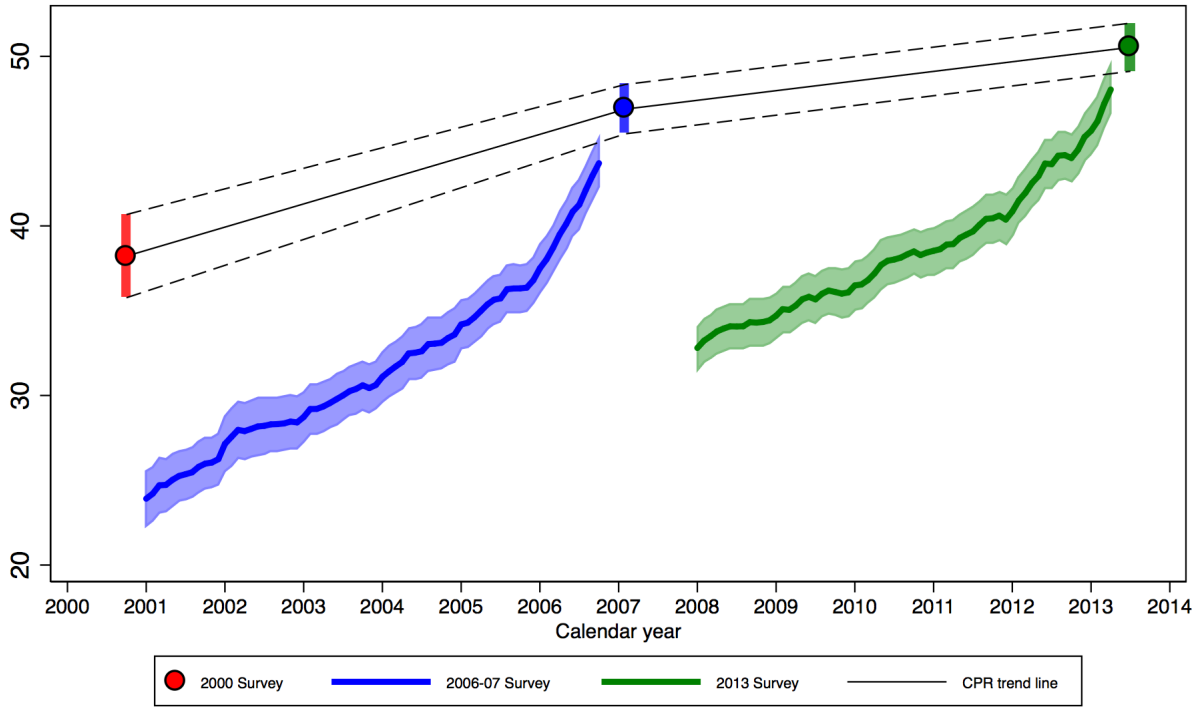
The Madagascar 2008-09 calendar data appear to underestimate contraceptive prevalence in 2004. Twenty-one percent of women ages 15-43 reported current use of contraception in the 2003-04 survey (CI 19.8-24.6), compared with 18.6 percent from the calendar for the same time point (CI 17.4-19.7) (Appendix Table 7). LAM use appears to be underreported, at 1.3 percent in current status data and 0.3 percent in the calendar, as does condom use at 1.2 percent in current status data, and 0.6 percent in calendar data. Neither LAM nor condoms are commonly used in Madagascar.

Figure 10: Total contraceptive prevalence rate among women 15-43, Malawi



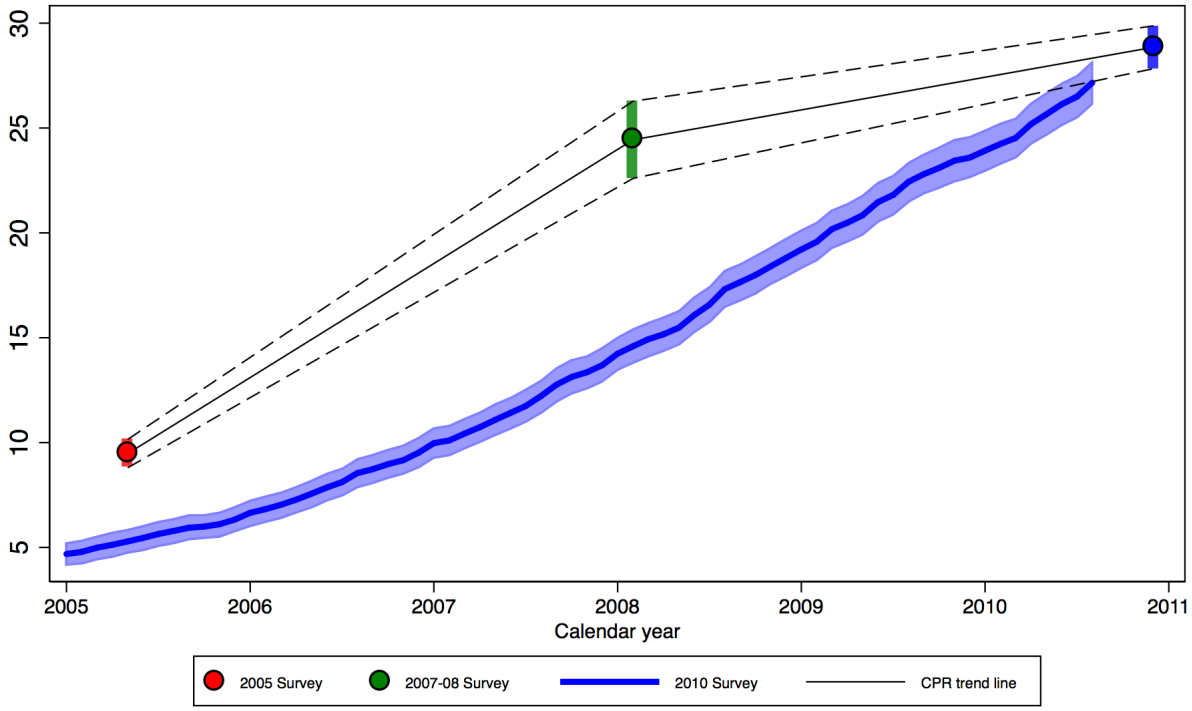
Both the 2010 and 2004 calendars in Malawi appear to underestimate contraceptive use. The gap between current status and calendar data is particularly large in the 2004 calendar: the current-status CPR in 2000 is 25.1 percent (CI 23.9-26.3), while data from the 2004 calendar show only 14.3 percent of women using contraception at that time (CI 13.4-15.4), underestimating the CPR by almost 11 percentage points (Appendix Table 9). This gap indicates that less than 60 percent of contraceptive use in 2000 was captured by the 2004 calendar. The gap between current-status and calendar data is 6.1 percentage points comparing the 2004 and 2010 data, at 25.3 percent (CI 24.2-26.5) and 19.2 percent (CI 18.4-20.0) respectively. In both comparisons, the majority of the gap is due to lower reporting of injectable use in the calendar: 13.5 percent in 2000 current status data versus 7.8 percent in the 2004 calendar, and 14.6 percent in the 2004 current status data versus 11.0 percent in the 2010 calendar. Condom use also appears underreported in both calendars, and pill and periodic abstinence use are also underreported in the 2004 calendar compared with the 2000 current status data.

Figure 11: Total contraceptive prevalence rate among women 15-43, Namibia



Neither of the calendars in Namibia cover precisely the same time period as the prior survey, leaving two months between the median date of the 2000 survey and the beginning of the 2006-07 calendar, and 11 months between the 2006-07 survey and the start of the 2013 calendar. Even so, contraceptive prevalence recorded in the calendar is so far below the current status trend line that it seems clear that the calendar data in Namibia underestimate contraceptive use. The 2000 current status data found a CPR of 38.2 percent (CI 35.8-40.7); the calendar data from the 2006-07 data estimate a CPR 14 percentage points lower at 23.9 percent (CI 22.4-25.5) only two months later (Appendix Table 9), which is clearly implausible. The difference between CPR estimates from the 2006-07 current status data and the 2013 calendar estimate for January 2008 is 14.1 percentage points: 46.9 percent from current status data (CI 45.4-48.3) and 32.8 percent from the calendar (CI 31.6-34.1). In both comparisons, injectables, condoms, and pills appear underreported in the calendar. The two calendars in Namibia capture only 63 to 70 percent of the contraceptive use reported in current status data at nearby time points.

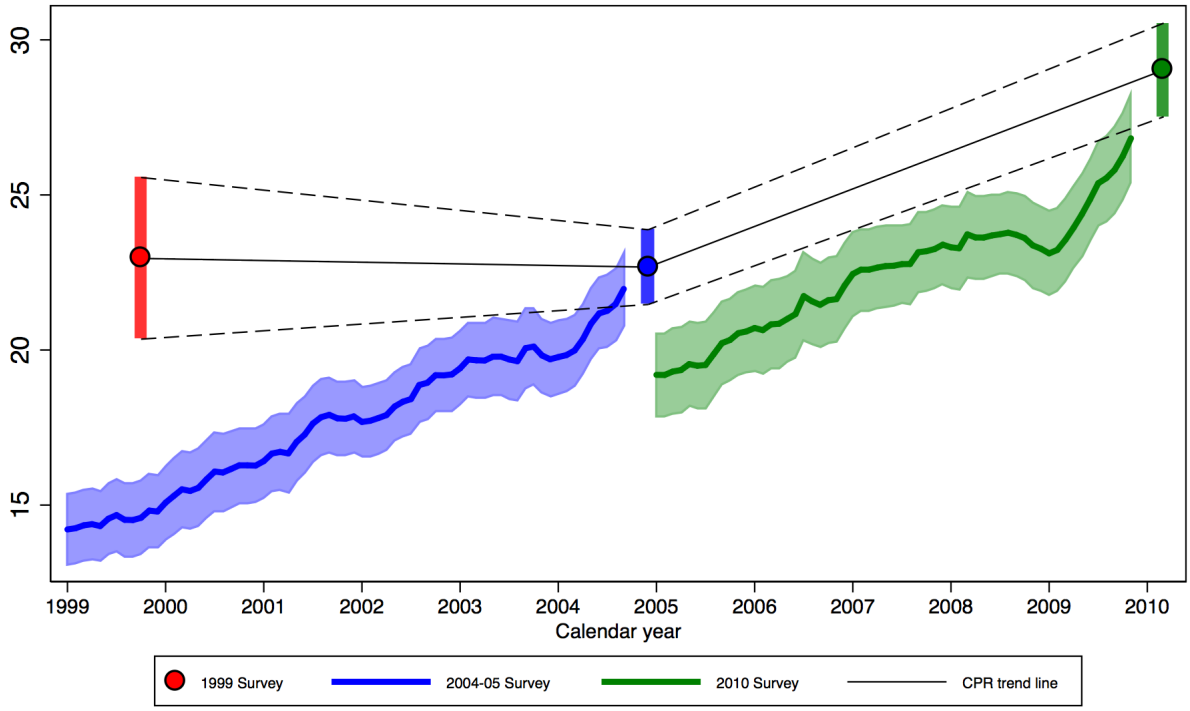
Figure 12: Total contraceptive prevalence rate among women 15-43, Rwanda



Assuming the 2005 and 2007-08 surveys accurately capture current-status contraceptive use, the 2010 calendar underestimates the CPR by 4 percentage points in 2005 and almost 10 percentage points in 2008, underestimating the current status CPR by 44 and 35 percent, respectively[19] (Appendix Table 10). In both comparisons, the majority of the difference is due to underreporting of periodic abstinence in the calendar. Periodic abstinence was reported to be the current method used by 2.3 percent of women in the 2005 survey (CI 2.0-2.6) and 6.0 percent of women in the 2007-08 survey (CI 4.8-7.4). Data from the 2010 calendar show less than 1 percent of women using this method throughout the calendar: 0.6 percent of women using periodic abstinence in May 2005 (CI 0.5-0.8) and 0.9 percent in February 2008 (CI 0.7-1.1). Given that only 2 percent of women reported periodic abstinence as their current method in 2005 and fewer than 1 percent reported using it in the 2010 current status data, it is possible that the method may have been over-reported in the 2007-08 survey. If that is the case, the gap between the 2007-08 current status and corresponding calendar data would be lessened, but calendar data also appear to underestimate pill, condom, and withdrawal use compared with current status data from both the 2005 and 2007-08 surveys.

[19] Calculated as the relative difference between current use and calendar estimates of the CPR. For example, the estimated CPR in 2008 was 22.4 percent in current use data and 14.6 percent in the 2010 calendar (see Appendix Table 10). (22.4 – 14.6) / 22.4 = 34.8 percent, indicating that the calendar-based data underestimate contraceptive use by approximately 35 percent relative to the current use estimate.

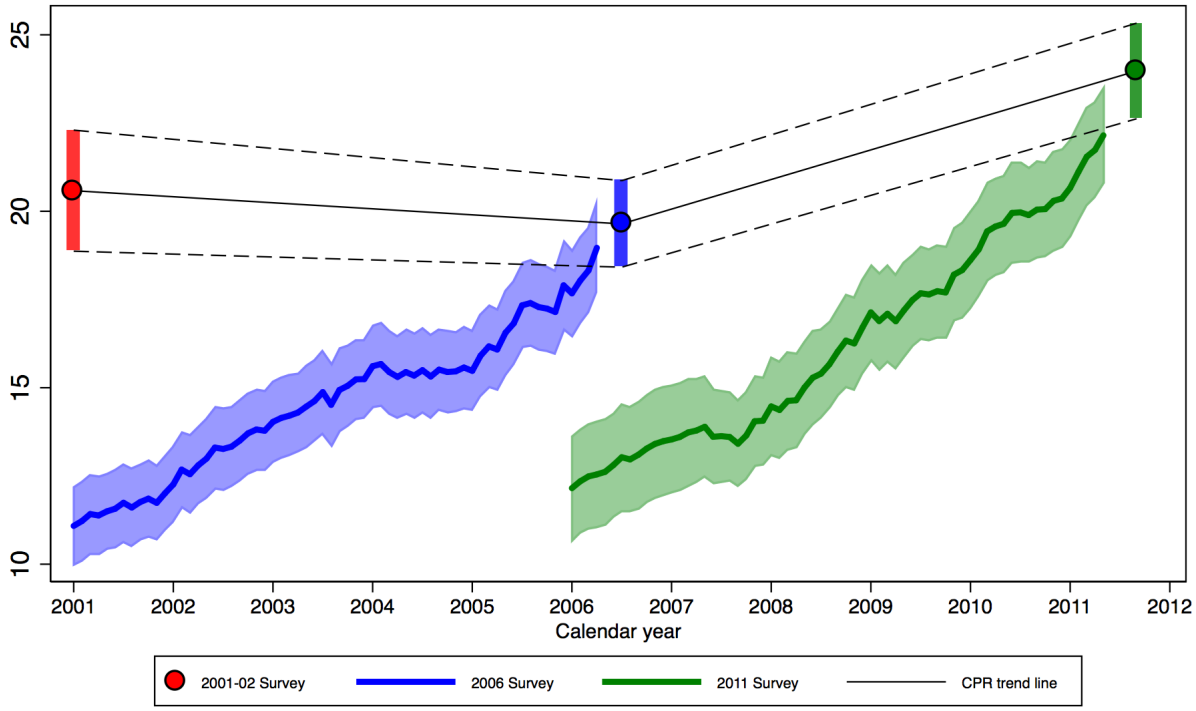
Figure 13: Total contraceptive prevalence rate among women 15-43, Tanzania



The calendars in the 2004-05 and 2010 Tanzania surveys do not appear to accurately capture women's contraceptive use as reported in current status data. The 1999 survey found a CPR of 23.0 percent (CI 20.5-25.7) (Appendix Table 11). The 2004-05 calendar estimates the CPR in 1999 to be 6 percentage points lower, at 14.6 percent (CI 13.4-15.8). The 2010 calendar comes closer to accurately capturing the CPR in 2005: the current status data show a CPR of 22.7 percent (CI 21.5-23.9), while the calendar estimate is 19.2 percent (17.9-20.6).

Condom use appears to be substantially underreported in both calendars: the 1999 estimates were 3.8 percent in current status data and 0.8 percent in the calendar, while the 2005 estimates were 3.3 percent current status data and 1.8 percent in the calendar. Pill use also appears underreported in both calendars, although differences are smaller.

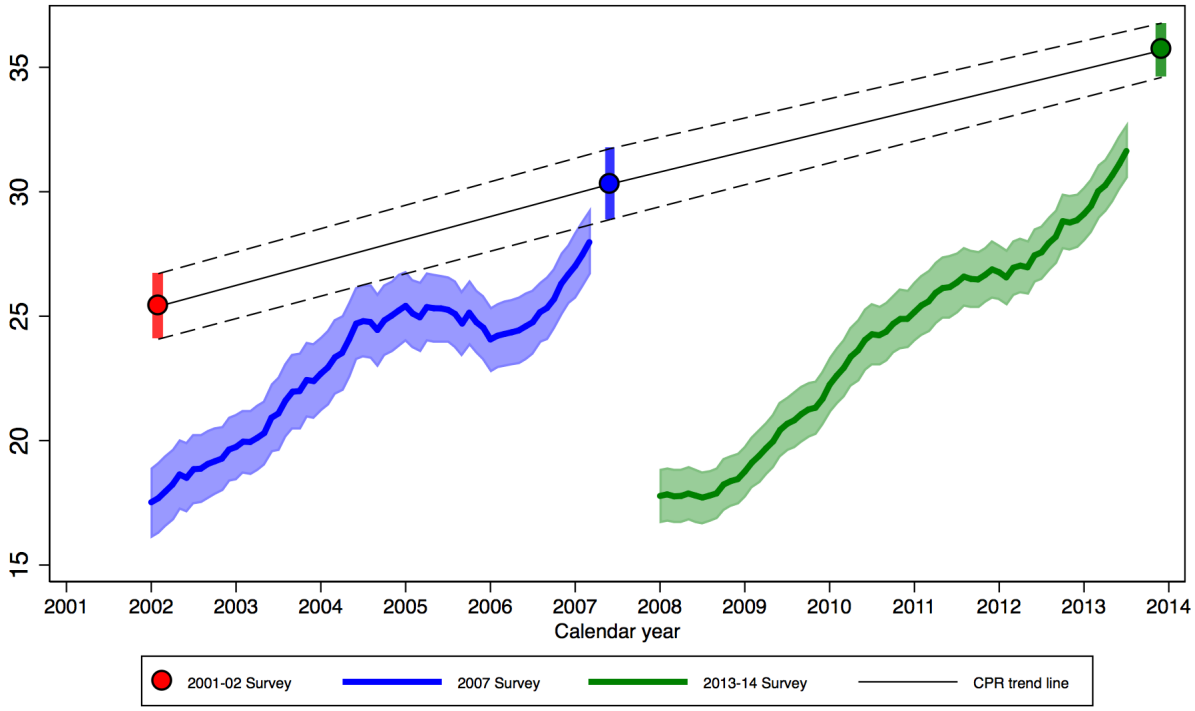
Figure 14: Total contraceptive prevalence rate among women 15-43, Uganda



Both the 2006 and 2011 calendars appear to substantially underestimate contraceptive use in Uganda. The 2006 calendar data show a CPR in 2001 that is 9.5 percentage points lower than the 2001 current status data: the reported CPR is 11.1 percent in the calendar (CI 10.0-12.2) and 20.6 percent from current status data (CI 18.9-22.4) (Appendix Table 12). One-third of this gap is due to very different levels of reported LAM use: 3.2 percent in the 2001 current status data (CI 2.6-4.0) and less than 0.1 percent in the calendar (CI 0.0-0.2). Condom and periodic abstinence also appear underreported in the calendar.

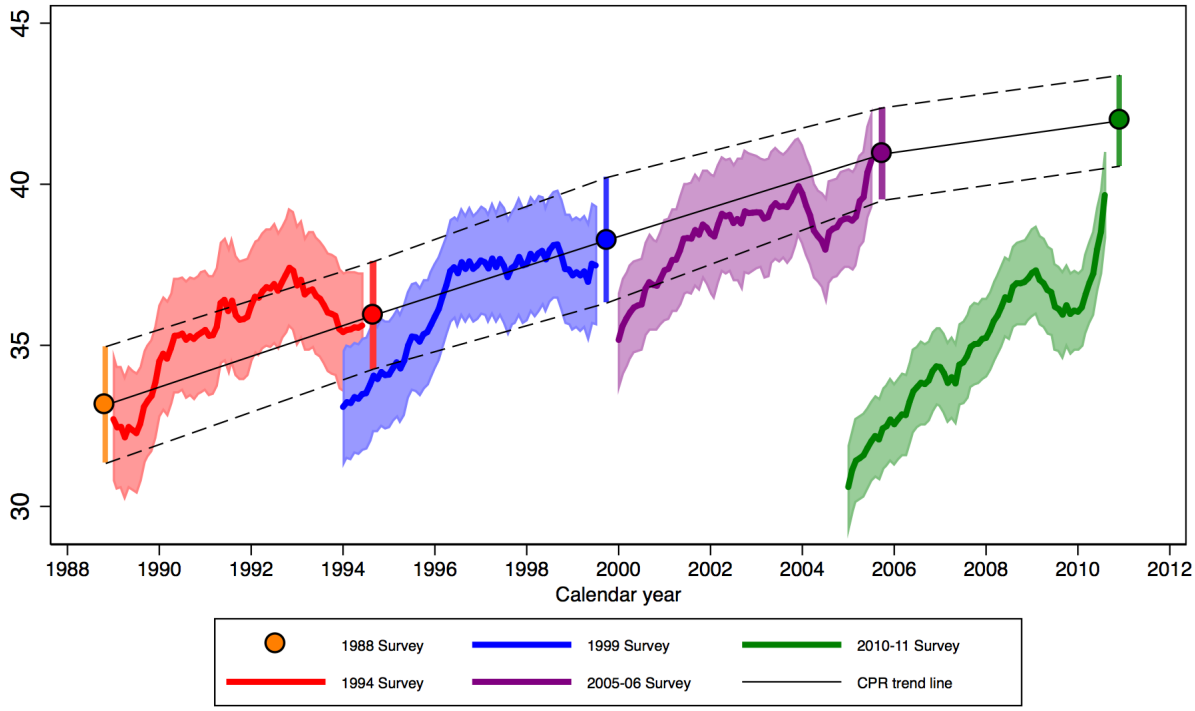
The CPR in 2006 was estimated to be 19.6 percent from current status data (CI 18.4-20.9) and only 13.0 percent from the 2011 calendar data, a difference of 6.6 percentage points. Unlike the 2001 survey, fewer than 0.01 percent of women reported LAM as their current method in 2006. Use of condoms, periodic abstinence, and injectables all appear underreported in the 2011 calendar compared with the 2006 current status data.

Figure 15: Total contraceptive prevalence rate among women 15:43, Zambia



Zambia's calendars from the 2007 and 2013-14 surveys appear to underestimate contraceptive prevalence by 8 and 13 percentage points, respectively (Appendix Table 13). The estimated CPR in 2002 was 25.4 percent (CI 24.1-26.7) from current status data and 17.7 percent (CI 16.3-19.1) from the 2007 calendar. The CPR was estimated to be 30.3 percent (28.9-31.8) in 2007 from current status data; the calendar data show a CPR of 17.8 percent (CI 16.7-18.9) in January 2008. A large part of the discrepancy between the calendar and current status data in both cases is underreporting of condom use in the calendar: the 2002 condom use estimate was 4.3 percent in current status data but 1.8 percent in the calendar, and the 2007 estimate was 5.3 percent in current status data while the calendar estimate was 1.5 percent for the corresponding time point. Withdrawal and injectable use also appear underreported in both calendars, and periodic abstinence and LAM additionally appear to be underreported in the 2013-14 calendar.

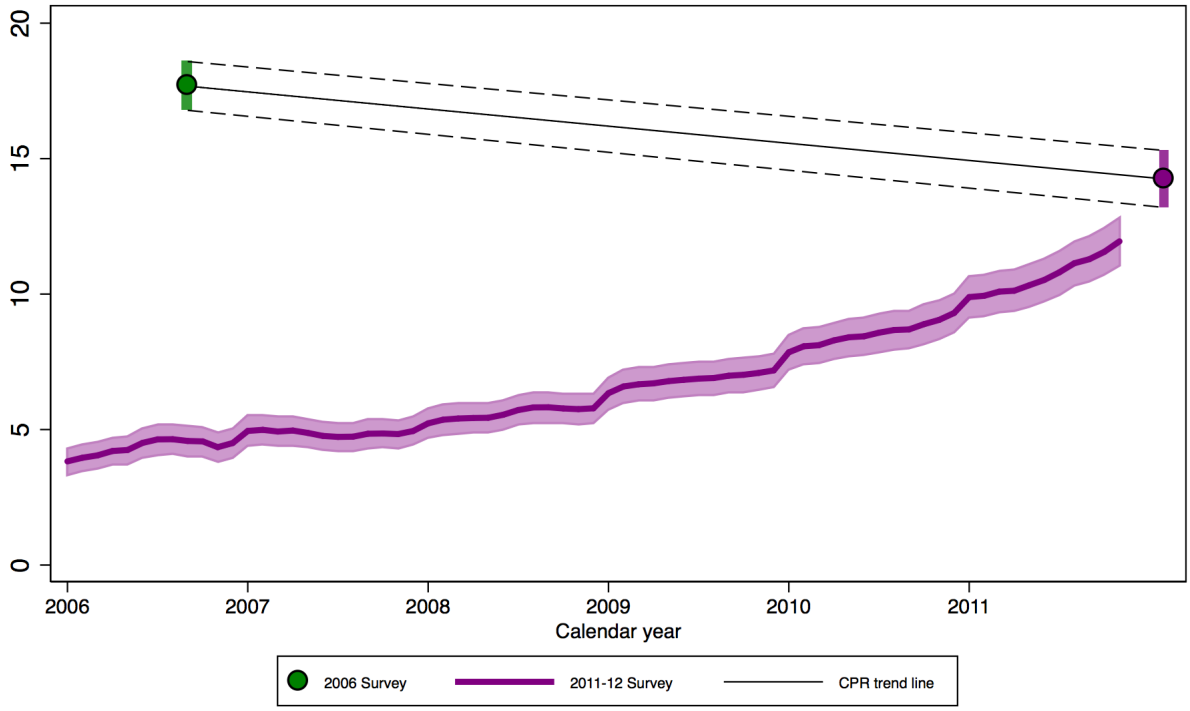
Figure 16: Total contraceptive prevalence rate among women 15-43, Zimbabwe



Zimbabwe's calendar data from the 1994 survey matches up remarkably well with the 1988 current status data: the total CPR is 33 percent in both estimates (Appendix Table 14). The method mix recorded in the calendar and current status data are also very similar. The 1999 and 2005-06 calendars also match up reasonably well with current status data from the prior surveys, although not as precisely as the 1994 survey. Condom and withdrawal use appear underreported in both calendars, although neither method is widely used enough to substantially affect the total CPR. Zimbabwe's history of what appears to be quite accurate calendar data makes the results from the 2010-11 calendar all the more surprising. The 2010-11 calendar data produce an estimate of 32.4 percent for the CPR in October 2005 (CI 31.2-33.7) – an 8.5 percentage point drop from the 2005-06 current status estimate of 40.9 percent (CI 39.5-42.4), or a one-third decrease. The majority of the difference is in reported pill use, although injectable use also appears to be underreported in the 2010-11 calendar.

The striking difference between the first three calendars and the fourth prompted us to search for differences between the surveys. The 1988, 1994, 1999, and 2005-06 DHS surveys were all conducted using paper questionnaires. The 2010-11 survey was implemented using Computer Assisted Personal Interviews (CAPI), in which PDAs or tablet computers are used to display questions to the interviewer and record responses. The DHS Survey Organization Manual notes that CAPI has advantages and disadvantages compared with paper questionnaires (ICF International 2012). With CAPI, interviewers do not have a visual depiction of the calendar shown in Figure 5. It seems possible that interviewers found the calendar more difficult to complete without this visual aid and may not have followed the instructions to prompt women to recall all of their contraceptive use episodes throughout the calendar period. It is also possible that field staff were less comfortable with the computer technology than they had been with paper surveys.

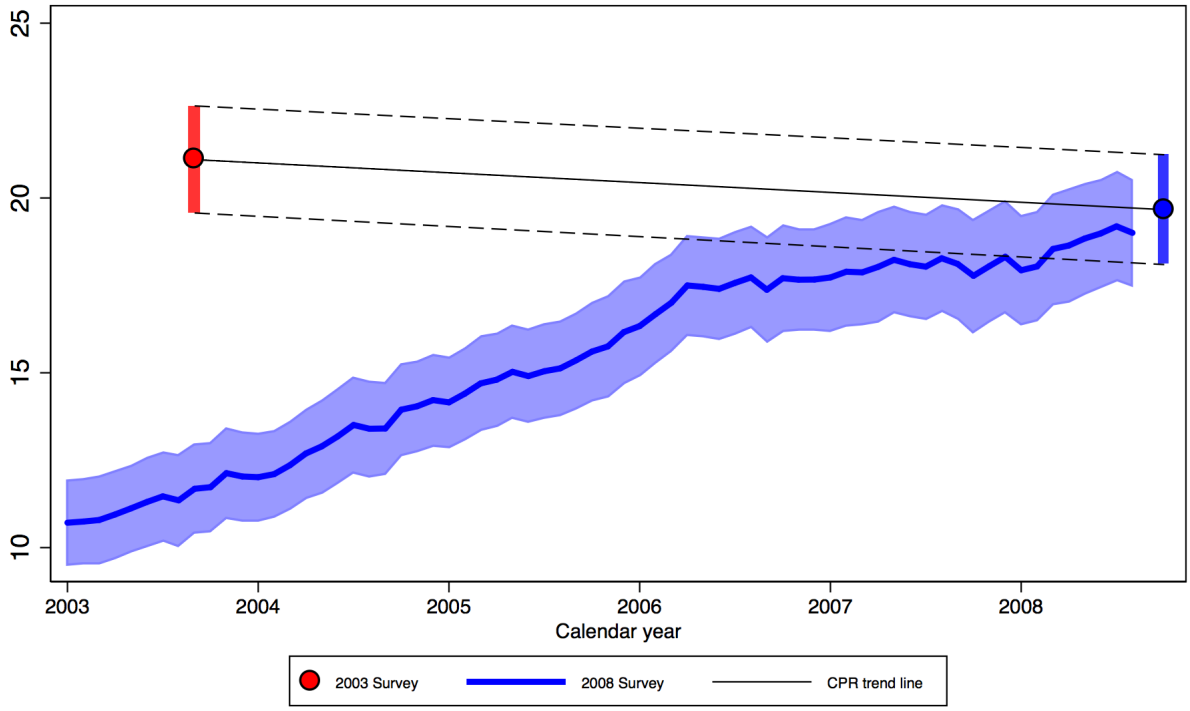
Figure 17: Total contraceptive prevalence rate among women 15-43, Benin



The 2011-12 calendar data clearly appear to underestimate contraceptive use in Benin. The total CPR is difficult to compute for the calendar data because there were episodes in the calendar recorded as "unknown if using." We calculated a "high" and "low" estimate of the total CPR: excluding the "unknown" episodes gives a CPR of 4.6 (CI 4.1-5.2); counting them all as contraceptive use gives a CPR of 6.9 (CI: 6.2-7.7) (Appendix Table 15). Even this "high" estimate is less than half the reported CPR from current-status data in 2006: 17.7 percent (CI: 16.8-18.6).

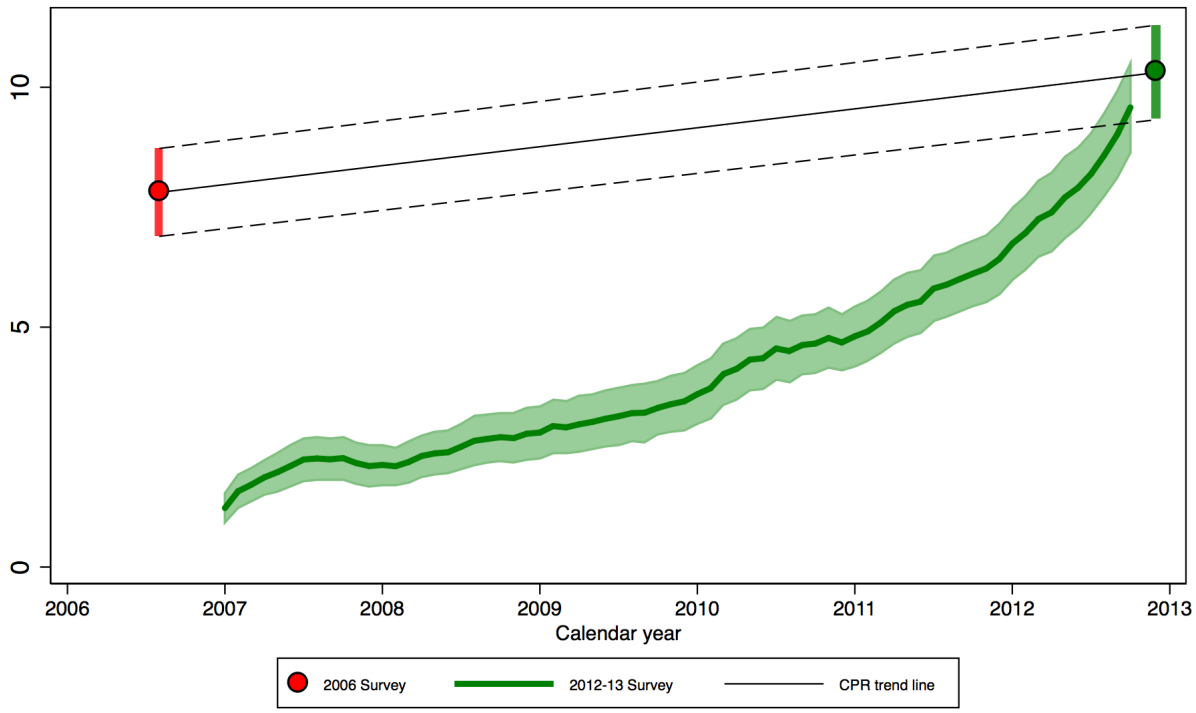
Figure 17 also displays heaping of reporting at the start of each year, most noticeable in the bumps corresponding to the starts of 2009, 2010, and 2011. This relates to heaping of the reported dates when the woman began using her most current method. In examining the underlying data, we found that 25 percent of episodes of current use were reported to have begun in the month of January. If, as seems reasonable, the start dates of women's contraceptive use were evenly distributed across the year, we would only expect 1/12, or 8.3 percent of episodes to have begun in any particular month. This finding very likely indicates heaping of reported start dates on the month of January.

Figure 18: Total contraceptive prevalence rate among women 15-43, Ghana



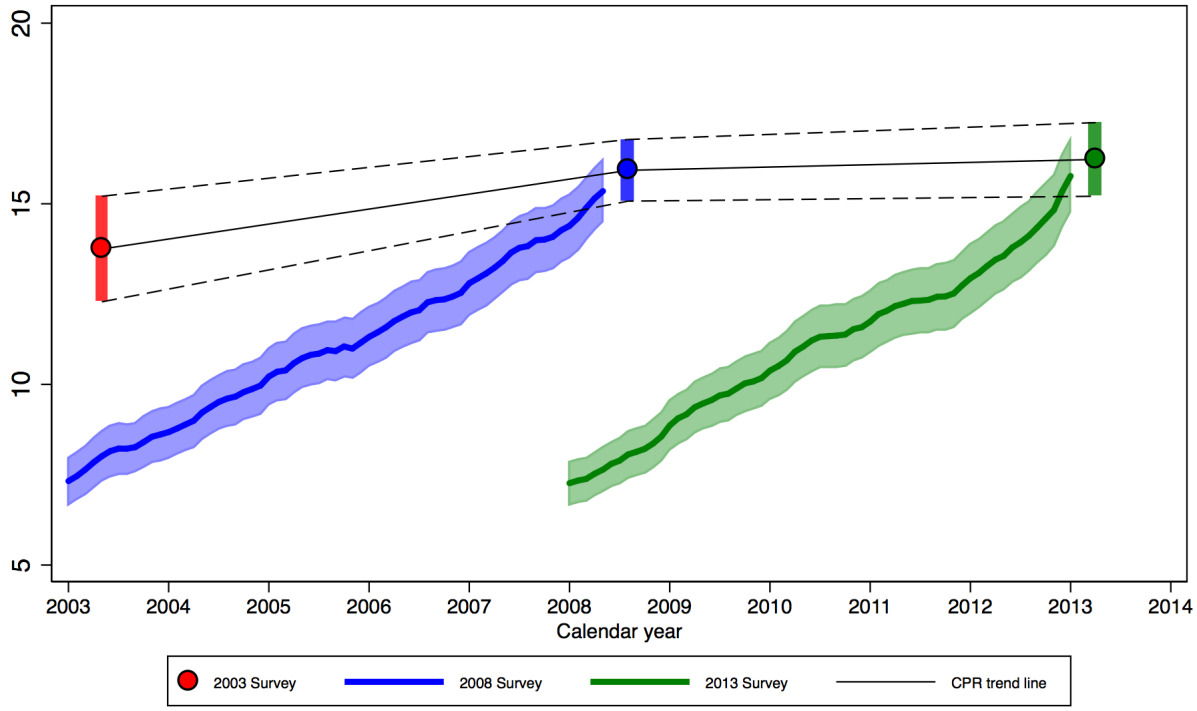
The estimated CPR from Ghana's 2008 calendar for 2003 is 11.7 percent (CI 10.5-13.0), while the 2003 current status data estimate is 9.4 percentage points higher at 21.1 (CI 19.6-22.7), suggesting that the 2008 calendar captured only about 55 percent of women's contraceptive use in 2003 (Appendix Table 16). The calendar does not appear to accurately capture women's contraceptive use, especially farther back in time. Condom, pill, injectable, periodic abstinence, and LAM use all appear to be substantially underreported in the calendar.

Figure 19: Total contraceptive prevalence rate among women 15-43, Mali



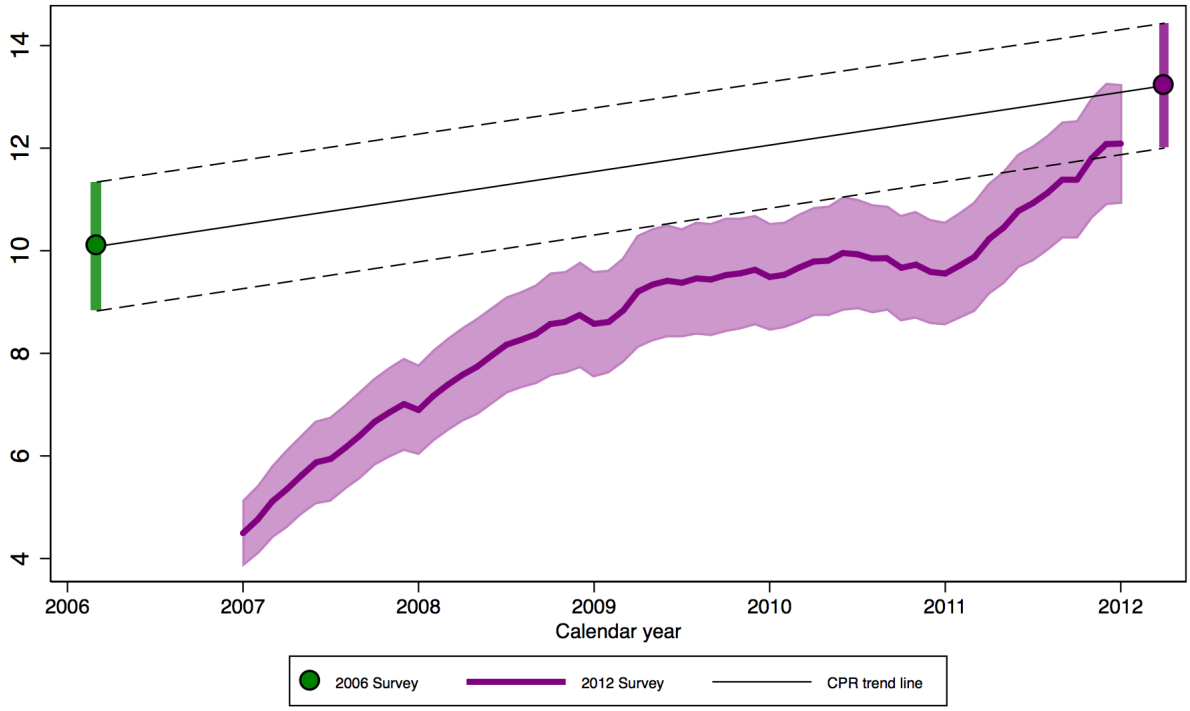
Mali's 2012-13 calendar begins in January 2007, four months after the median date of the 2006 survey, so the surveys do not precisely overlap. Given that the two current status survey points show the CPR increasing over time, however, it is highly unlikely that the CPR dropped from 7.8 percent in August 2006 (CI 6.9-8.8) to 1.5 percent (CI 1.2-1.8) four months later (Appendix Table 17). The 2012-13 calendar data appear to underestimate women's contraceptive use in 2007 by approximately 81 percent.

Figure 20: Total contraceptive prevalence rate among women 15-43, Nigeria



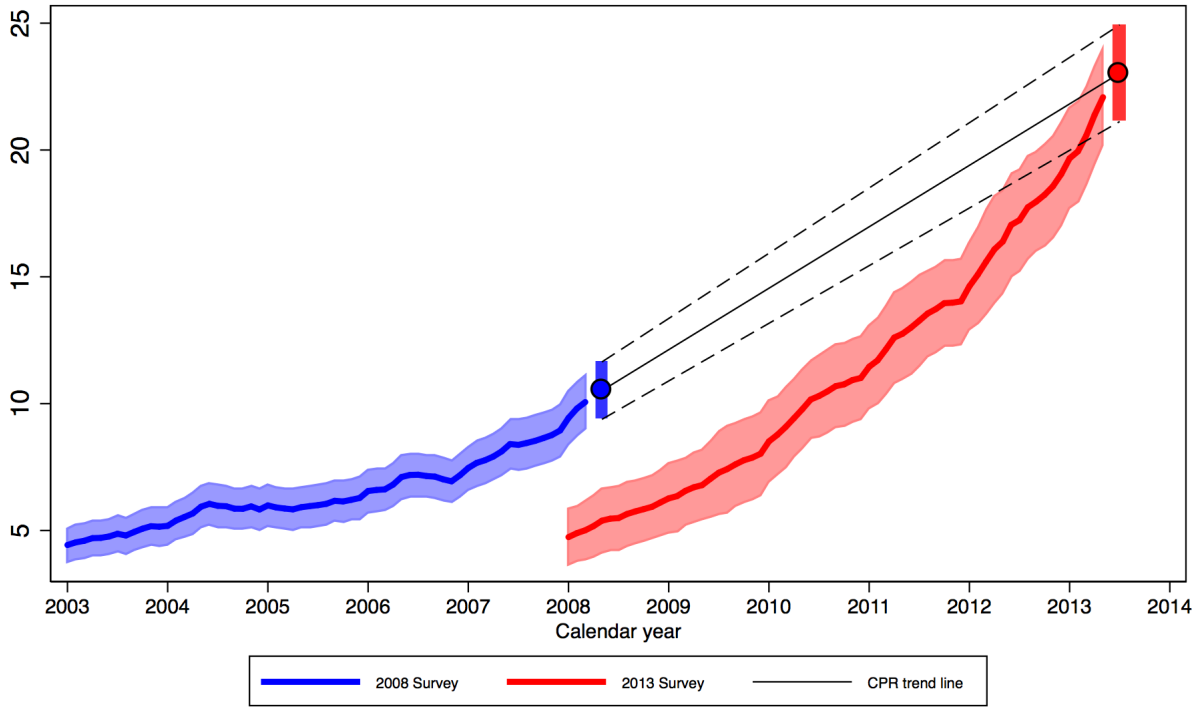
Both the 2008 and 2013 Nigeria calendars appear to substantially underestimate contraceptive use. The current status CPR in 2003 is estimated at 13.7 percent (CI 12.4-15.3) (Appendix Table 18). The calendar data for the same point shows the CPR to be only 8.0 percent (CI 7.4-8.7), 42 percent lower than the current status estimate. The 2013 calendar appears to underestimate contraceptive use to a higher degree than the 2008 calendar: the current status CPR for 2008 is 15.9 percent (CI 15.1-16.8), while the calendar estimate is almost 8 percentage points lower, at 8.1 percent (CI 7.4-8.7), or about half of the current status estimate. Condoms, pills, injectables, periodic abstinence, and LAM appear underreported in both calendars, and withdrawal appears underreported in the 2013 calendar compared with the 2008 current status data.

Figure 21: Total contraceptive prevalence rate among women 15-43, Niger



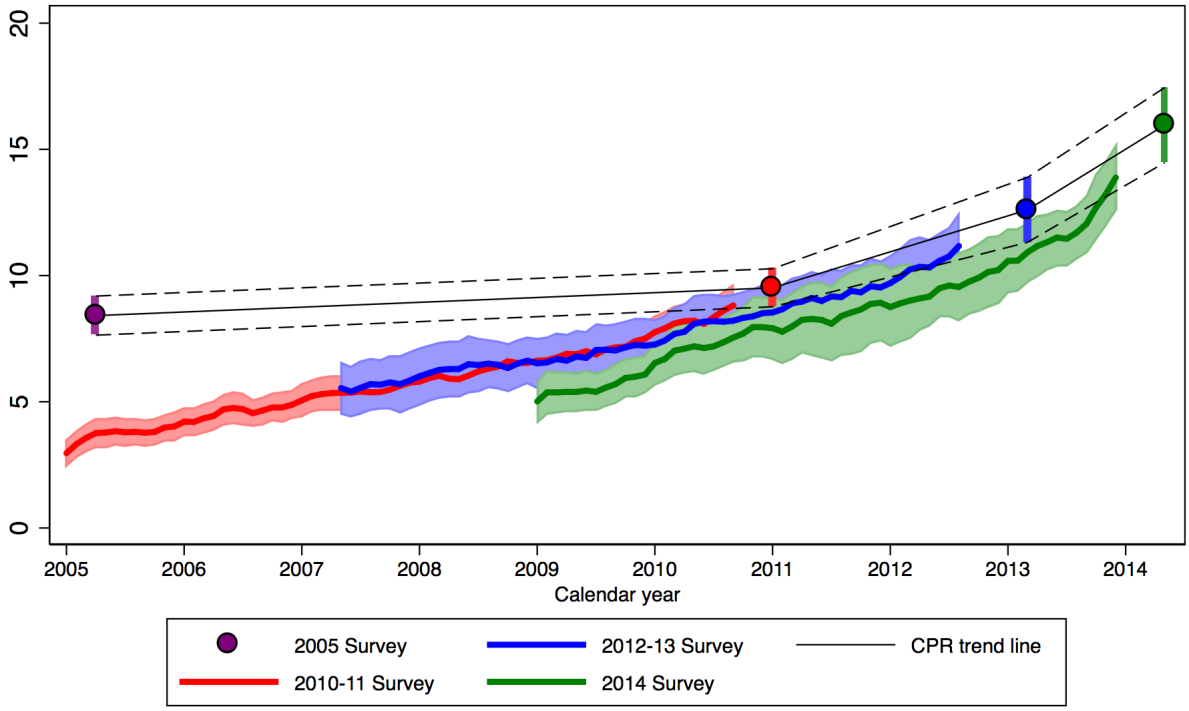
The Niger 2012 calendar does not cover the year 2006, so we cannot precisely compare the calendar and current status data from the same date. Even so, the calendar appears to show substantial underreporting of contraceptive use compared with the linear interpolation between the two current status estimates shown by the current status CPR trend line. Ten percent of women 15-43 in the 2006 survey reported they were using contraception (CI 8.9-11.4), while the calendar from the 2012 survey produces a CPR of 4.5 percent (CI 3.9-5.2) for January 2007, less than half of the 2006 current status CPR (Appendix Table 19). The prevalence of each method is lower in the calendar than the current status data for 2006, but the difference is particularly pronounced for LAM. LAM prevalence was reported to be 4.2 percent in 2006 and only 1.1 percent in January 2007 in the calendar.

Figure 22: Total contraceptive prevalence rate among women 15-43, Sierra Leone



Sierra Leone's CPR was estimated to be 10.5 percent at the time of the 2008 survey (CI 9.4-11.7) (Appendix Table 20). This is 5 percentage points higher than the 2008 CPR estimated from the 2013 calendar, at 5.4 percent (CI 4.3-6.8), representing just over half of the current status CPR. All methods other than withdrawal, which is reported at less than 0.3 percent prevalence in both the calendar and current status data, appear to be underreported in Sierra Leone's 2013 calendar.

Figure 23: Total contraceptive prevalence rate among women 15-43, Senegal

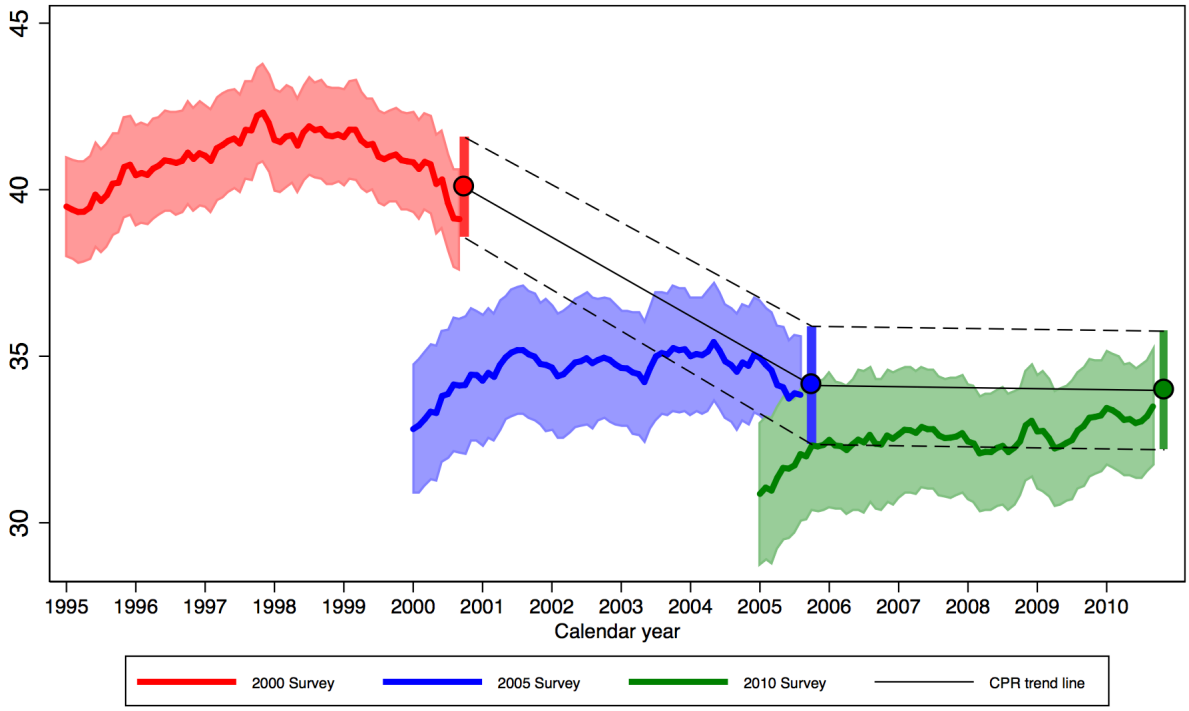


Senegal is the second country to implement a continuous DHS, in which data are collected in consecutive rounds every year. The continuous survey began in Senegal in 2010 after having been first implemented in Peru in 2004.

The calendar data from the Senegal continuous survey appear to estimate contraceptive use reasonably well in recent years, but all three rounds of the continuous survey seem to underestimate contraceptive use further back in time. The 2005 Senegal DHS found a CPR of 8.4 percent (CI 7.7-9.2 percent) compared with the 2010-11 calendar estimate of 3.8 percent (CI 3.3-4.3) in 2005, which is less than half of the current status estimate (Appendix Table 21). Pills, injectables, condoms, periodic abstinence, and sterilization all appear to be underreported in the 2010-11 calendar compared with the 2005 current status reports.

The current status CPR trend line shown in black simply connects the current status point estimates and is not based on any additional data, so we cannot say with confidence that contraceptive use in the period 2006-2010 is underestimated by the 2010, 2012-13, and 2014 Senegal calendars. It seems unlikely, however, that contraceptive use in Senegal was 8.4 percent in 2005 and increased to 9.5 percent in 2011, but dropped to less than 6 percent between those two points. We therefore find it unlikely that the Senegal calendars adequately captured contraceptive use during this period.

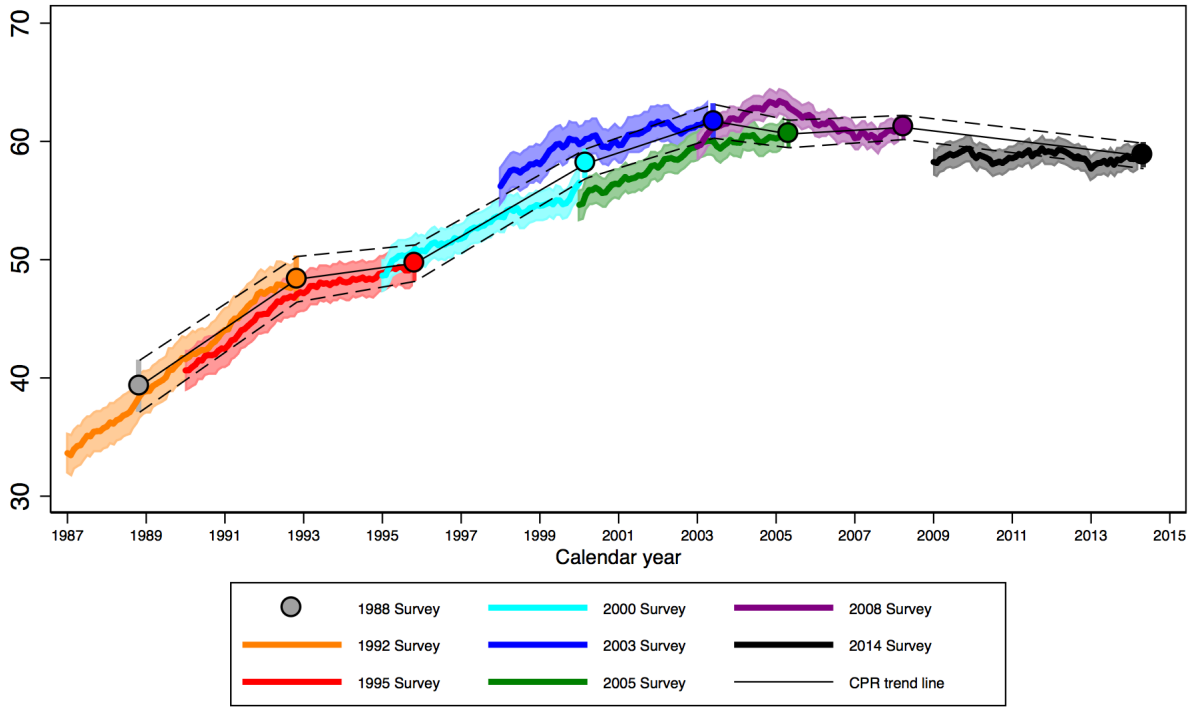
Figure 24: Total contraceptive prevalence rate among women 15-43, Armenia



The Armenia 2010 survey seems to capture most, if not all, contraceptive use in the calendar period. The 2005 CPR was estimated at 34.1 percent in the 2005 survey (CI 32.4-35.9) and 32.3 percent (CI 30.4-34.3) in the calendar data (Appendix Table 22). Most of the difference is explained by lower reporting of LAM, withdrawal, and "other traditional methods" in the 2010 calendar compared with the 2005 current status data, although condom use also appears to be underreported.

The Armenia 2005 calendar appears to underestimate contraceptive use more substantially compared with the earlier survey. The 2000 CPR was estimated at 40.1 percent in the 2000 survey (CI 38.6-41.6) and 34.1 percent (CI 32.1-36.2) in the calendar data. Reporting of withdrawal and LAM use are lower in the calendar data than the current status data. Surprisingly, IUD and sterilization use also appear underreported in the 2000 calendar compared with the current status data: 6.3 percent of women reported IUD use in current status compared with 5.0 percent in the calendar; 1.4 percent reported sterilization in the current status data compared with 0.4 percent in the calendar. This is surprising, as we expect reporting to be more consistent for long-term and permanent methods than short-term ones, and is unlike the results for most other countries.

Figure 25: Total contraceptive prevalence rate among currently married women 15-43, Egypt

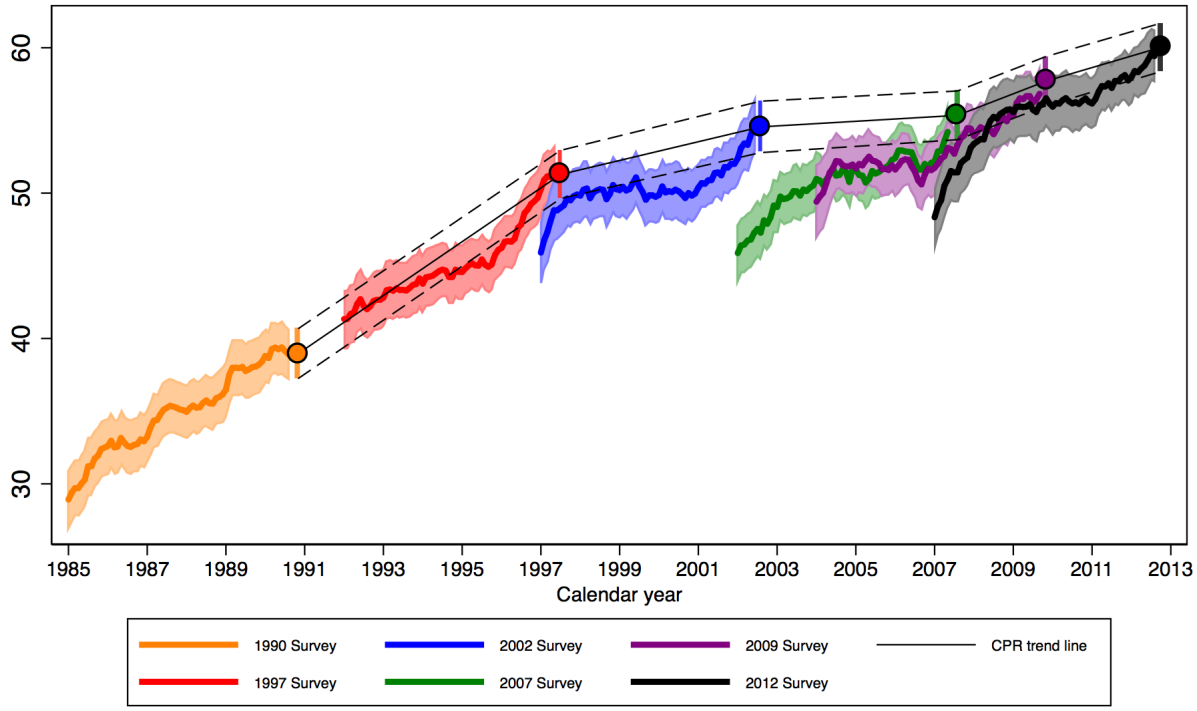


Contraceptive use as reported in the eight Egypt surveys presented here, seven of which contain calendar data, is remarkably consistent. Covering the time period from 1987 to 2014, the multiple calendars track contraceptive prevalence almost perfectly over time, with the vast majority of the calendar data points falling within the confidence intervals around the current status data points. The calendar in the 2003 survey appears to slightly overestimate contraceptive prevalence: the 2000 CPR from current status was reported to be 58.1 percent (CI 56.9-59.4), while the CPR from the 2003 calendar is two percentage points higher, at 60.1 percent (CI 58.7-61.6) (Appendix Table 23). We compared the current status estimates to each calendar that contained the same time point, so the 2000 current status estimate shown in Figure 27 was compared with the 2003 (dark blue) and 2005(green) calendars. In these comparisons, there were several statistically significant differences between the current status and calendar CPRs, but because Egypt's CPR is so high each difference represented only a 3-5 percent difference in the overall CPR.

Condom use appears underreported in almost every calendar in Egypt. Comparisons of the calendar data for January 2009 from the 2014 calendar (shown in black) and the current status data from 2008 (shown in purple) suggest additional underreporting of IUD use and overreporting of pill and injectable use in the 2014 calendar, although it could be possible that use patterns changed in Egypt between 2008 and 2009.

Aside from the exceptions noted above, all other contraceptive methods appear to be consistently reported in the Egypt calendars. The overall consistency of calendar in Egypt is impressive.

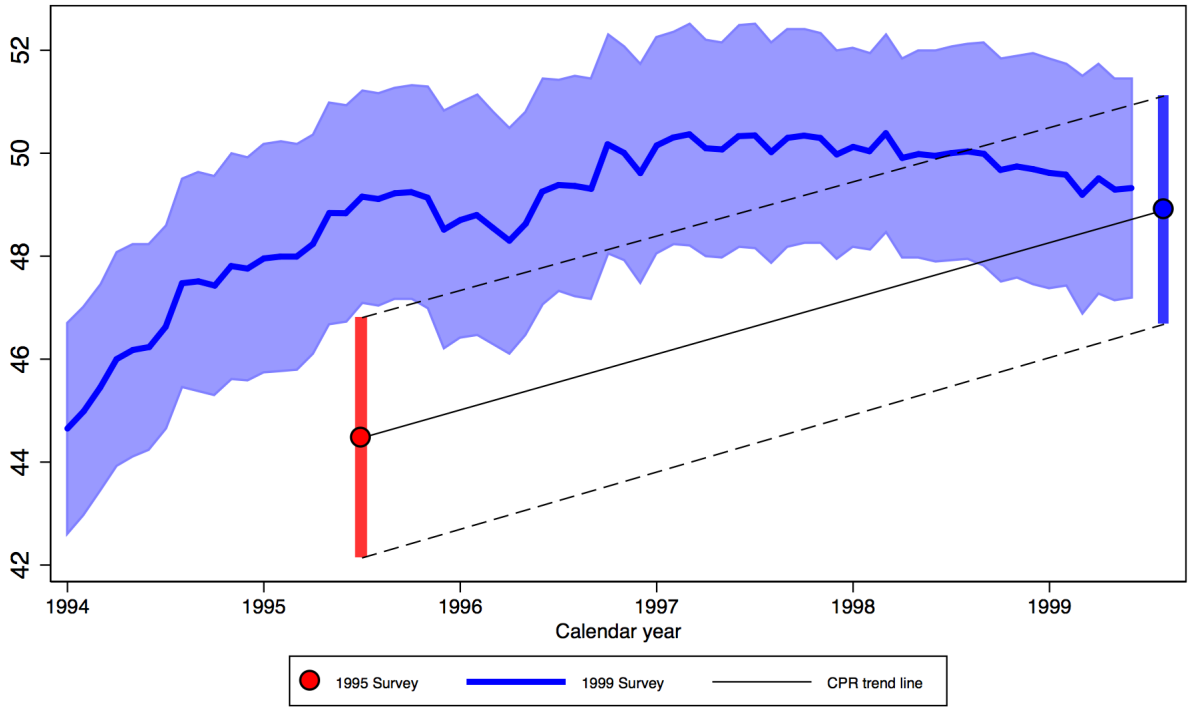
Figure 26: Total contraceptive prevalence rate among ever-married women 15-43, Jordan



Jordan's 2002 calendar, shown in blue in Figure 28, appears to accurately capture contraceptive use in 1997, as compared with current status data. The 1997 (red) calendar also appears to fit with the trend suggested by the 1990 (orange) data, although the 1997 calendar did not collect data as far back as 1990.

In contrast to the earlier calendars, Jordan's 2007, 2009, and 2012 calendars all show evidence of underreporting, especially in the early years of each calendar. For example, the 2002 current status CPR estimate is 54.6 percent (CI 52.8-56.3), while the estimate from the 2007 calendar (green) is 47.3 (45.4-49.1) (Appendix Table 24). IUD, condom, periodic abstinence, and LAM use all appear underreported in the 2007 calendar compared with the 2002 current status data. The 2009 calendar (purple) aligns closely with the 2007 data with a total CPR of 53.3 in the calendar and 55.4 in the 2007 current use data, but the reported prevalence in the 2009 calendar decreases going further back in time, falling below 50 percent in 2004, which is unlikely to be accurate. The 2012 calendar data (black) follow a similar path back in time, aligning well with the 2009 current status data, falling slightly below the 2007 current status data, and dropping to 50 percent by January 2007.

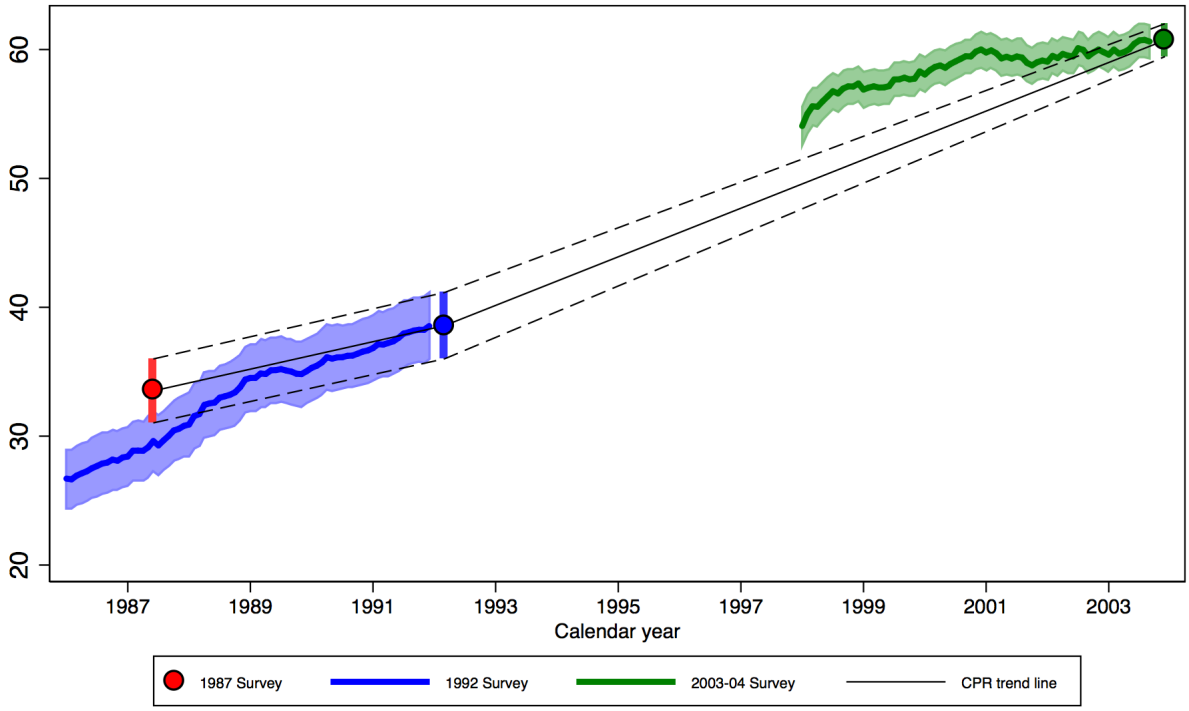
Figure 27: Total contraceptive prevalence rate among women 15-43, Kazakhstan



Kazakhstan's 1999 calendar seems, surprisingly, to overestimate the CPR compared with the 1995 survey. The 1995 current status CPR is 44.5 (CI 42.2-46.8), while the 1999 calendar estimate is 48.1 (CI 46.0-50.3) for the same time point (Appendix Table 25). The difference is primarily due to what seems to be overreporting of IUD and sterilization use in the calendar versus the current status data. IUD use was reported at 29.1 percent in the 1995 current status data versus 33.6 percent in the calendar, and sterilization was reported at 0.5 percent current status versus 1.5 percent in the calendar.

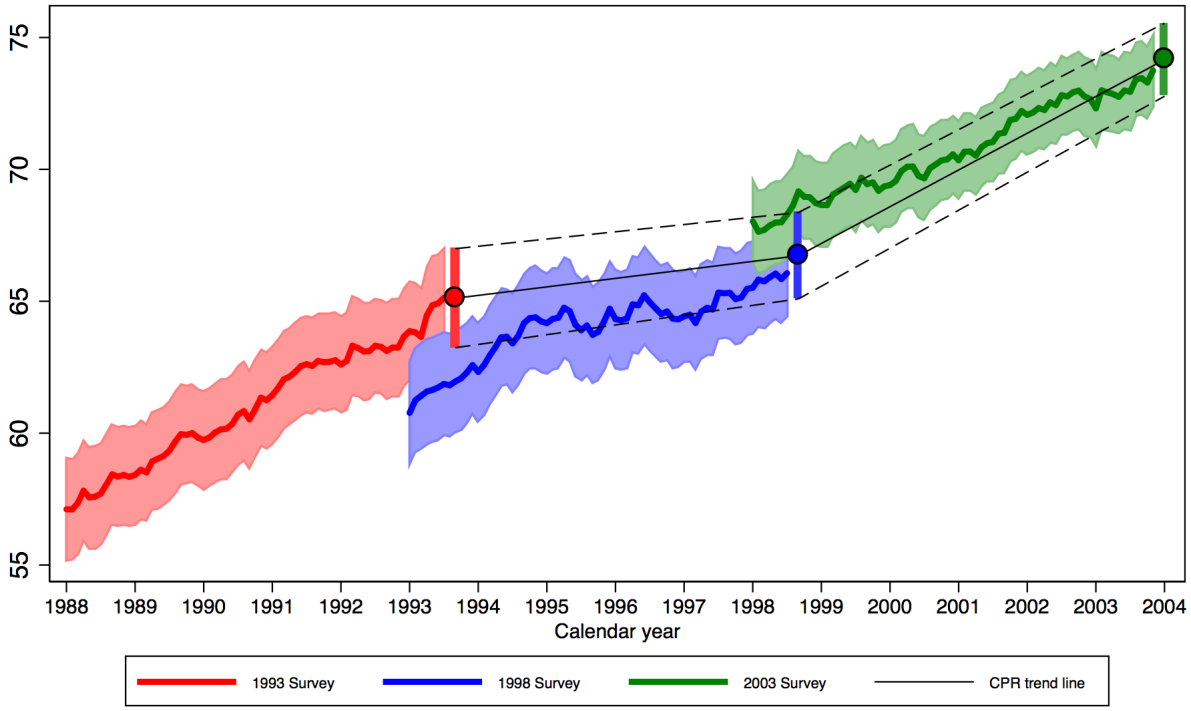
A possible explanation for this surprising discrepancy is that our assumption that the populations of women interviewed in the 1995 and 1999 surveys were the same was violated. The Kazakhstan 1999 DHS final report notes that 472,273 people were recorded as having migrated out of the country in 1998, which represents almost one-third of the country's estimated population of 14.9 million (Academy of Preventive Medicine [Kazakhstan] and Macro International Inc. 2000, p. 1). Such large and rapid changes in the country's population make it likely that the populations interviewed in 1995 and 1999 were, in fact, different. This is a likely explanation for the seeming discrepancies in the calendar and current-status data.

Figure 28: Total contraceptive prevalence rate among ever-married women 15-43, Morocco



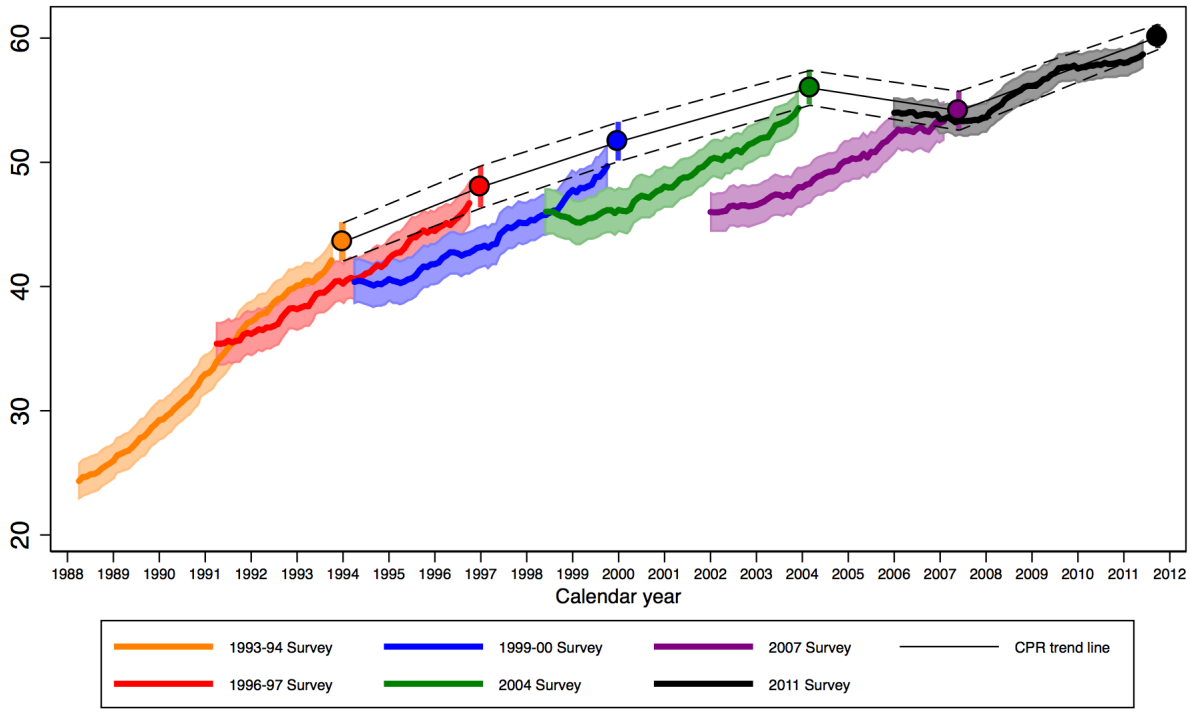
The 2003-04 Morocco survey was implemented more than 11 years after the 1992 survey was conducted. We cannot therefore compare the 2003-04 calendar data to the earlier surveys and have included the later survey in Figure 30 only to give a sense of the general trend in the CPR. The 1992 survey appears to underestimate the 1989 CPR: the 1989 current status CPR estimate is 33.4 percent (CI 31.0-35.9) and the calendar estimate is 29.7 percent (CI 27.3-32.1) (Appendix Table 26). The only methods that are reported at significantly different levels are withdrawal, reported at 2.9 percent in the current status data and 1.8 percent in the calendar, and "other traditional methods," reported at 1.2 percent in the current status data and 0.4 percent in the calendar. All other contraceptive methods appear to be adequately captured in the calendar.

Figure 29: Total contraceptive prevalence rate among currently married women 15-43, Turkey



The CPRs estimated from Turkey's 1998 survey are lower than those recorded in the 1993 current status data and the 2003 calendar. The magnitude of the differences, although statistically significant, is small in both absolute and relative terms. The 1993 survey current-status CPR estimate is 65.1 (CI 63.2-67.0), and the estimate for the same time point from the 1998 calendar is 62.0 (CI 60.0-63.8)—a difference of 3.2 percentage points representing 4.8 percent of the total CPR (Appendix Table 27). Reporting of withdrawal and condom use are both lower in the 1998 calendar than in the 1993 current status data for the same time point. The CPR estimates for 1998 are 66.7 percent in the current status data (CI 65.1-68.3) and 69.2 in the 2003 calendar (CI 67.6-70.7), a difference of 2.4 percentage points or 3.6 percent of the total CPR. The only contraceptive method reported at statistically significant levels between the two data sources is LAM, which was not captured at all in the 1998 survey.

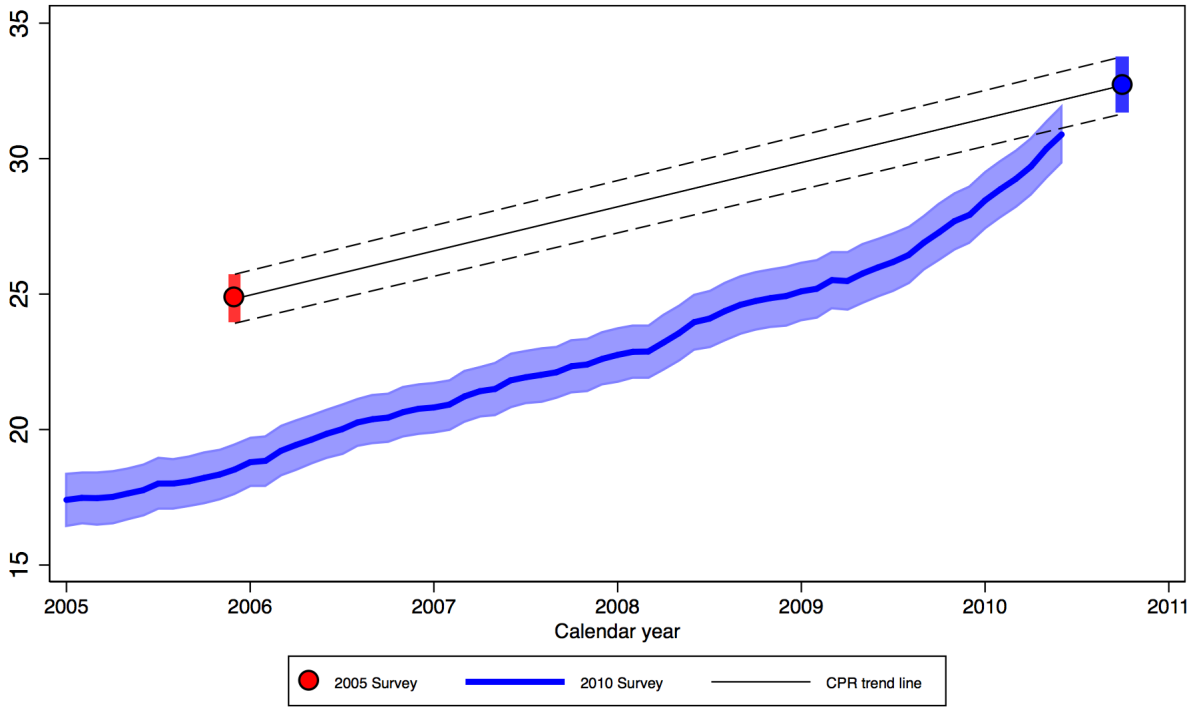
Figure 30: Total contraceptive prevalence rate among ever-married women 15-43, Bangladesh



The calendar data from the six Bangladesh DHSs pictured here show a relatively consistent pattern of increasing contraceptive use according to the current status points (with 2011 the only exception, discussed below), but the calendar data seem to underestimate contraceptive use slightly in all time points with a consistent slope. The largest difference is seen comparing the 2004 current status and 2007 calendar data: the current CPR was estimated at 56.0 percent (CI 54.6-57.4) in 2004, but only 48.3 percent (CI 46.8-49.8) by the 2007 calendar, a 7.7 percentage point decrease (Appendix Table 28). The 2011 survey is the only calendar in which the current use CPR from the prior survey (2007 current use CPR of 54.2 percent, CI 52.6-55.7) matches the CPR captured by the calendar (53.3 percent, CI 52.2-54.5). It is possible, however, that this is a coincidence: the slope of the 2011 calendar is similar to all the other surveys, but the prior current status point is lower. If the 2007 current status estimate had been higher (shifting the purple data points higher), the 2011 survey would not overlap the 2009 current status estimate, and the pattern would be consistent with all the other Bangladesh calendars.

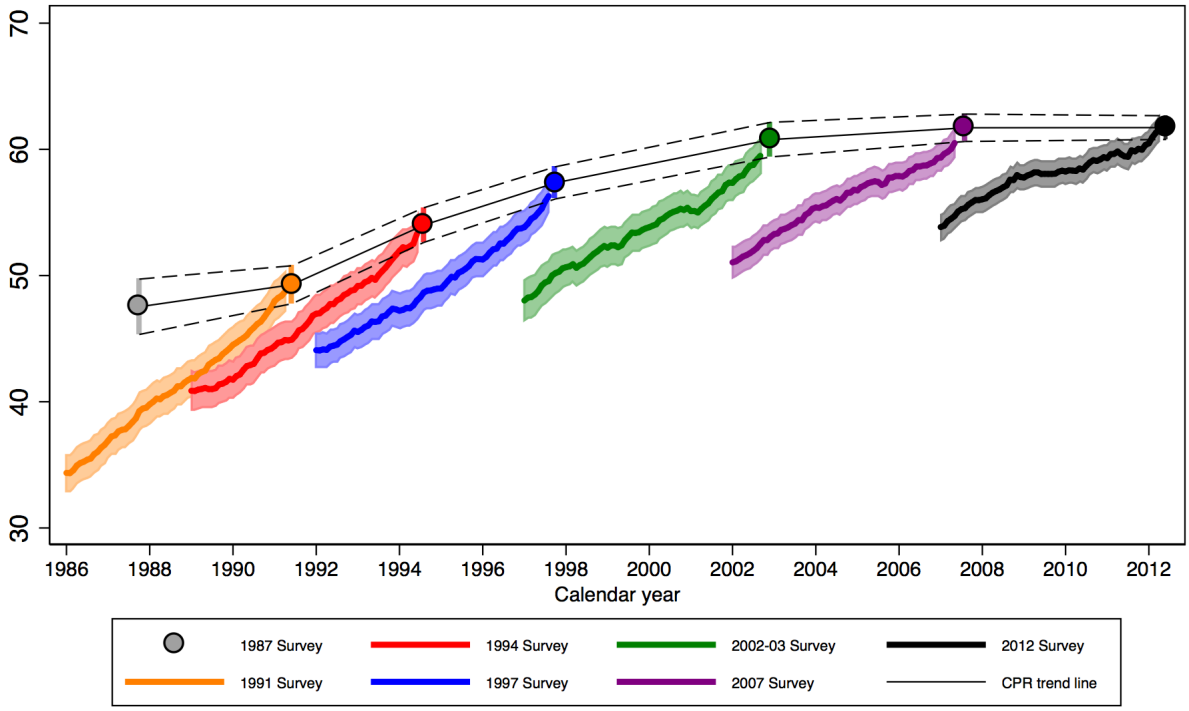
The decrease in CPR between 2004 and 2007 appears to be explained by a shortage of injectable supplies that affected both non-governmental and public sector family planning clinics in 2006-07, according to the 2007 Bangladesh DHS final report (NIPORT, Mitra and Associates, and Macro International Inc. 2009, p. 60). As the 2011 calendar appears to accurately capture this decrease between 2006 and 2007, followed by consistently increasing use, it is possible that the 2011 calendar accurately captures trends in women's contraceptive use. None of the other calendars in Bangladesh, however, appear to capture retrospective contraceptive use as accurately.

Figure 31: Total contraceptive prevalence rate among women 15-43, Cambodia



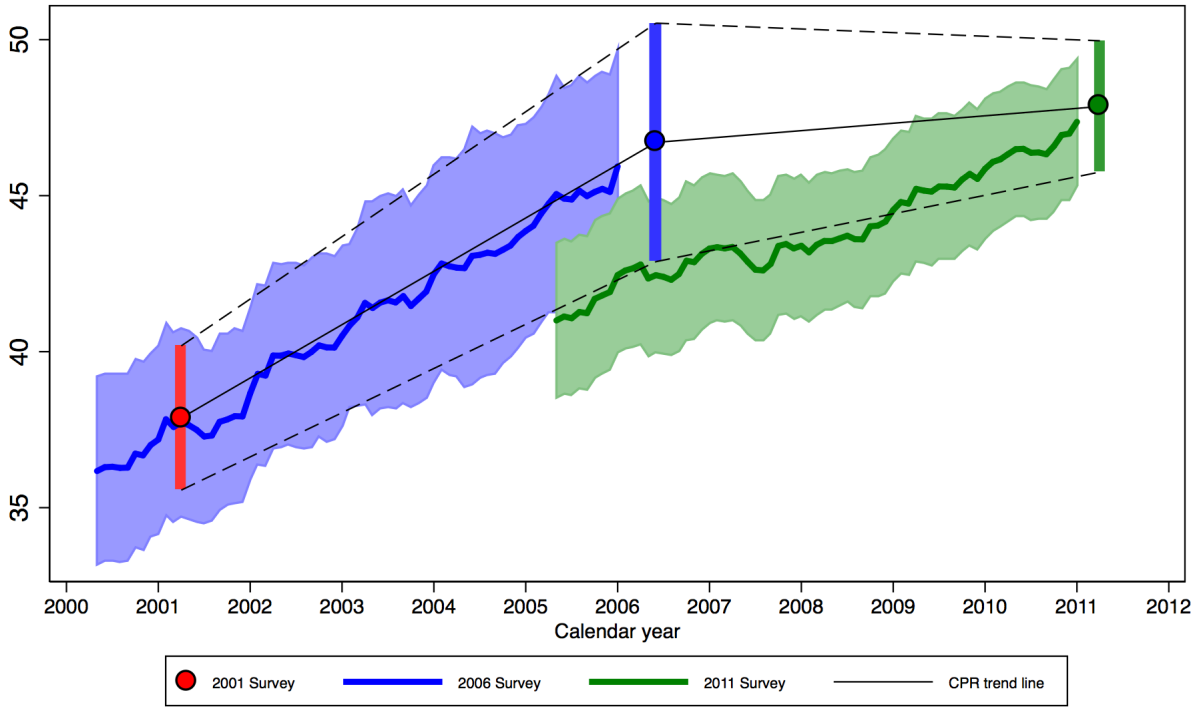
The calendar in Cambodia's 2010 DHS does not appear to accurately capture contraceptive use in 2006. The 2006 survey estimate of current CPR was 24.8 (CI 23.9-25.7), while the calendar estimate of the 2006 CPR was more than six percentage points lower, at 18.5 (CI 17.6-19.4) (Appendix Table 29). IUDs, injectables, condoms, periodic abstinence, and LAM all appear to be underreported in the calendar.

Figure 32: Total contraceptive prevalence rate among ever-married women 15-43, Indonesia



The six calendars from Indonesia analyzed here all seem to underestimate contraceptive use as compared with current status data. The level of underestimation ranges from 8.3 percentage points in 1987, when the CPR was estimated to be 47.5 (CI 45.3-49.7) in current status data and 39.3 percent (CI 37.8-40.7) in the overlapping 1991 calendar, to 4.2 percentage points in 1991, when the current estimate of CPR was 49.3 percent (CI 47.8-50.8) in current status data and 44.9 percent (43.5-46.4) in the overlapping 1994 calendar (Appendix Table 30). The 2002-03, 2007, and 2012 calendars appear to have underestimated the current-status CPR in the prior survey by 7.2, 7.7, and 6.4 percentage points, respectively. Pill and condom use appear underreported in most of Indonesia's calendars, and injectables, which are the dominant method in Indonesia in recent time points, appears underreported in the three most recent calendars relative to the current status estimates.

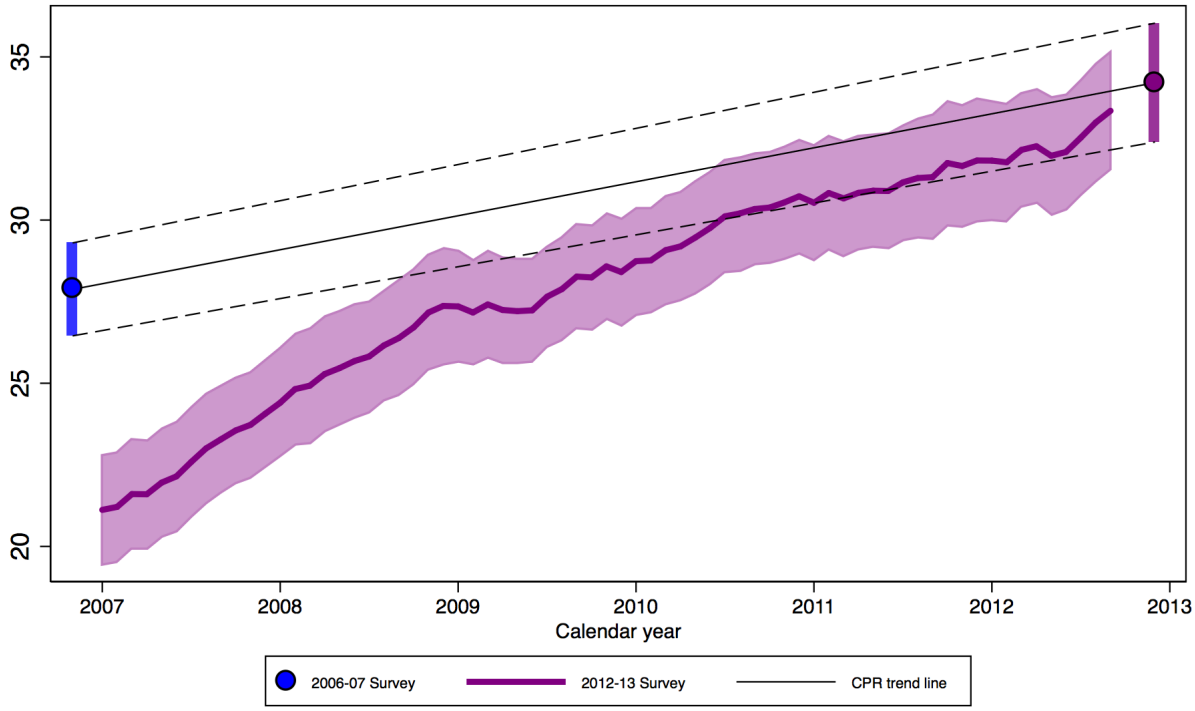
Figure 33: Total contraceptive prevalence rate among ever-married women 15-43, Nepal



The calendars in the 2006 and 2011 Nepal DHSs appear to capture total contraceptive use accurately, but the method mixes differ between sources. The current CPR was estimated to be 37.9 percent (CI 35.5-40.3) in 2001, which matches almost perfectly with the calendar estimate of 37.7 percent (CI 34.7-40.9) (Appendix Table 31). Interestingly, this correspondence is not due to matching reports of each method, but apparent overreporting of pill use in the calendar compared with the current status data, which is balanced by apparent underreporting of condom, periodic abstinence, and withdrawal use.

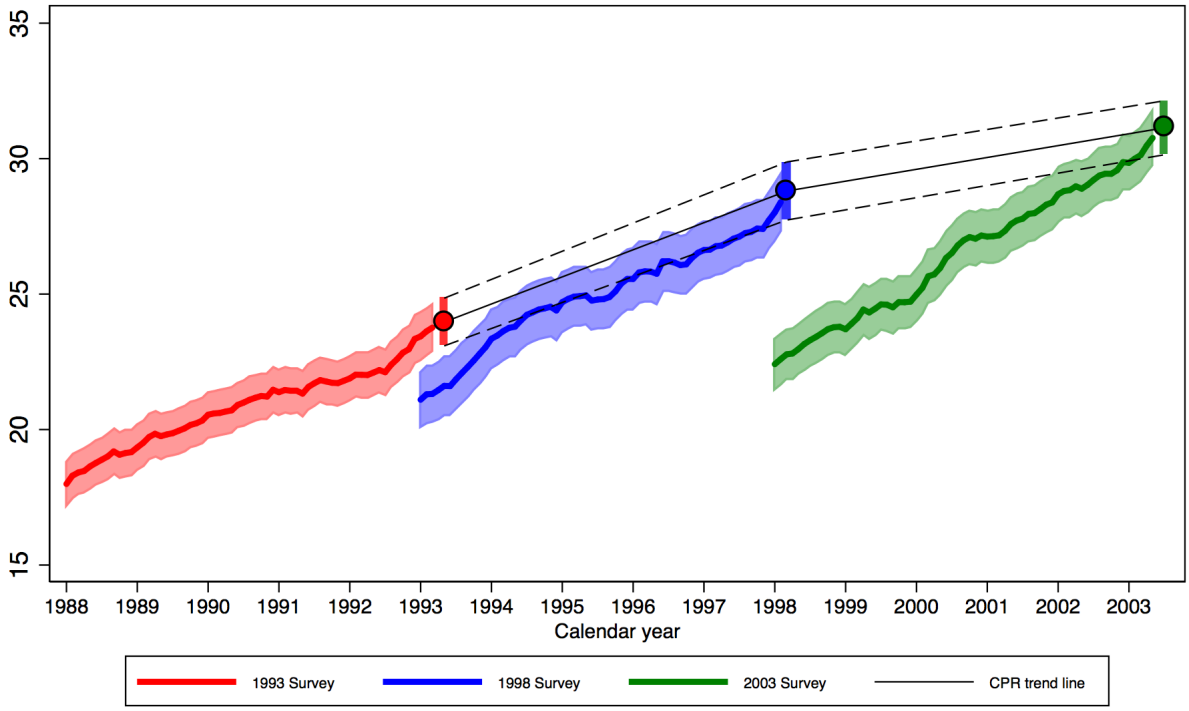
The 2011 calendar estimate of contraceptive use is not statistically significantly lower than 2006 current status estimate, at 46.7 percent (CI 42.8-50.7) and 42.5 percent (40.0-45.0) respectively, but again the method mixes differ. As in the 2006 calendar, condom use appears underestimated in the 2011 calendar at 5.1 percent in current status data but 2.7 percent in the calendar. By contrast, withdrawal appears overreported in the 2011 calendar, which balances out the apparent underreporting of condom use to make the difference between the total CPRs non-significant.

Figure 34: Total contraceptive prevalence rate among ever-married women 15-43, Pakistan



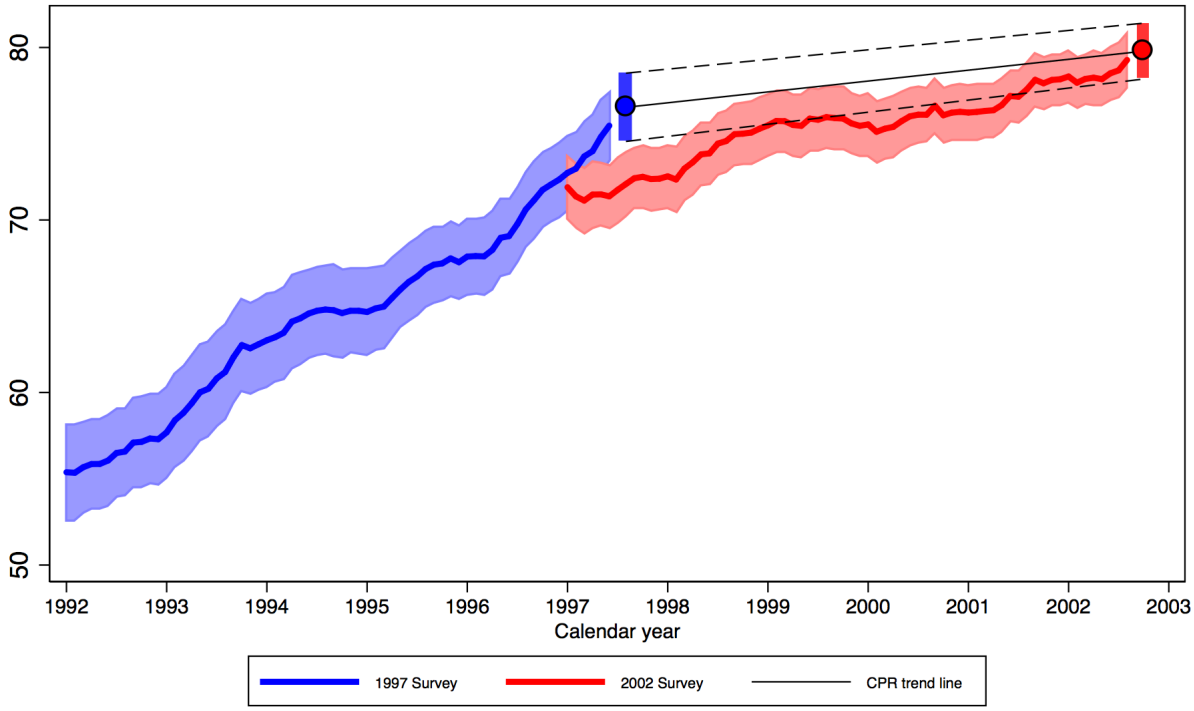
The Pakistan 20006-07 DHS was implemented between September 2006 and March 2006, with a median date of November 2006. The calendar from the 2012-13 DHS begins two months later, in January 2007. The current use CPR from the 2006-07 survey was reported to be 27.9 percent (CI 26.5-29.3), while the CPR estimated from the January 2007 calendar data is 6.6 percentage points lower, at 21.3 percent (CI 19.7-23.1), underestimating the current status CPR by about one quarter (Appendix Table 32). Periodic abstinence in particular appears substantially underreported, with 3.3 percent reported current use in 2006-07 compared with 0.2 percent in the calendar in January 2007. Withdrawal use matches in the calendar and current status data, but all other short-term methods do not appear to be accurately captured in at least the earliest portion of Pakistan's 2012-13 calendar.

Figure 35: Total contraceptive prevalence rate among women 15-43, Philippines



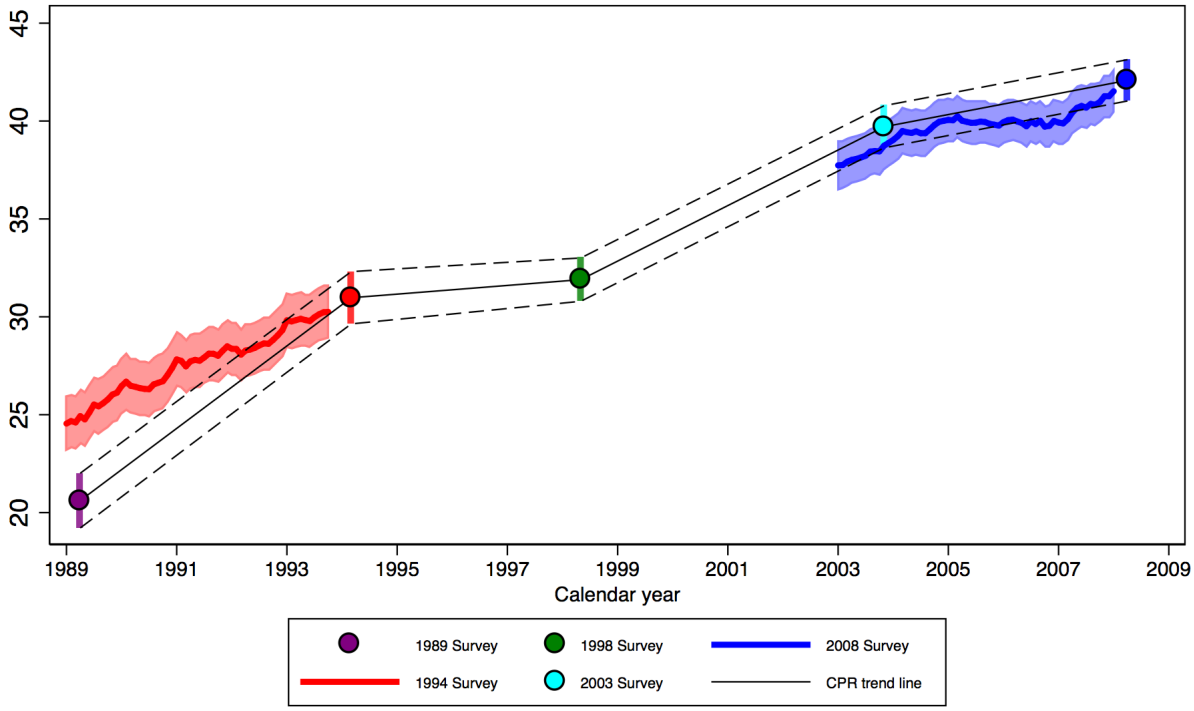
The 1998 and 2003 calendars from the Philippines DHSs both appear to underestimate contraceptive use, with more underestimation evident in the more recent survey. The 1998 current status CPR was estimated to be 28.8 percent (CI 27.7-29.9) compared with 22.8 percent (CI 21.9-23.7) from the 2003 calendar, a gap of 6 percentage points or 21 percent of the current status CPR (Appendix Table 33). Withdrawal and periodic abstinence, which are fairly widely used in the Philippines, are both underreported in the 2003 calendar, and withdrawal is underreported in the 1998 calendar.

Figure 36: Total contraceptive prevalence rate among currently married women 15-43, Vietnam



Current status data from Vietnam's 1997 DHS produce a CPR of 76.5 (CI 74.5-78.5), while calendar data for the same time point from the 2002 DHS show a CPR 4.4 percentage points lower, at 72.1 (70.2-73.9) (Appendix Table 34). The difference is primarily due to apparent underreporting of condom use, at 6.3 percent current status data and 4.5 percent from the calendar data.

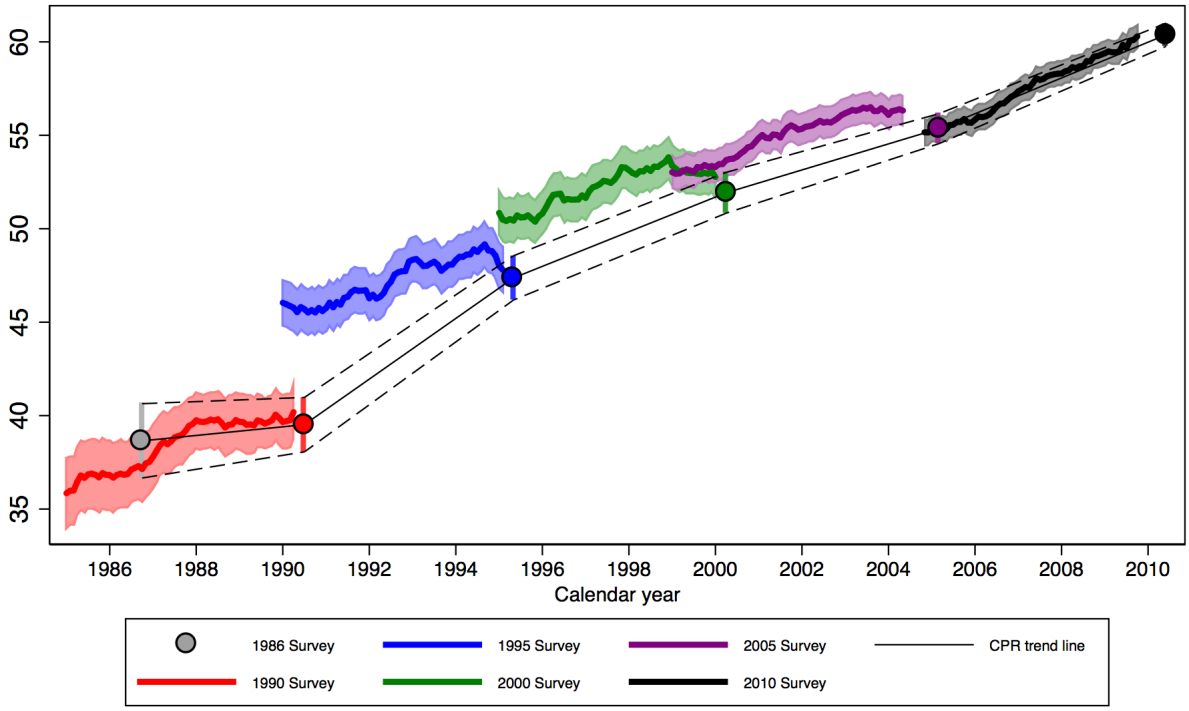
Figure 37: Total contraceptive prevalence rate among women 15-43, Bolivia



Although the five Bolivia surveys pictured here cover the time span between 1989 and 2008, we can only draw comparisons between the calendar and a prior survey at two points in time: 1989 and 2003. The 1994 calendar data appear to overestimate the CPR in 1989 compared with current status data, which is contrary to the normal pattern. The 1998 current status CPR was estimated at 20.6 percent (CI 19.3-22.0), while the calendar estimate is 4.4 percentage points higher, at 25.0 percent (CI 23.7-26.4) (Appendix Table 35). The difference is predominantly due to higher reporting of periodic abstinence in the calendar, at 13.5 percent, compared with 11.1 percent in current status data.

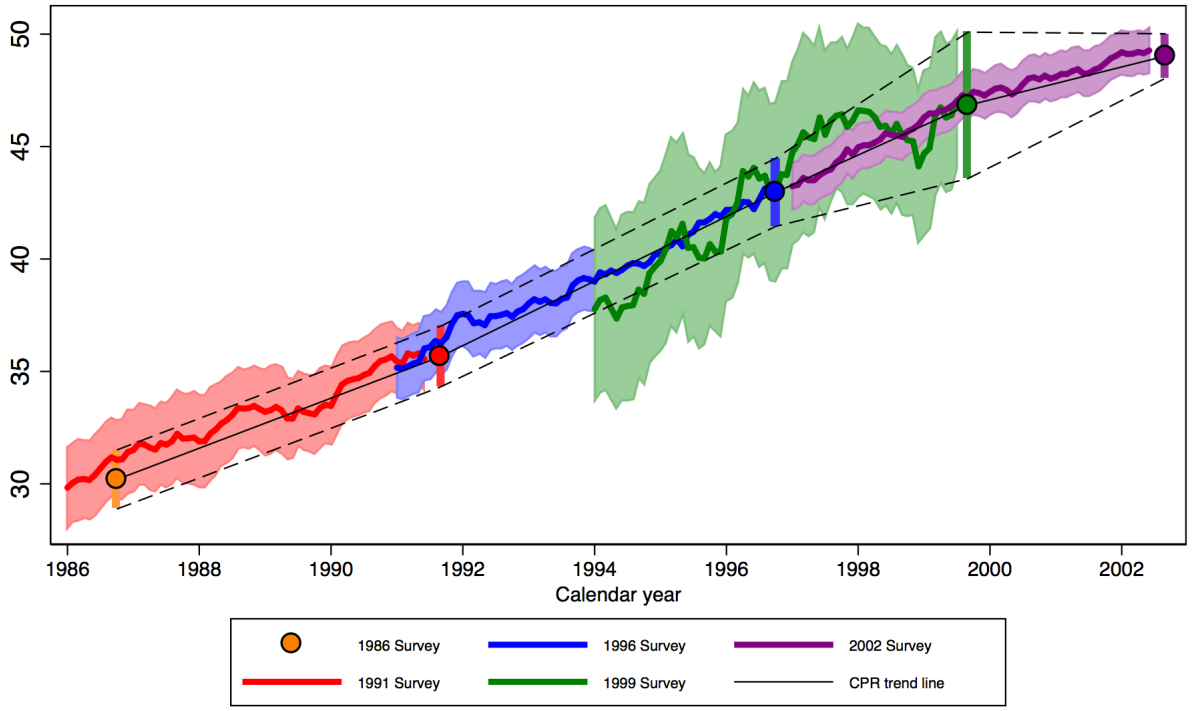
The 2008 Bolivia DHS calendar appears to accurately capture total contraceptive use as recorded in the 2003 DHS. The 2003 current status CPR was recorded as 39.7 percent (CI 38.6-40.8) and the calendar estimate was 38.8 (CI 37.6-39.9). Interestingly, periodic abstinence again appears slightly overreported in the calendar: prevalence is reported as 14.5 percent in the calendar (CI 13.7-15.4) versus 12.9 percent in the 2003 current status data (CI 12.0-13.9). This apparent overreporting is balanced by apparent underreporting of condom, LAM, and sterilization use.

Figure 38: Total contraceptive prevalence rate among women 15-43, Colombia



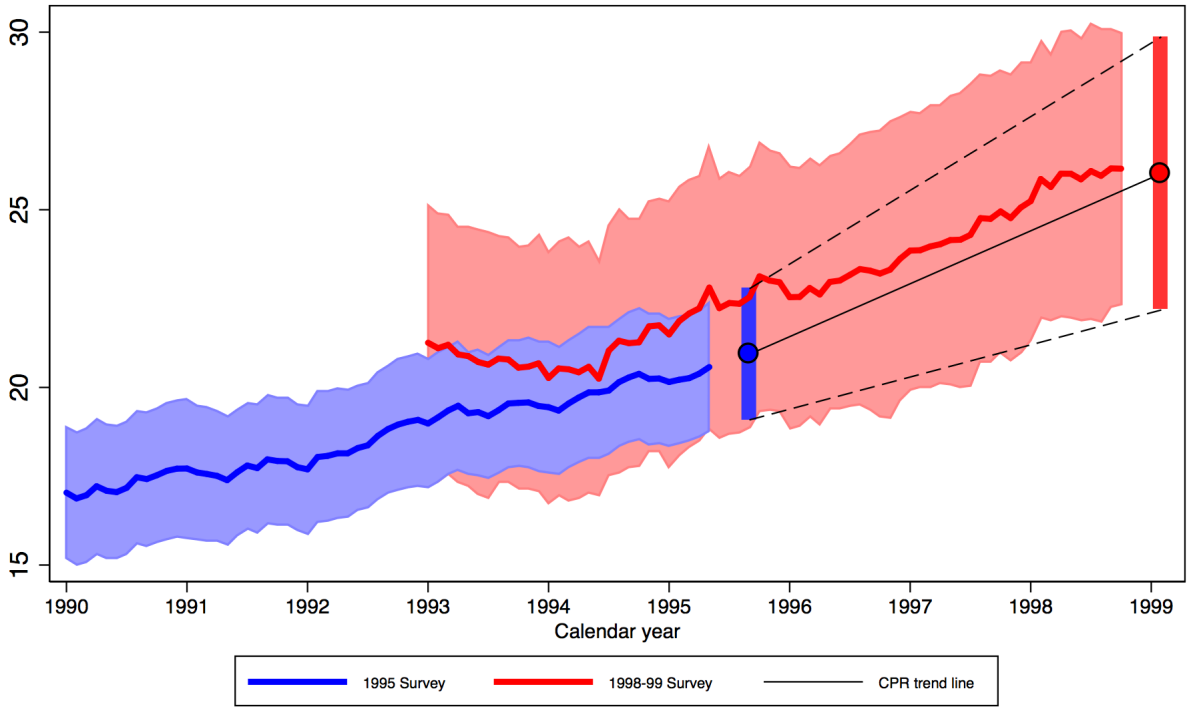
Two of the surveys collected in Colombia, the 1990 and 2010 DHSs, appear to accurately capture women's contraceptive use, as compared with the current status surveys. The other three surveys appear to overestimate contraceptive use in the calendar. The largest gap in reporting is between the 1990 current status data and the reporting from the 1995 calendar. The 1990 current status CPR was estimated at 39.5 (CI 38.1-41.0), and the 1990 estimate from the 1995 calendar was 6.2 percentage points higher, at 45.7 (CI 44.5-46.9) (Appendix Table 36). The difference between the 1995 current status and 2000 calendar estimates of the 1995 CPR was only 3 percentage points, and the gap between the 2000 current status and 2005 calendar estimates was small, at 1.8 percentage points. The two most recent surveys in Colombia, the 2005 and 2010 DHSs, were implemented using Computer Assisted Personal Interviews or CAPI (mentioned earlier in this text discussing underreporting in the Zimbabwe associated with moving from paper questionnaires to CAPI). It is unclear whether the use of CAPI may be associated with what we assume to be more accurate reporting of contraceptive use in the two most recent Colombia surveys (2005 and 2010), compared with the two prior surveys (1995 and 2000).

Figure 39: Total contraceptive prevalence rate among women 15-43, Dominican Republic



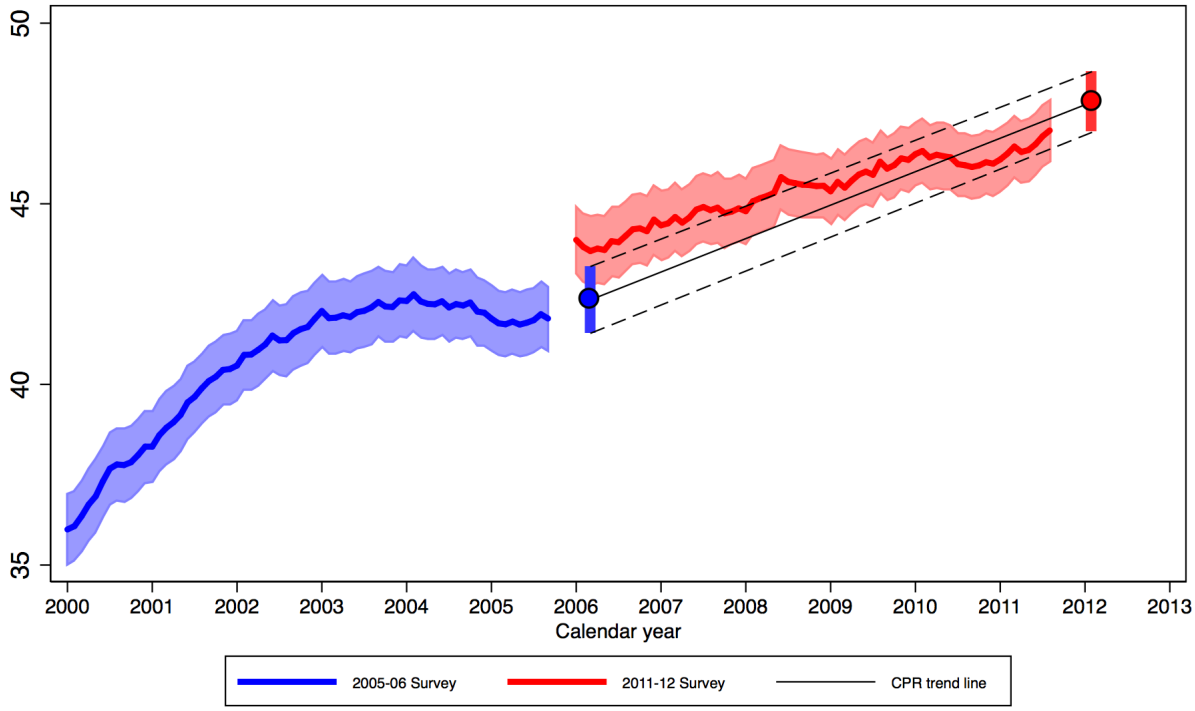
The quality of the calendar data collected in the four Dominican Republic surveys pictured here appears to be excellent. The 1999 Dominican Republic DHS was an experimental survey with a small sample size of 1,286 women, which is about one-twentieth the size of the 2002 Dominican Republic DHS sample. Even in the small 1999 sample, the estimated CPR matches up perfectly with current status and calendar data from 1996, as well as with calendar data from 2002. There is some apparent overreporting of sterilization in the 2002 calendar compared with the 1996 current status data: 27.9 percent in the calendar and 25.9 percent in the current status data (Appendix Table 37). Differences in sterilization reporting are not statistically significant, however, when comparing surveys closer in time: the 2002 calendar and 1999 current status data capture very similar levels of sterilization, as do the 1999 calendar and 1994 current status data. The overall level of precision and consistency in the Dominican Republic's calendars is quite impressive.

Figure 40: Total contraceptive prevalence rate among women 15-43, Guatemala



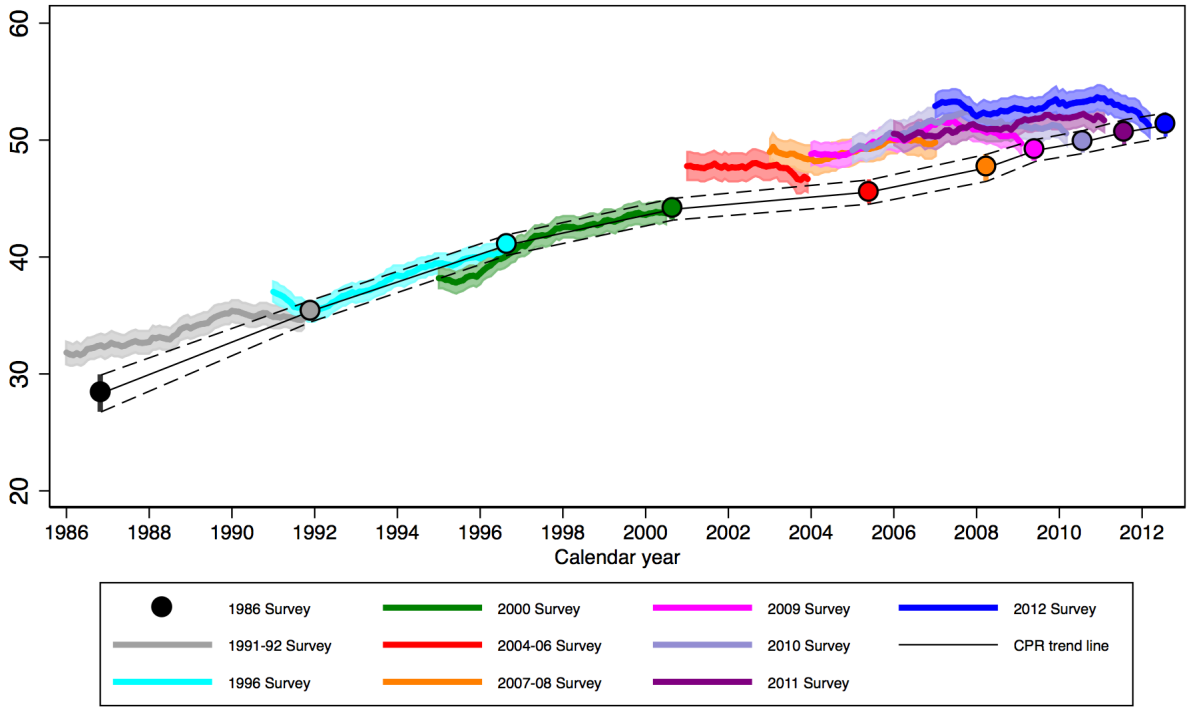
The calendars collected in Guatemala's 1995 and 1998-99 surveys appear to match up well, and the current status CPR estimated from the 1995 survey is very close to the estimate from the 1998-99 calendar: 20.9 percent (CI 19.1-22.8) in current status data and 22.5 percent (CI 19.1-26.4) from the calendar (Appendix Table 38). There appears to be some overreporting of periodic abstinence in the 1998-99 calendar, but the method is not commonly used enough for the difference to substantially affect the total CPR. All other contraceptive methods appear to be consistently reported.

Figure 41: Total contraceptive prevalence rate among women 15-43, Honduras



The calendar data from Honduras's 2011-12 survey appear to very slightly overestimate total contraceptive use as reported in the 2005-06 survey. The CPR in 2006 was recorded as 42.3 percent from the current status data (CI 41.4-43.3)—1.4 percentage points lower than the calendar estimate of 43.7 percent (CI 42.7-44.6) (Appendix Table 39). IUD use appears overrreported in the calendar (5.3 percent in the calendar versus 4.5 percent current use) and LAM appears underreported (0.009 percent in the calendar versus 0.1 percent current use). Although these differences are statistically significant, the magnitude of the differences is very small. All other contraceptive methods appear to be accurately reported in the calendar as compared with the current status data.

Figure 42: Total contraceptive prevalence rate among women 15-43, Peru



The calendars from Peru's 1996 and 2000 calendars match the overlapping current status CPRs almost perfectly, although there are odd patterns in showing higher levels of contraceptive use in the first few months of each calendar. Calendars in the other seven Peru surveys appear to consistently overestimate contraceptive prevalence relative to the current status data. The amount of apparent overestimation in these more recent surveys ranges from 2.0 to 7.4 percentage points, and the overestimation is consistent in all of Peru surveys collected since 2004 (Appendix Table 40). Notably, the 2004-06 survey was the same survey in which Peru discontinued use of paper questionnaires and became the first DHS to implement surveys on computers, the aforementioned CAPI. All of the Peru surveys beginning in 2004-06 were conducted on PDAs rather than on paper. It is interesting to note that CAPI use seems to be associated with overreporting of contraceptive use in Peru and Colombia and with underreporting of contraceptive use in Zimbabwe. This issue warrants further investigation.

Reporting of contraceptive use by method

Recall of contraceptive use is anticipated to vary by contraceptive method. Table 3 summarizes the degree to which the survey pairs match or do not match up by contraceptive method type (all methods combined, modern, or traditional methods) and specific contraceptive method. Our basic metric for matching is whether or not there is a statistically significant difference between the retrospectively recalled contraceptive use (using the calendar) and the current use in the preceding survey. We are also interested in whether or not the estimates of contraceptive use tabulated with the calendar are over-estimates or under-estimates relative to the current use in the previous survey. Table 3 presents the number and percentage of survey pairs in which the use of a (particular) method is significantly different between the results generated from the calendar and current use at the time of the previous survey. For survey pairs in which estimates of use are statistically

significantly different, Table 3 presents the magnitude of the difference, both as the percentage point difference between the two estimates and the percent of method use this represents, compared with the current status estimate.

Table 3: Summary comparisons between calendar and previous survey by contraceptive method

	Total comparisons with statistically significant differences				Calendar significantly over estimates FP use				Calendar significantly under estimates FP use				Number of survey pairs
	Number of compar-isons	Percent of compar-isons	Percent-age point difference	% differ-ence	Number of compar-isons	Percent of compar-isons	Percent-age point differenc e	% differ-ence	Number of compar-isons	Percent of compar-isons	Percent-age point differenc e	% differ-ence	
All methods	78	73.6	5.2	19.1	26	24.5	3.4	8.0	52	49.1	6.2	24.6	106
Modern methods	66	62.3	4.4	20.6	20	18.9	2.8	8.6	46	43.4	5.1	25.9	106
Traditional methods	63	59.4	2.0	34.5	18	17.0	1.7	22.1	45	42.5	2.1	39.4	106
LAM	45	66.2	0.7	-	9	13.2	0.6		36	52.9	0.7		68
Male Condom	59	55.7	1.3	47.1	3	2.8	1.3	70.6	56	52.8	1.3	45.9	106
Injectable	45	42.9	2.0	36.5	16	15.2	1.6	46.5	29	27.6	2.2	31.0	105
Periodic abstinence	43	40.6	1.4	46.0	15	14.2	1.5	30.5	28	26.4	1.4	54.3	106
Pills	41	38.7	1.6	31.0	12	11.3	1.2	23.8	29	27.4	1.7	34.0	106
Withdrawal	41	38.7	1.1	42.2	9	8.5	0.9	34.0	32	30.2	1.1	44.5	106
Sterilization	21	19.8	0.7	69.7	7	6.6	1.1	127.7	14	13.2	0.6	40.7	106
IUD	17	16.0	1.4	28.0	4	3.8	2.1	14.3	13	12.3	1.2	32.2	106
Implants	12	13.3	0.4	-	7	7.8	0.1	-	5	5.6	0.8	-	90

LAM: Lactational Amenorrhea Method

In the top line of Table 3, we see that in 74 percent (78 out of 106) of the survey pairs the measures of total contraceptive use are statistically different. We also see that an under-estimation of contraceptive use in the calendar is twice as frequent as an over-estimation (49 percent versus 25 percent). The magnitude of the difference varies by whether the total CPR is under- or over-estimated by the calendar compared with current use estimates. In comparisons in which the calendar appears to underestimate contraceptive use, the average CPR is 6.2 percentage points lower, underestimating the current use CPR by 25 percent. In comparisons in which the calendar appears to overestimate contraceptive use, the average difference is much smaller, at 3.4 percentage points, overestimating the current use CPR by 8 percent. The next rows of the table present disaggregates of the same measures by contraceptive method type and specific method.

Estimates of the percentage of women using modern methods of contraception were significantly different in 62 percent of comparisons, and estimates of traditional method use were significantly different in 59 percent of comparisons.[20] Modern methods do not appear to be reported any more or less accurately in the calendar than traditional methods, on average. Again, the magnitude of the

[20] Please note that in some survey pairs, neither the modern CPR nor traditional CPR difference was statistically significant, but when all methods were combined, the total CPRs were statistically significantly different in the calendar versus current status data. The same is also true for specific methods. It may be the case that in one pair of surveys, none of the method-specific levels of use are statistically different, but when combined together the total all-method CPR estimates are significantly different.

differences is larger in surveys in which the calendar underestimates contraceptive use than surveys in which the calendar gives an overestimate.

In the second part of Table 3, contraceptive methods are ordered from the method most frequently differently reported in the calendar versus current use to the method most consistently reported. LAM[21] and male condoms are reported at significantly different levels in the calendar and current status data in well over half of survey pairs. The preponderance of these discordances are due to an underestimate of the prevalence by the calendar. These methods are fraught with difficulty for measurement. LAM is notoriously difficult to measure (Fabic and Choi 2013) and is frequently confused with simple breastfeeding. Condom use is coitus-dependent and may frequently be transitory. Continuous use of these methods at any point in the past may be misremembered or not remembered at all. The other coitus-dependent methods, periodic abstinence and withdrawal, are also frequently problematic: about 41 percent of the survey pairs show a significant difference between the prevalence of periodic abstinence calculated with the calendar and current use reported in the preceding survey, and 39 percent show a difference for withdrawal. Similar levels of problematic reporting are true for the resupply methods pills and injectables, at 39 and 43 percent respectively. Similar to LAM and condom, use of these methods can be temporary and their use may be subject to misremembering or forgetting intervals of use. Finally, the long-acting and permanent methods have the lowest incidence of discordance between the estimate made using the calendar and current use in the earlier survey. For all methods except implants, underestimation in the calendar is much more likely than overestimation. (Implant use appears to be overreported slightly more often than it is underreported in 8 and 6 percent of surveys respectively, but the numbers are quite small.)

Reporting of contraceptive use by region and survey characteristics

Table 4 presents the same analysis of survey pairs as Table 3, summarized by geographic region. The sub-Saharan African and South/Southeast Asian regions show worse performance on the matching CPR metric than Latin America and the Caribbean and North Africa/West Asia/Europe, with more than 80 percent of survey comparisons in the sub-Saharan African and Asian regions showing statistically significant differences. The higher level of disagreement between CPR estimates in the sub-Saharan Africa and East/Southeast Asia sub-regions is almost exclusively due to a lower estimate of family planning use by the calendar. In Latin America and the Caribbean, calendars that produced estimates that were statistically significantly different from the current status data consistently overestimated the CPR, and in North Africa/West Asia/Europe the cases of significant disagreement were distributed across both overestimation and underestimation by the calendar relative to the corresponding current status data. The magnitude of the differences in reporting is particularly large in the sub-Saharan African region. In survey comparisons in which the calendar significantly underestimated contraceptive use as compared with current status data, the surveys in East and Southern Africa underestimated contraceptive use by an average of 29 percent in the calendar, and the surveys in West and Central Africa underestimated contraceptive use on average by 51 percent. Please note that broad conclusions are not possible since the number of survey pairs is relatively small and the Latin America and Caribbean region is dominated by surveys conducted in Peru. However, the high levels of apparent underestimation and the magnitude of the differences

[21] Comparisons of LAM use are limited to survey pairs in which LAM use was reported in both data sources. Because some surveys did not capture any LAM use in either the calendar or current use data, LAM can only be compared in 68 survey pairs. For the same reason, implant use can only be compared in 89 survey pairs.

between the calendar and current use estimates of the CPR in sub-Saharan Africa and East/Southeast Asia suggest that the great majority of calendars from these regions are likely to be unreliable.

Table 4: Summary comparisons between calendar and previous survey by region

	Total comparisons with statistically significant differences				Calendar significantly over estimates FP use				Calendar significantly under estimates FP use				
	Number of compar-isons	Percent of compar-isons	Percent-age point differenc e	% differ-ence	Number of compar-isons	Percent of compar-isons	Percent-age point differenc e	% differ-ence	Number of compar-isons	Percent of compar-isons	Percent-age point differenc e	% differ-ence	Numbe r of survey pairs
All	78	73.6	5.2	19.1	26	24.5	3.4	8.0	52	49.1	6.2	24.6	106
Latin America and the Caribbean	21	65.6	3.6	8.5	21	65.6	3.6	8.5	0	0.0	NA	NA	32
South/SE Asia	17	85.0	5.5	12.7	0	0.0	NA	NA	17	85.0	5.5	12.7	20
North Africa/West Asia/Europe	11	55.0	3.6	7.2	4	20.0	2.6	4.7	7	35.0	4.2	8.6	20
East and Southern Africa	20	87.0	7.1	27.9	1	4.3	2.5	9.7	19	82.6	7.3	28.9	23
West and Central Africa	9	81.8	6.3	50.5	0	0.0	NA	NA	9	81.8	6.3	50.5	11

NA: Not applicable

Table 5 summarizes the comparison of survey pairs by average level of contraceptive use, education level, and survey length. Education is measured by the percent of survey respondents who have ever attended school. If the percent of women in a survey who have at least some education exceeds the median level for all surveys, that survey is counted as having a relatively high level of education. Similarly, for the length of the survey, if the number of questions in the survey in which we use the calendar exceeds the median number of questions across the collection of surveys, the survey is counted as having a relatively long survey. We also disaggregated surveys by whether the country's contraceptive use at the time of the calendar survey was higher or lower than the median level of use across all surveys analyzed.

A potential hypothesis concerning the calendar is that reporting of contraceptive use is more reliable in countries with higher levels of family planning use. We do find that the frequency of significant differences between the CPR in the calendar versus current use is somewhat improved for the countries with relatively high family planning use at the time of survey compared with low family planning use, but the difference is small (72 versus 75 percent). Perhaps mimicking the regional patterns in Table 5, there were large differences in the underestimation versus the overestimation. Notably, among countries with lower levels of family planning use, the calendar underestimated the current status CPR in 72 percent of survey pairs analyzed.

Another potential hypothesis concerning the apparent poor recall of contraceptive use in the calendar is that the surveys are long and the interviewers and/or interviewees are fatigued by the length of the survey. If this is the case, interviewers may not ask sufficient probing questions to accurately capture contraceptive use, and we should see poorer performance of the calendar at replicating the current use CPR in longer surveys than in shorter surveys. The survey pairs in which there was a relatively long survey instrument for the calendar implementation were more likely to overestimate the family planning use relative to the survey pairs in which the survey instrument was shorter (more than double, 34 percent versus 15 percent). This may be related again to regional

variation, particularly the relatively lengthy Peru surveys. There was not a large difference in terms of underestimation (47 percent versus 51 percent).

Table 5: Summary of comparisons between calendar and previous survey by survey characteristics

	Total comparisons with statistically significant differences		Calendar significantly over estimates FP use		Calendar significantly under estimates FP use		Number of survey pairs
	Number of comparisons	Percent of comparisons	Number of comparisons	Percent of comparisons	Number of comparisons	Percent of comparisons	
All	78	73.6	26	24.5	52	49.1	106
High family planning use	38	71.7	24	45.3	14	26.4	53
Low family planning use	40	75.5	2	3.8	38	71.7	53
Long survey	43	81.1	18	34.0	25	47.2	53
Short survey	35	66.0	8	15.1	27	50.9	53
High education	37	69.8	21	39.6	16	30.2	53
Low education	41	77.4	5	9.4	36	67.9	53
High Education (LAC/MENA)	24	63.2	21	55.3	3	7.9	38
High Education (Africa/Asia)	13	86.7	0	0.0	13	86.7	15
Low Education (LAC/MENA)	8	57.1	4	28.6	4	28.6	14
Low Education (Africa/Asia)	33	84.6	1	2.6	32	82.1	39

LAC: Latin America and the Caribbean
MENA: North Africa/West Asia/Europe

An additional potential hypothesis is that in surveys conducted in areas of low literacy or low education, women would have poorer recall of dates related to prior family planning use. In Table 5 there are two groups of output related to education that show the numbers and percentages of surveys in which the current use and calendar estimates are significantly different. In the first group we look at the survey pairs in which the country at the time the calendar survey was conducted has a relatively high level of education versus those with a relatively low level of education. There is not a great difference between the two for the overall level of disagreement between contraceptive use estimates from the calendar versus current status data. There are large differences in the degrees of overestimation and underestimation of the CPR by the calendar. However, we recall the overestimation phenomenon is largely restricted to the LAC survey pairs. The second group of rows relating to education disaggregates the high and low levels of education by regional groups. The North Africa/West Asia/Europe and LAC regions had lower levels of disagreement, while the sub-Saharan Africa and Asia regions had higher levels of disagreement between CPR estimates. Therefore, we cut the educational categories by these broad regional groups to help control potential regional bias. This disaggregation shows that the apparent differences by education appear to be entirely driven by regional differences. A majority of the high-education surveys were in LAC/MENA, which had a 62% mismatch rate; almost all the less-educated surveys were in Asia/Africa, which had an 85% mismatch rate. Within these two broad regional groupings, differences in error rates for more versus less-educated survey respondent drop to 2 and 6 percentage points for LAC/MENA and Asia Africa respectively, and reverse direction (with the more educated showing higher error rates than the less educated).

Discussion and Recommendations

Discussion

One key issue to keep in mind when interpreting the results of this analysis is that the calendar was not necessarily intended to provide estimates of the CPR that would perfectly match prior estimates of contraceptive use, and calendar data are not used for reports of contraceptive prevalence in DHS final reports. The calendar, as first implemented in the experimental 1986 Dominican Republic and Peru surveys, was to provide "monthly data on contraceptive practice, amenorrhea, postpartum abstinence and exposure to risk… for estimates of fecundability, natural fertility, and contraceptive efficacy," (Goldman, Moreno, and Westoff 1989b, p.1) and not necessarily to estimate contraceptive prevalence for a specific month in time. In this report we compare women's reports of the method they are "currently" using to avoid pregnancy to reports from other women of the method they were using at a specific point in time. Because the wording of the question is different, and because the recall of episodes of contraceptive use that occurred many years ago could be expected to be imperfect, it is not clear that we should expect a perfect match between levels of use reported retrospectively in the calendar with reported levels of current use.

There has been, however, a decades-long history within the DHS of evaluating the quality of calendar data by comparing estimates of contraceptive use in a specific month from the calendar with prior estimates of current use from an earlier survey. The first evaluation of the experimental calendar data from Peru compared estimates of contraceptive use in 1981 collected from the 1986 experimental calendar to current use estimates collected in the 1981 Contraceptive Prevalence Survey (CPS), and judged the accuracy of the 1986 calendar by how well the total and method-specific CPRs from the then experimental calendar matched current use estimates for the same time point collected in the 1981 CPS (Goldman, Moreno, and Westoff 1989b). The calendar was judged to show "complete reporting of the most effective methods (pill and IUD) for a date more than five years prior to the survey," (Goldman, Moreno, and Westoff 1989b, p.43) because the estimated use of these methods matched almost perfectly between the DHS calendar and the CPS estimate for the same date (differences were 0.1 percentage point for both pill and IUD). Reports of use of injectables, condoms, diaphragm,[22] periodic abstinence, withdrawal, and sterilization were all within 1.1 percentage points of each other in the calendar compared with current status data. The authors noted that the total CPR of 34.6 percent collected in the calendar was still significantly lower than the CPS estimate of 38.1 percent. Based on the table of results shown in the 1986 report, readers can see that the underestimation of 3.5 percentage points, 9 percent of the current status CPR, is predominantly due to reporting of "other" methods in the calendar at 1.9 percentage points lower than the level reported in the CPS. As the initial evaluation of the contraceptive calendar compared retrospective estimates from the calendar with current use estimates for the same date and tested whether or not any differences were statistically significantly different, we believe it is appropriate to use the same methodology in this comprehensive analysis.

Given that even the first implementation of the calendar produced estimates of the total CPR that were statistically significantly different between the calendar and current status data for the same time, it is worth questioning whether statistical significance is an appropriate guideline for determining the reliability of calendar data. In compiling the results of this analysis, we considered

[22] Injectables, condoms, and diaphragms were grouped together in the 1986 analysis.

whether there should be some cutoff for what was considered "poor" correspondence between contraceptive use levels recorded in the calendar and current use data. Should a gap of five percentage points in estimates of the total CPR between the two estimates be considered an indicator of poor correspondence? Or should such a cutoff be relative to the level of contraceptive use, i.e. an underestimate of 10 percent or more of the current use CPR by the calendar?

Determining such cutoffs seemed arbitrary and subjective, so we followed the more objective convention of calculating whether levels of contraceptive use were statistically significantly different between the two sources. Please note, therefore, that while we have incorporated statistical significance as a useful guideline in determining whether the calendar accurately captures contraceptive use, we caution readers to keep in mind that a statistically significant difference may not necessarily be a meaningful difference. For example, the 2006 Honduras CPR was estimated to be 42.3 percent from current status data and 43.7 percent from the 2011-12 calendar, a difference of 1.4 percentage points or 3 percent of the current-use CPR. This difference is statistically significant at the $p<0.05$ level, but that does not imply that the difference is meaningful. Rather, the finding of statistical significance is due in part to the large sample sizes of more than 16,500 women in each of the two Honduras surveys analyzed, which allows for detection of small differences. Nepal provides a counter-example. The 2006 CPR was estimated at 46.7 percent from current-status and 42.5 percent from calendar data, a difference of 4.2 percentage points. This much larger difference is not statistically significant, however, due in large part to the much smaller sample sizes of under 8,000 women ages 15-43 in each survey. Additionally, the difference in the total CPR estimates in Nepal would be larger if the underreporting of condom use in the calendar was not balanced by overreporting of withdrawal in the calendar. These examples reinforce the point that statistical significance, while useful as a summary measure, is only one piece of information that should be used to determine whether calendar data plausibly capture past contraceptive use. We therefore urge readers interested in the quality of specific surveys not to place too much value on statistical significance and to focus more on the differences in CPR between estimates, including method-specific results.

An additional concern about comparing current and retrospective data on contraceptive use is that the questions are phrased differently. In the calendar, women are asked about their contraceptive use during a specific time, while for current use no time limit is given and women may have different interpretations of what constitutes "currently doing anything to avoid pregnancy." We expect that women using hormonal or long-term methods would report that they are currently using a method, but this expectation may not hold for coitus-dependent methods such as condoms, diaphragms, withdrawal, or other traditional methods. Women could report they are "currently" using a coitus-dependent method even if they have not used the method that month, while in the calendar women are asked if they used that method during a specific time period. If women report they are currently using a method even if they have not used the method that month, this would bias the current use CPR upwards and potentially lead to understandably poorer consistency between the current use and calendar CPRs. On the other hand, we do not know whether or not women consider coitus-dependent methods to reflect "current" use. If they do not, some users of these methods may report that they are not currently using any method despite intending to use such a method the next time they have sex. If women do not report such methods as "current" use, but do report them in the calendar, this would bias current use estimates downwards. Such a downward bias might lead to better correspondence between current use and calendar data because estimates of use from the calendar are generally lower. We cannot determine from existing data whether these two potential biases may cancel each other out, or if the bias in one direction may be larger than the other.

Another potential bias in these comparisons relates to the fact that births, pregnancies, and terminations are recorded in the calendar prior to recording any methods of contraceptive use, and only one event per month is recorded in the calendar. Women who had a live birth or a pregnancy termination during the calendar period are asked how many months they were pregnant at the time of the birth/termination, and P's are put in all of the cells in months when they were pregnant. If women were using contraception immediately prior to the pregnancy, contraceptive use is filled in up to the beginning of the pregnancy, but even if the woman was using contraception during the first few months of pregnancy (as may be true in the case of contraceptive failure when the woman has not yet recognized she is pregnant), contraceptive use is not recorded in those early months of pregnancy, as the P has already been filled in and multiple entries are not allowed. The same is not true for current use: if, at the time of interview, a woman does not report she is currently pregnant, she is asked if she is currently using contraception; she can be recorded as a current user, even if she is (unknowingly) in her first trimester of pregnancy. Similarly, if a woman had a birth or termination and began using contraception in the same month, she will have a B or T recorded in the calendar for that month, rather than contraceptive use. If the same birth or termination occurs during the month of interview and the woman has begun using contraception (for example, a post-delivery sterilization or IUD insertion), that woman will be counted as a user in the current use estimate. The result of this different recording in current use versus the calendar is that the current CPR will be systematically higher than the CPR calculated from an earlier part of the calendar even when contraceptive prevalence has not changed over time. While this is certainly a real bias, a thought experiment makes clear that the impact on estimates of CPR is likely to be quite small. If nine percent of women in a survey were pregnant in a given month of the calendar (a reasonable estimate for many sub-Saharan African surveys), perhaps two percent were in their first or second months of pregnancy. If we assume that half of these women did not know they were pregnant, that would result in one percent of all women in the survey being unknowingly pregnant in a specific month. Given the general low levels of contraceptive use in surveys analyzed, and the fact that the women have become pregnant, it seems implausible that more than 10 percent of this group of women were using contraception while pregnant. If 10 percent of the one percent of unknowingly pregnant women in their first or second month of pregnancy were using contraception, this issue would thus affect only 0.1 percent of women in the entire population, and therefore is unlikely to significantly impact the comparisons between contraceptive use in the calendar and current status data.

The best answer to the question of whether we should expect estimates of total and/or method-specific CPRs to match when calculated from the calendar and current use data for the same point would seem to come from the data. The calendars in the 1994 and 1999 surveys in Zimbabwe shown in Figure 18, for example, demonstrate near-perfect correspondence between contraceptive use reported retrospectively in the calendar and currently in the prior survey. Data from the Dominican Republic and Egypt also show very good correspondence between the two data sources. Many other survey pairs, especially in Latin America and the Caribbean and North Africa/West Asia/Eastern Europe, show close correspondence. These examples suggest that, although the expectation of perfect or near-perfect matching between contraceptive use levels collected from the retrospective calendar and prior current use data is clearly a high bar, such results are possible and feasible in at least some countries. The data from Zimbabwe are particularly relevant: even though the most recent survey showed substantial underestimation of contraceptive use in the calendar, previous surveys in the same country have shown that the collection of contraceptive use data in the calendar that is consistent with other data sources is clearly achievable.

Summary and recommendations

Overall, our analysis found that in most comparisons, calendar data appear to underestimate contraceptive use, often substantially. Levels of total contraceptive use differ significantly between the calendar and current use reports in 74 percent of survey pairs analyzed. While statistical significance is not a perfect indicator of calendar data quality, we note that in the vast majority of surveys with statistically significant differences in CPR, the gap in estimates was large enough to demonstrate that the contraceptive use data from the calendar are clearly implausible, given the levels reported for the same time point in previous surveys. In the 74 percent of survey pairs that were statistically significantly different, the average difference in total contraceptive use was 5.2 percentage points, resulting in an average discrepancy of 19 percent relative to the current use CPR data. Ignoring statistical significance, the gap between CPR estimates was 4.1 percentage points on average across the 106 survey pairs analyzed, or 15 percent of the average current status CPR.

Condom use does not appear to be accurately captured in calendar data, with significantly lower levels of condom use reported in more than half of calendars as compared with current use data. On average across the 56 survey pairs in which condom use appears underreported in the calendar, it was recorded in the calendar at levels 46 percent lower than those recorded in current use data. In countries where LAM is reported at all, it appears to be reported inconsistently. Reported levels of use of traditional methods, specifically periodic abstinence and withdrawal, and short-term resupply modern methods, specifically pills, and injectables, differ significantly between calendar and corresponding current use data in about 40 percent of survey pairs. The long-term methods of IUDs, implants, and sterilization appear to be reported much more consistently. The pattern of better reporting of longer-term methods is consistent with previous studies, both of DHS and other surveys, as summarized by Callahan and Becker (2012).

The correspondence between levels of contraceptive use collected in the calendar versus current status data appears to vary regionally. The level of agreement between calendar and current use estimates of contraceptive use is generally high in several surveys in Latin America and the Caribbean, particularly in the Dominican Republic and Guatemala. None of the calendars from this region appear to underestimate contraceptive use, although overestimation of use in the calendar is evident in several surveys in Peru and Colombia, especially in surveys conducted using CAPI. In the North Africa/West Asia/Eastern Europe region, the level of consistency between calendar and current use estimates of contraceptive prevalence is also generally high for several surveys, with near perfect matches between data sources in multiple Egypt surveys. In most of the Asian and sub-Saharan African surveys, the picture looks bleak. In more than 80 percent of surveys in these regions, the calendar does not appear to accurately capture the level of contraceptive use measured from current status data. In many surveys in these regions, particularly in lower contraceptive prevalence countries, the calendar underestimates the current use estimate of total CPR by 25 to 50 percent. The West African surveys analyzed show particularly large discrepancies between estimates of CPR from the calendar and current use data, although we note that the number of surveys analyzed per region is small. The only survey pairs from West Africa in which there are not statistically significantly different levels of contraceptive use between calendar and current status estimates are from Senegal, and in both cases, the data compared were collected less than two years apart. This finding again suggests that poor recall is indeed a problem for the comparability of calendar and current use data in some settings, and also suggests a potential way forward, summarized below.

In the majority of the figures shown in this report, the CPR in the calendar decreases as the calendar moves further back in time, from right to left in each image. In many cases, this represents the calendar CPR estimate falling further and further below levels reported in earlier surveys for periods further back in time. Worse reporting for events further in the past is to be expected, but this trend also suggests a troubling pattern of underreporting of contraceptive discontinuations. In the month of interview, women's current contraceptive method (if any) is recorded in the calendar, and it is filled in for all the previous months in which she continuously used the same method. As the calendar progresses further back in time, it is less and less likely that women would have been using the same contraceptive method without stopping. Instead, any episodes of use that occurred many years ago would likely have been stopped, at least temporarily, or switched to a different method at some point during the past several years. In most calendars, we see that the gap between the calendar CPR and the line showing the interpolated current status CPR grows wider as the calendar progresses further back in time. This pattern strongly suggests that discontinuations during the calendar period are underreported.

Underreporting of discontinued episodes of contraceptive use is of particular concern for reports of contraceptive discontinuation rates, including failure rates. If discontinued episodes of use, particularly those that ended in contraceptive failure, are underreported, this will bias estimates of contraceptive failure and other rates of contraceptive discontinuation, which are a primary use of contraceptive calendar data. There is evidence from U.S. surveys that episodes of contraceptive use that end in failures—particularly those that result in abortion—are underreported in survey data (Trussell and Vaughan 1999; Jones and Kost 2007). It seems likely that this would be the case in DHS calendars as well, although we cannot confirm this because reliable external sources of information about abortion are not available in most countries analyzed in this report. It is unclear whether the omitted episodes of discontinuation would be balanced by omitted episodes of contraceptive acceptance; one could imagine situations in which discontinuation rates would be over- or under-estimated due to these omissions. On the whole, however, because we expect better reporting of episodes of use that continued into current use (and are censored in discontinuation rate calculations) than those that have been discontinued, we anticipate that on average such omissions will lead to underestimates of contraceptive discontinuation rates.

Based on the results of this analysis, we recommend that The DHS Program:

- Experiment with the length of the calendar to see if a shorter calendar—perhaps two years shorter, beginning in January of the calendar year three years prior to the start of the survey—could produce better quality data by limiting the recall period while still gathering enough episodes of contraception to be useful for analysis. Note that in order to calculate one-year contraceptive discontinuation rates as in the standard DHS final report, the calendar period needs to be long enough for respondents to have a chance to take up a method, use it for some length of time, and have the possibility of discontinuing use during the calendar period. If a shorter calendar is adopted, we also recommend including a question about when contraceptive method use began for any method that was being used at the beginning of the calendar in order to include left truncated episodes.[23]

[23] Episodes of use that were ongoing at the time the calendar began (the earliest month in which calendar data were collected) are left truncated. In standard analyses of calendar data, such as one-year discontinuation rates in DHS final reports, these left truncated episodes of use are dropped from analysis because the date of the start of use is unknown

- Experiment with ways to enhance the use of CAPI in calendar data collection. Although we only were able to analyze a handful of surveys that used CAPI to collect calendar data, results so far suggest that collecting calendar data with CAPI appears problematic as currently implemented. The analysis of additional surveys using CAPI that are ongoing or recently completed (but not available for analysis at the time of this writing) will help shed light on this issue. As the Program moves forward collecting more data electronically, experiments should be conducted with alternative ways to collect the calendar to take advantage of the technology and provide the visual cues available from the paper questionnaire.

    - For these two types of experiments, households could be randomized to receive different versions of the calendar section of the questionnaire to test the effect of different data collection mechanisms. We strongly recommend comparing results from different data collection methods within the same survey, especially regarding calendar length. If this step is not taken, it will be difficult to draw conclusions about the impact of questionnaire changes. Shorter calendars would no longer overlap with prior surveys, as DHS surveys are typically conducted approximately five years apart. Therefore, the only way to assess shorter calendars in countries without frequent repeat surveys would be to compare shorter and longer calendar results from the same survey.

- Investigate the successful strategies of surveys that appear to have collected high-quality information on contraceptive use in the calendar to see if some of the strategies used in these surveys could be applied more broadly, especially to surveys in Asia and sub-Saharan Africa. Individuals' memories are fallible, and the extent to which women do not remember their contraceptive use episodes cannot likely be changed. At the same time, all reasonable measures must be taken in training and supervision to ensure that the data collected are of the highest quality possible. The results of this analysis suggest that additional efforts in this area are warranted.

For users of calendar data, this analysis shows that caution must be used when analyzing and interpreting results from calendar data in certain surveys. It is clear that the quality of contraceptive use data from each survey must be examined. The consistency of contraceptive use data collected in the calendar clearly varies across regions and even across surveys within the same country, as noted previously in the Zimbabwe example. We also note that although many surveys may not accurately capture total contraceptive prevalence in the calendar, this is often due to unreliable reporting of certain short-term methods, most notably LAM and condom use. For users interested in analysis of other contraceptive methods, calendar data in many surveys can and should still be used.

---

and so the duration of use cannot be determined. In a shorter calendar, the number of left truncated episodes would not change on average, but the number of episodes starting inside the calendar would be reduced substantially, and thus the proportion of all episodes that are left truncated would be much greater. We therefore recommend that, for all episodes of use that were ongoing when the calendar began, a question be included asking when that episode of use began so that the duration of use can be calculated. The question about date of first use for ongoing episodes has been included in previous rounds of the DHS, e.g. Q333 in the DHS II Model A Questionnaire.

Previous assessments of the quality of contraceptive use collected with the DHS calendar data using similar methods found DHS contraceptive calendar data to be generally of high quality (Curtis and Blanc 1997) or to slightly underestimate contraceptive use (Bradley, Schwandt, and Khan 2009). The results of this analysis are more negative, in large part because this analysis includes more recent surveys and more surveys from sub-Saharan Africa, particularly West Africa, which tend to have greater levels of underreporting of contraceptive use in the calendar. Overall, this analysis finds evidence of substantial underreporting of contraceptive use as captured by the calendars compared with current status estimates in the majority of surveys analyze

Global contraceptive failure rates: Who is most at risk?

Abstract: Contraceptive failure is a major contributor to unintended pregnancy worldwide, yet the experience is not well understood, especially in low-income countries. This study uses the highest-quality data available from 140,529 episodes of contraceptive use collected from 97,094 women's reproductive histories in 16 low- and middle-income countries to estimate the prevalence and correlates of contraceptive failure for each of the most widely-used contraceptive methods. We find that contraceptive failure rates vary widely by age, with adolescent women experiencing the highest failure rates. Failure also appears associated with socio-economic status, suggesting that the youngest and poorest women are at highest risk of experiencing unintended pregnancy. The findings presented here have direct applications for modeling approaches as well as for program and policy development worldwide.

Introduction

Contraceptive failure is a major contributor to unintended pregnancy worldwide. There are an estimated 85 million unintended pregnancies every year, 86 percent of which (73 million) occur in low- and middle-income countries (Sedgh, Singh, and Hussain 2014). The contribution of contraceptive failure to unintended pregnancy varies with contraceptive prevalence: in a theoretical population with a 100 percent contraceptive prevalence rate, 100 percent of unintended pregnancies that occurred would result from contraceptive failure. Estimates across a range of low- and middle-income countries suggest that approximately one out of every three unintended pregnancies was conceived while using contraception (Bradley, Croft, and Rutstein 2011; Singh, Darroch, and Ashford 2014). As contraceptive prevalence continues to increase, the proportion of unintended pregnancies that result from failure will increase concomitantly. Contraceptive failures clearly represent a gap between women's and couple's intentions to avoid pregnancy and their ability to implement those intentions, and elimination of that gap is a goal of policies and programs worldwide (Brown et al. 2014; Galati 2015)

Despite the programmatic and demographic significance of contraceptive failure, remarkably little is known about its correlates, especially outside of high-income countries. Recent studies in the US and France have generally found contraceptive failure rates to decrease as strength of motivation to avoid pregnancy increases; and to increase as socioeconomic status decreases; though results are inconsistent and vary by contraceptive method selected (Black et al. 2010; Kost et al. 2008; Moreau et al. 2007). In low- and middle-income countries, we were able to find only two multi-country studies that modeled correlates of contraceptive failure, both of which used Demographic and Health Survey (DHS) data from the 1980s and early 1990s (M. Ali and Cleland 1999; Curtis and Blanc 1997; Moreno 1993; Moreno and Goldman 1991). More recently, two studies have produced estimates of contraceptive failure from a number of DHS surveys (Ali, Cleland, & Shah, 2012; Polis et al., 2016). Ali and colleagues produced failure rates for the entire population only (2012).[24] Polis and colleagues estimated contraceptive failure rates by combinations of sociodemographic characteristics but did not examine correlates of failure in a multivariate framework (2016).

An area in which there is strikingly little evidence is in the variation of failure rates by age. This is surprising given that demographers tend to be particularly aware of the importance of using age-

[24] Specifically, for the population of women who were married at the time of interview.

specific data in modeling fertility, mortality, and other life experiences. We would expect to see large variations in failure rates by age for multiple reasons. One, women's biologic fecundity, or the probability of conception per coital act, decreases with increasing age (Menken, Trussell, and Larsen 1986), as does their male partner's. Two, coital frequency, which has a clear and direct impact on the probability of contraceptive failure, has also been shown to decrease with age (Westoff 1974). Three, older contraceptive users are likely to have more experience using method and thus are less likely to experience failures due to method unfamiliarity. If we assume that the costs of an unplanned pregnancy increase with age, we may additionally expect more diligence and attention to correct and consistent use among older users. Despite these logical expectations, in recent studies from the US and France, patterns of failure by age have often been found to be inconsistent. In France, the hazard of condom failure was higher among women ages 20-34 than among teenagers (Moreau et al. 2007). Results from the US show virtually no differences in failure rates between teenagers and women in their 20s after correcting for abortion underreporting (Kost et al. 2008), though these results pooled together all contraceptive methods. As shown below, women of different ages select different contraceptive methods, so age-specific differences in failure rates for a particular method may be disguised by different method mixes within each age category in the Kost et al. analysis.

In this analysis we provide estimates of contraceptive failure rates and the relationship between failure and sociodemographic characteristics, paying special attention to the impact of age. Because we are especially interested in correlates of failure, we want to avoid as much bias as possible. We therefore limit our data sources to surveys assessed as the most reliable, thereby ameliorating many of the concerns about calendar data quality raised in Bradley, Winfrey, & Croft, 2015 and echoed in (Bradley, Winfrey, and Croft 2015; Polis et al. 2016) We pool data across 16 nationally representative surveys from a wide range of low- and middle-income countries to separately examine rates and correlates of failure among users of contraceptive pills, injectables, condoms, IUDs, withdrawal, and periodic abstinence.

Data and methods

This analysis uses data from 16 Demographic and Health Surveys, which are large-scale, nationally representative household surveys of women of reproductive age (15–49). In the surveys selected, participants were asked about pregnancies, births, terminations and episodes of contraceptive use that occurred over the past five or more years, producing a retrospective month-by-month reproductive calendar history for each woman, hereafter referred to as "calendar data". For each episode of contraceptive use that was discontinued in the calendar period, women were asked, "Why did you stop using the (method)?" Women's responses are categorized into one of 14 precoded categories, including "became pregnant while using" (i.e., reported contraceptive failure). These histories allow for the use of life table methods to calculate failure rates by contraceptive method. The failure rates in this paper represent typical-use, rather than perfect-use, failure rates, including both method-related failures (failure of the method to work as expected) and user-related failures (stemming from incorrect or inconsistent use of the method).

Selection of datasets included in analysis

A recent large-scale report provided a comprehensive overview of failure rates from the most recent survey in each country that collected the necessary DHS calendar data (Polis et al. 2016). An

analysis of the quality of DHS calendar data (Bradley, Winfrey, and Croft 2015) highlighted potential problems with some of the surveys included in the report, and Polis and colleagues concluded that some of the failure rates in the comprehensive report were likely to be underestimated. In this paper, rather than focusing on the widest range of data possible, we focus on a smaller number of surveys that we believe most accurately represent women's reproductive experiences. We evaluated the reliability of every DHS survey that collected the necessary calendar data and was made publicly available on the DHS Program website as of January 2016.

A full description of the process for evaluating the reliability and consistency of calendar data is included in Appendix A. Briefly, we calculated indices for multiple data quality measures including potential underreporting, heaping, and displacement of events in the reproductive calendars for each survey, and examined the distribution of each index for outlying values. Outlying values in the upper tails of each index were taken to indicate potential data quality problems. We selected surveys for which 1) we were able to compare reported contraceptive prevalence from the calendar data to a previous overlapping survey (e.g., that a previous DHS survey had been conducted in the same country within approximately five years of the index survey), and 2) that did not have outlying values on any measured index. If there were multiple surveys within a country that fit these selection criteria, we selected the most recent survey. These selection criteria led to a sample of 16 surveys: Armenia 2005, Bangladesh 2011, Cambodia 2014, Colombia 2010, Dominican Republic 1996, Egypt 2014, Honduras 2011-12, Jordan 2009, Kenya 1998, Morocco 1992, Peru 2012, Philippines 2003, Rwanda 2010, Senegal 2012-13, Turkey 2003, and Zimbabwe 2005-06. The selected surveys come from a wide range of socioeconomic and demographic contexts in Africa, Asia, Eastern Europe, and Latin America. The final sample included 140,529 episodes of contraceptive use collected from 97,094 women interviewed.

Analytic methods

Each segment of contraceptive use reported in the reproductive calendar was converted to a contraceptive episode for analysis. A single woman could contribute multiple episodes to the analysis if she stopped and started using contraception several times during the calendar period, or if she switched between different methods. Each episode is a segment of a single method of use. To calculate failure rates, we constructed episode-based associated-single decrement life tables. In these calculations, all contraceptive discontinuations for reasons other than contraceptive failure were censored.

As described in Appendix A, we found evidence of recall bias or other issues that led contraceptive failures to be underreported, particularly for time periods greater than 3 years before the interview. The month of interview and two months prior are censored to allow for the fact that women in their first trimesters may not yet recognize they are pregnant, which could lead to an underestimation of contraceptive failure. We therefore limited all data to the most recent 3-38 months prior to interview, thereby capturing a full 3 years of data. Episodes of use that began prior to this window enter into the life table as late entries (see Polis et al. 2016 for details of life table calculations and left truncation).

Life table failure rates are equivalent to cumulative probabilities. We calculate the probability of failing in each month x , conditional on not having failed in the previous month. The probability of "surviving," or not experiencing contraceptive failure in month x, is the compliment of the failure

probability. A failure rate is equivalent to 1 - the cumulative product of the monthly conditional survival probabilities.

We calculate the monthly conditional probabilities using logit regression. A logit regression of failure on dummy variables for each month x gives the inverse logit of the conditional probability of failure in each month. We then calculate the cumulative product of the conditional probabilities of survival in each month 1 through 12, and the 12-month failure rate as 1-this product. These calculations are detailed in Appendix B.

An advantage to this regression-based approach for failure rate calculation is that estimates of variance can be calculated taking full account of the sample design, as noted by Abatih and colleagues (2008) including the stratified, clustered sample design used in DHS surveys. We implement this by using Stata's svy suite of commands to produce the failure probabilities and associated variance-covariance matrix. The variance and confidence intervals around the cumulative failure probability are then estimated using the Delta method (Fishman 2015; Oehlert 1992), also detailed in Appendix B.[25]

To analyze factors associated with contraceptive failures, we used multilevel piecewise exponential hazard models. We partitioned the duration of contraceptive use into intervals s within which the baseline hazard is assumed to be constant. Based on graphical analyses of the baseline hazards and following previous analyses of contraceptive failure (Bradley, Schwandt, and Khan 2009; Curtis and Blanc 1997; Moreau et al. 2007), we defined intervals of three months duration for the first year of use (0-2 months, 3-5, 6-8, and 9-11 months).

In preliminary analyses, we found that the baseline hazard was far more similar for the same method across countries than for different contraceptive methods within the same country. We therefore pooled all data together across countries, and estimated separate models for each of the seven most commonly used contraceptive method: pills, injectables, IUDs[26], implants[27], male condoms, withdrawal, and periodic abstinence[28]. Using separate models for each contraceptive method is in line with previous findings that different types of women select into using different contraceptive methods (Frost and Darroch 2008; WHO Task Force 1980) and that and method choice is endogenous with some types of discontinuation (Steele and Curtis 2003).

---

[25] One disadvantage of this approach is that when failures are extremely rare (e.g. one failure within a subgroup across an entire 12-month period) we cannot estimate the logit of the probability of failure in each month. This is the case for multiple subcategories of implant use shown in Table 1, e.g. women ages 30-34, women with no education, and women who were never married prior to implant use. When this occurs, we have substituted in Table 1 failure rates calculated with standard life tables, and confidence intervals using the asymptotic variance of $ln\,[-ln\,\widehat{S}(t)]$ (Kalbfleisch and Prentice 2002; StataCorp 2015)

[26] We are unable to distinguish between hormonal and non-hormonal IUDs.

[27] Although we were able to estimate failure rates for the contraceptive implant, failures are so rare that we were unable to assess correlates in multivariate models.

[28] In some countries, fertility awareness methods (FAM) such as cycle beads are a part of the country's family planning program and such methods are included as separate categories in the DHS questionnaire. In these countries, the category of "periodic abstinence" excludes self-identified FAM users. However, it is possible that some FAM users who self-reported using "periodic abstinence" or "rhythm method" are included in this category.

Data from all interviewed women in each of the selected surveys were pooled together for analyses described below. All analyses are weighted using sampling weights, and weights were multiplied by a survey-specific constant defined as $\frac{\sum_1^n w_i}{n\, w_i}$, where w_i is the weighted number of interviewed women in survey *i,* and n = 1, 2, … 16 surveys included in analysis. This constant equalizes the effective weighted sample size across surveys, so each survey contributes equally to the analysis, i.e., results are not weighted more heavily towards surveys with larger sample sizes. Results are therefore interpretable as averages across all women in the surveys included in analysis.

Episodes of contraceptive use were linked with data from other sections of each woman's individual interview, allowing for examination of failures by demographic and socioeconomic characteristics. We measure age at the start of the episode of use, grouping women's ages into 5-year categories with an open-ended category for women ages 40 and older because failures are very rare among women in this age group. We expect failure rates to decrease by age, due to biological variations in fecundity (Menken, Trussell, and Larsen 1986), decreasing coital frequency with age (Westoff 1974), contraceptive inexperience that could lead to more user errors, and selection: when younger, more fecund women fail they are selected out of the risk pool for at least 10 months if they carry the pregnancy to term, and likely longer due to postpartum insusceptibility. Marital status during each episode is measured by comparing the date of the end of the episode to the date of the woman's (first) marriage. Each episode is then classified according to whether the woman had been married at the time of discontinuation, or whether she had never been married before she discontinued. For women who were married only once and report they are currently married at the time of survey, "ever married" is synonymous with currently married at the time of discontinuation. For formerly married women, however, we do not know the date of marital dissolution, and for women who were married more than once, we do not know the date of any marriage after the first. We therefore can only classify women as "ever married" or "never married" at the time of the episode of contraceptive use. We expect that unmarried women may experience higher costs of unintended pregnancy and thus may be more attentive contraceptive users. Similarly, we anticipate that women using to space, rather than limit (hereafter *contraceptive intention*), their childbearing, may experience higher levels of failure because the anticipated costs of a mistimed pregnancy are lower than an unwanted pregnancy. Following Lightbourne (1985), contraceptive intention is calculated by comparing women's reported ideal number of children to the number of children they had when the episode of contraceptive use began. If their ideal number was less than or equal to their current number of children, women were assumed to have already achieved their ideal family size and the episode was classified as "using to limit." All other episodes of use were classified as "using to space." This includes non-numeric responses to the question on ideal number of children, such as "up to God." We reason that women who do not give a numeric ideal family size, but still use contraception, are using in order to space, rather than limit, their births. We include educational level and socio-economic status as proxies of access to information and contraceptive services and supplies, anticipating that failure rates may be lowest among the wealthiest and most highly educated. For our socioeconomic status measure, we use the DHS "wealth index" constructed from information on household ownership of durable goods and amenities using principal components analysis, placing households on a continuous scale of wealth, which is then divided into equally sized quintiles ((Rutstein and Johnson 2004). For this analysis, we regroup these quintiles into the poorest 60 percent of households (lowest three quintiles) and wealthiest 40 percent of households (highest two quintiles).

We fit multilevel models of contraceptive failure for each method using Poisson regression with the logarithm of the time each woman is at risk of failure within the 3-month interval *s* as an offset (Rabe-Hesketh and Skrondal 2012). The model is

$$\log(\mu_{seij}) = \log(t_{seij}) + \alpha_{1s} + \alpha_{2j} + \beta_1 X_{1seij} + \beta_2 X_{2seij} + \delta_1 Y_{1eij} + \gamma_1 Z_{1ij} + \gamma_2 Z_{2ij} + \zeta_{ij}$$

Where μ_{seij} is the mean parameter of the Poisson distribution, t_{seij} is the time at risk of failure in the 3-month interval *s* for contraceptive episode *e* from the reproductive calendar of woman *i* in survey *j*, α_{1s} is an interval-specific intercept that allows the baseline hazard of failure for that contraceptive method to change every 3 months, α_{2j} is a survey-specific fixed effect, X_{1seij} represents each woman's age at the beginning of interval *s*, X_{2seij} represents her marital status at the beginning of interval *s,* Y_{1eij} represents whether the intention of contraceptive use segment *e* was to space or limit births, Z_{1ij} measures the highest educational level achieved by woman *i* at the time of the survey, Z_{2ij} is a measure of the woman's socio-economic status at the time of survey, and the random intercept ζ_{ij} introduces dependence among the hazards for different episodes of contraceptive use for the same woman *i*, and $\exp(\zeta_{ij})$ is assumed to be normally distributed and independent of the covariates. ζ_{ij} represents an unobserved frailty shared across contraceptive episodes for the same woman, measuring constructs such as women's underlying fecundity or propensity towards failure that is not captured by her age or other sociodemographic characteristics included in the model.

Results

Failure rates

Unadjusted 12-month failure rates for each method are shown in Figure 43 and Table 6. Twelve-month failure rates are interpretable as the percentage of women who, on average, will become pregnant within the first year of typical method use. Estimates from the pooled sample used in this analysis, shown in red in Figure 1, are extremely low for implants and IUDs, with approximately one woman out of 100 becoming pregnant across a one-year horizon (Implant failure rate = 0.3 per 100 episodes, 95%CI 0.1 – 0.9; IUD failure rate 1.2, CI 0.9 – 1.5). Failure rates are higher for short-term resupply methods of pills and condoms, which require users to have the methods on hand and use them correctly, with an estimated 6 to 9 users out of every 100 becoming pregnant in the first year of use (pill failure rate 6.3, CI 5.9 – 6.8; condom failure rate 8.6, CI 7.6 – 9.6). The highest failure rates are seen for traditional methods of withdrawal and periodic abstinence, with 17-19 percent of users becoming pregnant within a year of beginning the method (withdrawal failure rate = 17.3, CI 15.9 – 18.7; periodic abstinence failure rate 19.0, CI 17.4 – 20.6).

Figure 43: Failure rates by contraceptive method

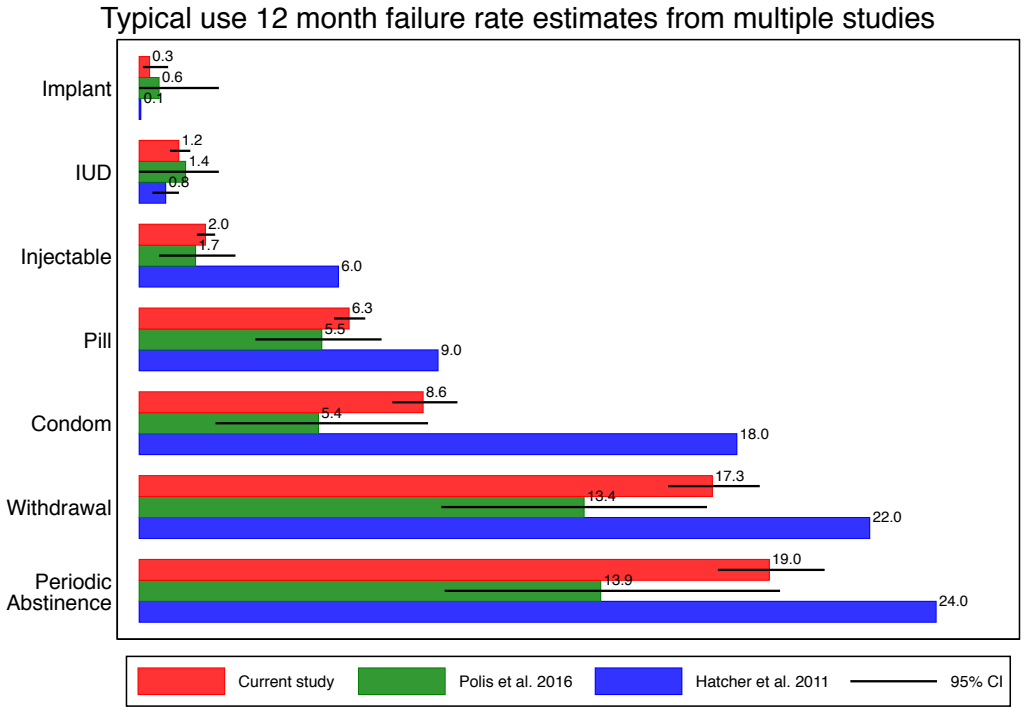


Figure 43 and Appendix Table 41 compare the estimated failure rates from this study (in red) with those estimated by Polis and colleagues from the median values of failure rates across 43 DHS surveys (shown in green), and the widely-cited typical use estimates from *Contraceptive Technology* based on US clinical and survey data from 1979, 1995, and 2002 (Hatcher 2011) shown in blue. Polis and colleagues noted that their estimated failure rates were similar to previous studies based on a broad range of DHS data (e.g. Ali et al. 2012), but diverged markedly from estimates using US data. Specifically, Polis and colleagues' estimated failure rates were substantially lower than U.S. estimates for injectables (1.7 vs. 6), oral contraceptive pills (5.5 vs. 9), male condoms (5.4 vs. 18), withdrawal (13.4 vs. 22), and periodic abstinence (13.9 vs. 24). The authors noted that one important source of this discrepancy is that the U.S. estimates were corrected for abortion underreporting using secondary estimates of the percentage of abortions resulting from each contraceptive method from abortion providers (Kost et al. 2008). No such information is available in the countries where DHS surveys are conducted, so DHS-based results cannot be corrected in this way. In the absence of the abortion underreporting correction, the U.S. estimate of condom failure rate decreases to 13.9, and fertility-awareness-based methods (a subset of the periodic abstinence method group) decreases to 23.0. Even in the absence of this correction, therefore, estimates in the Polis et al. study are clearly significantly lower than the Hatcher et al. U.S. estimates.

One aim of the present study was to investigate the potential causes of this discrepancy. We theorized that failure rates based on all available DHS surveys were biased downwards by the inclusion of surveys that showed substantial evidence of underreporting, based on the findings in (Bradley, Winfrey, and Croft 2015)

As shown in Figure 43, contraceptive failure rates estimated from calendar data that showed the lowest levels of underreporting (as described in Appendix A) produce estimated failure rates that are similar to the median rates across all available survey data for methods with low failure rates and thus limited variability: estimates of failure rates for implants and IUDs are virtually identical between the two data sources, with completely overlapping confidence intervals indicating that the results are not statistically significantly different. Our estimates of injectable failure are also similar (2.0 failures per 100 episodes of use vs. 1.7)

Differences between our estimates and Polis and colleagues' are larger for methods with higher levels of failure: condoms (8.6 vs. 5.4), withdrawal (17.3 vs. 13.4), and periodic abstinence (19.0 vs. 13.9). These substantial differences suggest that the inclusion of surveys with less reliable information on retrospective contraceptive use data did bias rates downwards in the Polis et al., and presumably the Ali et al. 2012, studies.

At the same time, our estimates, though higher, are still well below those in Hatcher et al. We therefore searched for other possible explanations. One potential rationale could be that in even the most reliable DHS calendar data, women still underreport contraceptive failures. This is logical, as outlined in the limitations section below, though we believe that the data used here are largely reliable due to the strict quality-based selection criteria we used to form our sample. We believe that another potential source of differences in the estimates could be due to an important yet widely ignored factor influencing contraceptive failure: age.

As shown in Table 6 and Figure 44, the strongest patterns in contraceptive failure are seen by age, with adolescents consistently experiencing the highest failure rates and women ages 40+ the lowest. Differences in failure estimates by age are substantial: teenaged condom users experience contraceptive failure at more than 10 times the rate of women ages 40 and older. Adolescent pill and periodic abstinence users have failure rates that are almost four times higher, and withdrawal users have failure rates that are six times higher, compared to women in their forties. These differences are dramatic enough that the discrepancies between our estimates those of Hatcher et al. could be explained entirely by differences in the age composition of users, at least for traditional methods. If the age distribution of traditional method users skews younger in the NSFG data on which the Hatcher et al. estimates are based than in the sample analyzed here, the differences between estimates could be simply explained by compositional differences in the age structure of users. The data presented in Kost et al. 2008 do not include the age distributions of users by method nor method-specific failure rates by age, so we cannot validate this theory, but this is a clear area for further examination.

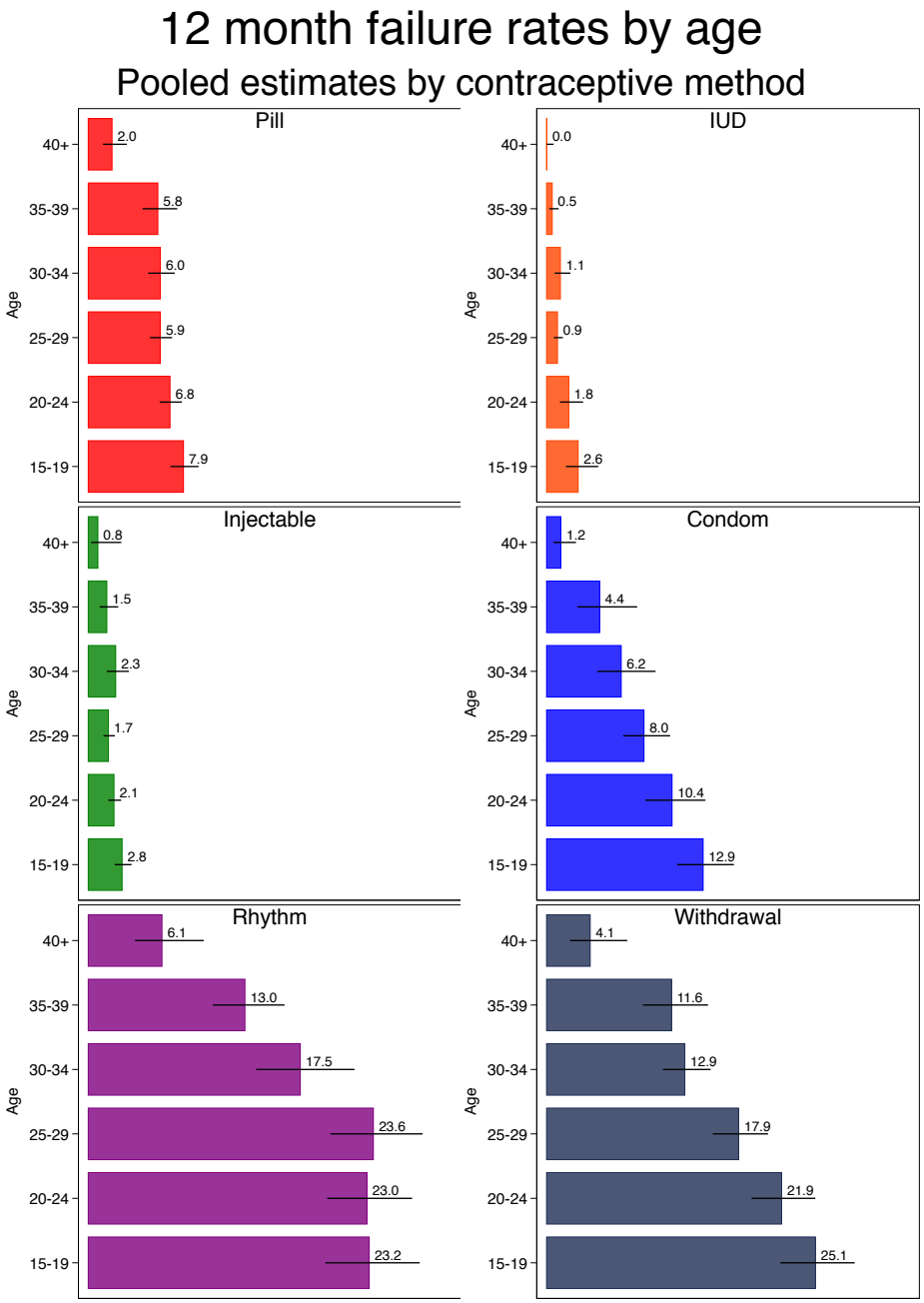
Table 6: 12-month contraceptive failure rates by sociodemographic characteristics, pooled DHS data

	Contraceptive Pill			IUD			Injection			Condom		
	Failure rate	(95% CI)	N of episodes	Failure rate	(95% CI)	N of episodes	Failure rate	(95% CI)	N of episodes	Failure rate	(95% CI)	N of episodes
Age groups												
15-19	7.9	(6.8 - 9.1)	5,731	2.6	(1.6 - 4.3)	772	2.8	(2.2 - 3.6)	4,737	12.9	(10.8 - 15.5	5,558
20-24	6.8	(5.9 - 7.7)	9,209	1.8	(1.1 - 3)	2,365	2.1	(1.7 - 2.7)	7,138	10.4	(8.2 - 13.1)	4,495
25-29	5.9	(5.1 - 6.9)	7,839	0.9	(0.6 - 1.3)	2,549	1.7	(1.3 - 2.2)	5,802	8.0	(6.3 - 10.2)	3,161
30-34	6.0	(5 - 7.1)	4,847	1.1	(0.7 - 2)	1,748	2.3	(1.5 - 3.3)	3,620	6.2	(4.2 - 9)	2,066
35-39	5.8	(4.5 - 7.4)	2,567	0.5	(0.2 - 1)	945	1.5	(0.9 - 2.5)	2,050	4.4	(2.6 - 7.5)	1,281
40+	2.0	(1.2 - 3.2)	1,284	0.0	(0 - 0.6)	400	0.8	(0.2 - 2.7)	1,107	1.2	(0.6 - 2.4)	815
Highest education level												
No education	6.9	(5.8 - 8.1)	3,380	0.3	(0.1 - 1.3)	659	2.1	(1.3 - 3.4)	2,129	6.1	(3.3 - 11.1)	325
Primary education	6.0	(5.2 - 7)	9,255	1.6	(0.9 - 3)	1,762	1.4	(1.1 - 1.7)	9,277	7.5	(5.8 - 9.6)	3,283
Secondary + education	6.3	(5.7 - 7)	18,842	1.2	(0.9 - 1.5)	6,358	2.6	(2.2 - 3.1)	13,048	8.9	(7.8 - 10.1)	13,768
Socioeconomic status												
Poorest 60%	7.3	(6.6 - 8)	19,457	1.2	(0.8 - 1.8)	5,019	2.0	(1.8 - 2.4)	17,437	10.8	(9.2 - 12.6)	9,595
Richest 40%	5.0	(4.4 - 5.7)	12,020	1.2	(0.8 - 1.7)	3,760	1.9	(1.4 - 2.5)	7,017	7.0	(5.9 - 8.2)	7,781
Contraceptive intention												
Spacing	6.7	(6.1 - 7.3)	19,789	1.6	(1.2 - 2.2)	4,805	1.9	(1.6 - 2.3)	14,315	9.4	(8.3 - 10.8)	12,962
Limiting	5.7	(5.1 - 6.5)	11,688	0.7	(0.4 - 1)	3,974	2.1	(1.6 - 2.6)	10,139	6.4	(5 - 8.2)	4,414
Marital status												
Never married	4.7	(3.5 - 6.2)	2,638	3.1	(1.4 - 6.5)	215	2.9	(2.1 - 3.9)	3,123	7.2	(6 - 8.6)	6,711
Ever married	6.4	(5.9 - 6.9)	28,839	1.2	(0.9 - 1.5)	8,564	1.9	(1.7 - 2.2)	21,331	8.9	(7.8 - 10.2)	10,665
Total	**6.3**	**(5.9 - 6.8)**	**31,477**	**1.2**	**(0.9 - 1.5)**	**8,779**	**2.0**	**(1.7 - 2.3)**	**24,454**	**8.6**	**(7.6 - 9.6)**	**17,376**

Table 6, continued

	Withdrawal			Periodic Abstinence			Implant		
	Failure rate	(95% CI)	N of episodes	Failure rate	(95% CI)	N of episodes	Failure rate	(95% CI)	N of episodes
Age groups									
15-19	25.1	(21.8 - 28.7	2,316	23.2	(19.6 - 27.4	1,246	0.3	(0 - 1.3)	349
20-24	21.9	(19.1 - 25.1	3,347	23.0	(19.8 - 26.8	1,635	-	-	630
25-29	17.9	(15.5 - 20.7	3,185	23.6	(20 - 27.6)	1,691	0.9	(0.2 - 3.3)	564
30-34	12.9	(10.8 - 15.3	2,135	17.5	(13.9 - 22)	1,467	0.3	(0.1 - 0.9)	375
35-39	11.6	(9 - 15.1)	1,310	13.0	(10.3 - 16.2	1,068	-	-	201
40+	4.1	(2.2 - 7.5)	865	6.1	(3.9 - 9.5)	752	-	-	100
Highest education level									
No education	13.2	(10.2 - 17.1	772	17.1	(13.2 - 22)	505	0.7	(0.3 - 1.6)	214
Primary education	15.3	(13.7 - 17.1	4,346	17.6	(15.2 - 20.3	2,271	0.1	(0 - 0.4)	696
Secondary + education	18.8	(16.9 - 21)	8,040	19.9	(17.8 - 22.1	5,083	0.4	(0.1 - 1.6)	1,309
Socioeconomic status									
Poorest 60%	17.8	(16.1 - 19.7	8,657	19.9	(17.9 - 22.1	4,980	0.3	(0.1 - 1.2)	1,243
Richest 40%	16.3	(14.3 - 18.6	4,501	17.9	(15.6 - 20.5	2,879	0.4	(0.1 - 1.4)	976
Contraceptive intention									
Spacing	19.5	(17.8 - 21.4	8,947	22.4	(20.3 - 24.6	4,801	0.3	(0 - 1.3)	1,194
Limiting	13.0	(11.4 - 14.8	4,211	13.8	(11.6 - 16.4	3,058	0.4	(0.1 - 1.4)	1,025
Marital status									
Never married	27.1	(21.4 - 33.9	1,775	18.3	(15.1 - 22.1	1,297	0.1	(0 - 2.1)	317
Ever married	16.7	(15.4 - 18)	11,383	19.1	(17.4 - 20.9	6,562	0.3	(0.1 - 1)	1,902
Total	**17.3**	**(15.9 - 18.7**	**13,158**	**19.0**	**(17.4 - 20.6**	**7,859**	**0.3**	**(0.1 - 0.9)**	**2,219**

Figure 44: Patterns of contraceptive failure by age



Failure rates for pills, condoms, withdrawal, and periodic abstinence are significantly higher for women in the poorest 60% of the population than for women from wealthier households (Table 6). Women who are using contraceptives in order to space (and thus presumably have lower motivation to avoid pregnancy than women who have completed their families and are using to limit additional births) have significantly higher rates of contraceptive failure for pills, condoms, withdrawal, and periodic abstinence (Figure 4). IUD users also report higher rates of failure if they are using to space rather than limit, which is surprising given that once an IUD is inserted, we would not expect the effectiveness to vary based on any action by the user. This finding could indicate that women who want no more children are, on average, older and thus less fecund.

A priori, we anticipate that contraceptive failure rates may be lower among more well-educated women who may have a better understanding of how and when they are at risk of pregnancy, and may have access to more information about how to avoid pregnancy when, for example, they forget a contraceptive pill. This theory is not consistently borne out by the data, however. The results for periodic abstinence are particularly surprising, as women with secondary or higher education have significantly higher failure rates than women with no formal education. This issue is revisited in the multivariate models. Patterns of failure by marital status are inconsistent.

Model results

Table 7 presents results from the multilevel multivariate hazard models of contraceptive failure. In these models, age remains by far the most consistent predictor of contraceptive failure after adjusting for the other covariates. Compared to adolescent women ages 15-19, the hazard of failure for women ages 40 and older is 76 percent lower for pill users, 98 percent lower for IUD users, 64 percent lower for injectable users, and 77-82 percent lower for traditional method users. For most methods, a steady decrease is seen in the hazard of failure as women's age increases.

Table 7: Hazard Ratios of contraceptive failure within the first year of use by contraceptive method

	Contraceptive Pill		IUD		Injection		Male Condom		Periodic Abstinence		Withdrawal	
	Hazard ratio	95% CI	Hazard ratio	95% CI	Hazard ratio	95% CI	Hazard ratio	95% CI	Hazard ratio	95% CI	Hazard ratio	95% CI
Age <20 (ref)	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
20-24	0.829*	0.678,1.013	0.950	0.465,1.939	0.931	0.654,1.324	0.555***	0.411,0.749	0.798*	0.614,1.038	0.859	0.685,1.078
25-29	0.697***	0.553,0.878	0.608	0.297,1.245	0.693*	0.450,1.068	0.350***	0.244,0.502	0.823	0.626,1.081	0.731**	0.574,0.932
30-34	0.688***	0.518,0.913	0.868	0.386,1.952	1.047	0.657,1.668	0.273***	0.175,0.427	0.632***	0.462,0.864	0.533***	0.404,0.705
35-39	0.648**	0.463,0.907	0.400*	0.149,1.073	0.702	0.387,1.276	0.184***	0.094,0.357	0.443***	0.314,0.625	0.518***	0.370,0.726
40+	0.238***	0.141,0.403	0.014***	0.002,0.110	0.363*	0.111,1.188	0.063***	0.027,0.145	0.228***	0.138,0.378	0.184***	0.099,0.342
Wealthiest 40% of population (ref)	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
Poorest 60% of population	1.462***	1.207,1.772	0.951	0.523,1.729	1.272	0.917,1.765	1.390**	1.077,1.793	1.268*	1.000,1.609	1.140	0.948,1.370
No formal education	1.111	0.869,1.421	0.289	0.058,1.431	0.906	0.476,1.724	0.811	0.407,1.614	1.364***	1.186,1.570	1.264	0.895,1.786
Primary education	1.100	0.914,1.324	1.368	0.697,2.683	0.574***	0.400,0.824	0.947	0.686,1.308	1.171***	1.078,1.273	1.211	0.947,1.547
Secondary + education (ref)	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
Intention to limit (ref = space)	0.910	0.754,1.098	0.500**	0.282,0.884	1.309	0.924,1.853	0.947	0.682,1.314	0.778**	0.631,0.960	0.706***	0.582,0.856
Rural residence (ref urban)	0.859*	0.724,1.019	1.033	0.557,1.917	0.976	0.703,1.356	0.909	0.699,1.183	0.921	0.737,1.150	0.898	0.759,1.063
Nver married (ref. ever married)	0.754	0.538,1.058	0.914	0.397,2.103	0.886	0.609,1.289	0.696**	0.524,0.923	0.712***	0.641,0.790	1.549**	1.110,2.161

* p<0.1, ** p<0.05, *** p<0.01

All models include survey-level fixed effects and woman-level random effects

Women's socioeconomic status is associated with failure among pill, condom, and periodic abstinence users, with poorer women experiencing significantly higher hazards of failure. After adjusting for other variables in the model, particularly age, the strange pattern of failure by education disappears or is reversed for most methods. The only method for which education is a consistently significant predictor of failure is periodic abstinence, and the hazard of failure is now higher for women with no or primary education compared to women with secondary or higher education. This change in failure patterns after adjustment is explained by the fact that in the populations analyzed, older women tend to have lower levels of education, and also lower levels of failure. Once age is held constant, the pattern of failure by education becomes non-significant or, as in the case of periodic abstinence, reverses entirely, becoming consistent with theory. Strength of motivation to avoid pregnancy, as measured by intention to limit vs. space, remains a significant correlate of failure for traditional method users and users of the IUD. Urban vs. rural residence appears to have little or no impact on contraceptive failure, and patterns by marital status remain inconsistent.

Limitations

As noted above, concerns have been raised about the reliability of calendar data in some DHS surveys. In completing the calendar, interviewed women are asked to recall events that occurred up to seven years in the past. Women may omit failures simply due to recall biases; they may report they ended contraceptive use for reasons other than failure due to social desirability bias; or they may omit episodes of use that ended in a failure to avoid discussing the failure, especially if the failure ended in an abortion. We have made robust efforts to limit the impact of these types of bias in three ways. First, by using only the most recent 3 years of data from each woman's calendar history, which evidence from preliminary analysis suggests is less subject to recall bias. Second, by selecting surveys in which the calendar data could be validated against external information (comparisons with current-status method-specific CPR data from previous DHSs) and did not show significant evidence of underreporting of any of the contraceptive methods analyzed here. Third, by examining each survey for other types of misreporting, as explained in Appendix A, and selecting only the surveys that showed minimal-to-no evidence of heaping, displacement, or other reporting issues. We therefore believe that the data analyzed here is reliable, but also recognize that other selection criteria could have resulted in a different sample of surveys.

We also note that some of the covariates examined – particularly education level and socioeconomic status measured by wealth quintile group – were measured at the time of survey, and not at the time of the episode of use. Because the episodes analyzed here took place in the most recent 3 years, it is unlikely that dramatic shifts occurred between categories in that time frame, but acknowledge that there may be some misidentification in relationships with failure due to this limitation.

Due to the limitations described, the failure rate estimates presented in this report should be viewed as direct reflections of women's self-reports, which are not validated in any clinical way, and may not precisely reflect women's actual contraceptive histories and contraceptive failures. Despite these data limitations, we believe that the patterns shown are reasonable and reliable, and provide important insights to understand women's experiences with contraceptive failure.

Discussion and conclusions

Increasing the number of contraceptive users in low-income countries is a widely-cited and agreed-upon goal in the international development community (Brown et al. 2014). As progress towards this goal is achieved, contraceptive failures are likely to increase as well; in a society wherein all couples used contraception, 100% of unintended pregnancies would be the result of contraceptive failure. Results from this analysis indicate that among contracepting women, failure disproportionately affects the youngest and poorest women – in other words, women who may be the least able to care for an unintended child, obtain maternal healthcare, and access safe abortion services (Bankole et al. 2008; Fung 2012; Gipson, Koenig, and Hindin 2008; Joyce, Tan, and Zhang 2013; Rasch and Kipingili 2009; Sundaram et al. 2012). As a greater proportion of women begin using contraceptives, contraceptive failure is almost certain to become a more widespread phenomenon, and a greater proportion of women and couples will experience unintended pregnancies via failure. The increasing contribution of contraceptive failures to the health and socioeconomic status of populations warrants a better understanding of this experience.

This analysis shows that using higher quality surveys generally produces higher estimates of contraceptive failure rates than prior analyses of DHS calendar data that did not consider quality criteria (Ali, Cleland, and Shah 2012; Polis et al. 2016). This research therefore shows that DHS calendar data quality should be considered in future studies using contraceptive calendar data.

Demographers have long used age-specific data to model fertility, mortality, and other life experiences, but age patterns have been widely ignored in models of contraceptive failure. Most modeling exercises that incorporate failure or use-effectiveness use single values for entire methods or method categories, either based on US data (Hatcher 2011; Kost et al. 2008) or data from the Philippines in 1978 (Bongaarts 2015; Bongaarts and Potter 1983; Liang 1978) which are still used for estimating the Proximate Determinants model today (Bongaarts, 2015). By contrast, the estimated failure rates and correlates presented here are based on what we believe to be the best available data from relatively recent surveys conducted in a range of low- and middle-income countries. We propose that the age- and method-specific failure estimates presented here provide a useful opportunity to refine existing models, particularly those that aim to understand or project fertility rates in low- and middle-income countries. Such evidence could also be of potential use in clinical settings, to help women at different life stages better understand their own levels of risk. The findings presented here have direct applications for modeling approaches as well as for program and policy development worldwide.

There are few indicators of intention to avoid pregnancy that are as clear as contraceptive use. Women and couples who use contraceptives do so with the expectation that they will not become pregnant. As most unintended pregnancies globally are conceived without contraceptive use, couples' use of contraceptives may indicate that they are experiencing situations that may make unintended pregnancies particularly problematic. Users of contraceptive methods are shouldering the responsibility of intentionally planning the number and spacing of their children. Family planning programs have an additional responsibility to educate potential users about risks of contraceptive failure that are most relevant to them, including the explanation and provision of age-specific failure rates. As policies and programs encourage more women to adopt contraception, there must be an increasing focus on supporting women and couples to avoid contraceptive failure, and providing support including safe abortion services for when contraceptive failure does occur.

Conclusions

This dissertation examines the relationship between the reliability of widely-used Demographic and Health Survey data and three demographically important outcomes: fertility, child mortality, and contraceptive use.

The first chapter demonstrates that birth displacement exists in the majority of DHS surveys, and that the magnitude of this displacement is often substantial. Of particular issue for the estimation of infant and under-five mortality rates is the disproportionate displacement of dead children compared to surviving children, which occurs in the vast majority of surveys. Using the survey as the unit of analysis and investigating characteristics associated with these data quality measures, I find that higher levels of birth displacement, and differential displacement of deceased children, are associated with increases in questionnaire length, as proxied by the average number of non-missing variables per woman in each DHS Individual Recode dataset. I show that longer questionnaires are strongly associated with reduced quality of data used to estimate infant and under-five mortality rates and fertility rates, and that this reduced quality is likely associated with biased estimates, particularly of under-five mortality. This analysis indicates that reductions in the questionnaire length will likely improve the quality of vital demographic and health data in the future.

In the second chapter, I examine the reliability of retrospective calendar data about contraceptive use by comparing estimates based on calendar data with current-status data from other surveys. I find that in the majority of comparisons, calendar data appear to underestimate contraceptive use, often substantially: levels of total contraceptive use differ significantly between the calendar and current use reports in 74 percent of survey pairs analyzed. Reporting on use of condoms and Lactational Amenorrhea Method were particularly problematic, while the long-term methods of IUDs, implants, and sterilization appear to be reported much more consistently. I demonstrate regional patterns in the correspondence between levels of contraceptive use collected in the calendar versus current status data. The level of agreement between calendar and current use estimates of contraceptive use is generally high surveys conducted in Latin America and the Caribbean, and in North Africa/West Asia/Eastern Europe. In most of the Asian and sub-Saharan African surveys, the picture looks bleak. In more than 80 percent of surveys in these regions, the calendar does not appear to accurately capture the level of contraceptive use measured from current status data. In many surveys in these regions, particularly in lower contraceptive prevalence countries, the calendar underestimates the current use estimate of total CPR by 25 to 50 percent. The West African surveys analyzed show particularly large discrepancies between estimates of CPR from the calendar and current use data. In this chapter, I speculate about the effect that underreporting of contraceptive use in the calendar has on estimates of contraceptive discontinuation, including contraceptive failure.

The third chapter builds on the findings from Chapter 2, examining the impact of contraceptive use underreporting in retrospective calendar data on estimates of contraceptive failure. This analysis shows that using higher quality surveys generally produces higher estimates of contraceptive failure rates than prior analyses of DHS calendar data that did not consider quality criteria (Ali, Cleland, and Shah 2012; Polis et al. 2016). This research therefore shows that DHS calendar data quality should be considered in future studies using contraceptive calendar data. This analysis also shows that in multivariate survival models, contraceptive failure disproportionately affects the youngest and poorest women. Previous research has found that young women and poor women are least able to care for an unintended child, obtain maternal healthcare, and access safe abortion services (Bankole et al. 2008; Fung 2012; Gipson, Koenig, and Hindin 2008; Joyce, Tan, and Zhang 2013; Rasch and

Kipingili 2009; Sundaram et al. 2012). Women and couples who use contraception are clearly trying to avoid pregnancy, shouldering the responsibility of intentionally planning the number and spacing of their children. Based on the results of this analysis, I propose that family planning programs have an additional responsibility to educate potential users about risks of contraceptive failure that are most relevant to them, including the explanation and provision of age-specific failure rates. As global programs encourage more women to adopt contraception, there must be an increasing focus on supporting women and couples to avoid contraceptive failure, and providing support including safe abortion services for when contraceptive failure does occur.

The common thread shared by the three substantive chapters in this dissertation is a careful scrutiny of the quality and reliability of DHS data. As DHS data are the primary source for health and demographic data in many low- and middle-income countries, the quality of DHS data is of the utmost importance for enabling countries to understand levels and patterns in these indicators, and to track progress towards global goals. Along with careful scrutiny, this dissertation points towards ways that the quality and reliability could be improved. Findings from these three studies contribute to our understanding about one of the most important and widely-used data sources in the world.

References

Abatih, Emmanuel, Herman Van Oyen, Nathalie Bossuyt, and Liesbeth Bruckers. 2008. "Variance Estimation Methods for Health Expectancy by Relative Socio-Economic Status." *European Journal of Epidemiology* 23 (4): 243–49. doi:10.1007/s10654-008-9227-5.

Academy of Preventive Medicine [Kazakhstan], and Macro International Inc. 2000. *Kazakhstan Demographic and Health Survey 1999*. Calverton, Maryland, USA: Academy of Preventive Medicine and Macro International Inc.

Ali, Mohamed, and John Cleland. 1999. "Determinants of Contraceptive Discontinuation in Six Developing Countries." *Journal of Biosocial Science* 31 (03): 343–60.

Ali, Mohamed M., John Cleland, and Iqbal H. Shah. 2012. "Causes and Consequences of Contraceptive Discontinuation: Evidence from 60 Demographic and Health Surveys." World Health Organization.

Bankole, Akinrinola, Gilda Sedgh, Boniface A. Oye-Adeniran, Isaac F. Adewole, Rubina Hussain, and Susheela Singh. 2008. "Abortion-Seeking Behaviour among Nigerian Women." *Journal of Biosocial Science* 40 (2): 247–68. doi:10.1017/S0021932007002283.

Bertrand, Marianne, and Sendhil Mullainathan. 2001. "Do People Mean What They Say? Implications for Subjective Survey Data." *American Economic Review* 91 (2): 67–72. doi:10.1257/aer.91.2.67.

Bignami-van Assche, S., G. Reniers, and A. A. Weinreb. 2003. "An Assessment of the KDICP and MDICP Data Quality: Interviewer Effects, Question Reliability and Sample Attrition." *Demographic Research* 1 (2): 31–76.

Black, Kirsten I., Sunanda Gupta, Angela Rassi, and Ali Kubba. 2010. "Why Do Women Experience Untimed Pregnancies? A Review of Contraceptive Failure Rates." *Best Practice & Research Clinical Obstetrics & Gynaecology*, Abortion and Post-abortion Care - Volume 1, 24 (4): 443–55. doi:10.1016/j.bpobgyn.2010.02.002.

Bongaarts, John. 2015. "Modeling the Fertility Impact of the Proximate Determinants: Time for a Tune-Up." *Demographic Research* 33 (September): 535–60. doi:10.4054/DemRes.2015.33.19.

Bongaarts, John, and Robert G. Potter. 1983. "5 - Applications of an Aggregate Fertility Model." In *Fertility, Biology, and Behavior*, 103–26. San Diego: Academic Press.

Bradley, Sarah E.K. 2015. "More Questions, More Bias? An Assessment of the Quality of Data Used for Direct Estimation of Infant and Child Mortality in the Demographic and Health Surveys." In . Population Association of America Annual Meeting, San Diego.

Bradley, Sarah E.K., Trevor N. Croft, and Shea O. Rutstein. 2011. "The Impact of Contraceptive Failure on Unintended Births and Induced Abortions: Estimates and Strategies for Reduction." DHS Analytical Studies No. 22. Calverton, Maryland, USA: ICF Macro. http://dhsprogram.com/pubs/pdf/AS22/AS22.pdf.

Bradley, Sarah E.K., Hilary M. Schwandt, and Shane Khan. 2009. "Levels, Trends, and Reasons for Contraceptive Discontinuation." DHS Analytical Studies No. 20. Calverton, Maryland, USA: ICF Macro. http://dhsprogram.com/pubs/pdf/AS20/AS20.pdf.

Bradley, Sarah E.K., William Winfrey, and Trevor 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. http://dhsprogram.com/pubs/pdf/MR17/MR17.pdf.

Brown, Win, Nel Druce, Julia Bunting, Scott Radloff, Desmond Koroma, Srishti Gupta, Brian Siems, Monica Kerrigan, Dan Kress, and Gary L. Darmstadt. 2014. "Developing the '120 by 20' Goal for the Global FP2020 Initiative." *Studies in Family Planning* 45 (1): 73–84. doi:10.1111/j.1728-4465.2014.00377.x.

Bryce, Jennifer, Agbessi Amouzou, Cesar G. Victora, Gareth Jones, Romesh Silva, Kenneth Hill, Robert E. Black, and RMM Working Group. 2016. "'Real-Time' Monitoring of Under-Five Mortality: Lessons for Strengthened Vital Statistics Systems." *PLOS Medicine* 13 (1): e1001904. doi:10.1371/journal.pmed.1001904.

Callahan, Rebecca L., and Stan Becker. 2012. "The Reliability of Calendar Data for Reporting Contraceptive Use: Evidence from Rural Bangladesh." *Studies in Family Planning* 43 (3): 213–22.

Cameron, Adrian Colin, and P. K. Trivedi. 2005. *Microeconometrics: Methods and Applications*. Cambridge; New York: Cambridge University Press.

Corsi, Daniel J., Melissa Neuman, Jocelyn E. Finlay, and S. V. Subramanian. 2012. "Demographic and Health Surveys: A Profile." *International Journal of Epidemiology* 41 (6): 1602–13. doi:10.1093/ije/dys184.

Curtis, Sian L. 1995. "Assessment of the Quality of Data Used for Direct Estimation of Infant and Child Mortality in DHS-II Surveys." DHS Occasional Papers No. 3. Calverton, Maryland, USA: Macro International. http://dhsprogram.com/pubs/pdf/OP3/OP3.pdf.

Curtis, Sian L., and Ann K. Blanc. 1997. "Determinants of Contraceptive Failure, Switching, and Discontinuation: An Analysis of DHS Contraceptive Histories." DHS Analytical Reports No. 6. Calverton, Maryland, USA: Macro International. http://dhsprogram.com/pubs/pdf/AR6/AR6.pdf.

Fabic, Madeleine Short, and Yoonjoung Choi. 2013. "Assessing the Quality of Data Regarding Use of the Lactational Amenorrhea Method." *Studies in Family Planning* 44 (2): 205–21.

Fishman, Ezra. 2015. "Variance Estimation for a Complex Life Table Quantity: Disease-Free Life Expectancy." Working Paper 15-2. Population Studies Center Working Paper Series. University of Pennsylvania. http://repository.upenn.edu/cgi/viewcontent.cgi?article=1059&context=psc_working_papers.

Fowler, Floyd J., and Thomas W. Mangione. 1990. *Standardized Survey Interviewing ; Minimizing Interviewer-Related Error*. Applied Social Research Methods Series, v. 18. Newbury Park, Calif: Sage Publications.

Frost, Jennifer J., and Jacqueline E. Darroch. 2008. "Factors Associated with Contraceptive Choice and Inconsistent Method Use, United States, 2004." *Perspectives on Sexual and Reproductive Health* 40 (2): 94–104. doi:10.1363/4009408.

Fung, Brian. 2012. "The Quiet Racism of Abortion Bans." *The Atlantic*, August 28. http://www.theatlantic.com/health/archive/2012/08/the-quiet-racism-of-abortion-bans/261665/.

Galati, Alanna J. 2015. "Onward to 2030: Sexual and Reproductive Health and Rights in the Context of the Sustainable Development Goals." *Guttmacher Policy Review* 18 (4). https://www.guttmacher.org/pubs/gpr/18/4/gpr1807715.html.

Galesic, Mirta, and Michael Bosnjak. 2009. "Effects of Questionnaire Length on Participation and Indicators of Response Quality in a Web Survey." *Public Opinion Quarterly* 73 (2): 349–60. doi:10.1093/poq/nfp031.

Gipson, Jessica D., Michael A. Koenig, and Michelle J. Hindin. 2008. "The Effects of Unintended Pregnancy on Infant, Child, and Parental Health: A Review of the Literature." *Studies in Family Planning* 39 (1): 18–38.

Goldman, Noreen, Lorenzo Moreno, and Charles F. Westoff. 1989a. "Collection of Survey Data on Contraception: An Evaluation of an Experiment in Peru." *Studies in Family Planning* 20 (3): 147–57.

———. 1989b. "Peru Experimental Study: An Evaluation of Fertility and Child Health Information." Columbia, MD, USA: Office of Population Research, Princeton University, Princeton, NJ and Institute for Resource Development/Macro Systems, Inc.
Hatcher, Robert Anthony. 2011. *Contraceptive Technology*. New York, N.Y.: Ardent Media.
Hill, Kenneth, Eoghan Brady, Linnea Zimmerman, Livia Montana, Romesh Silva, and Agbessi Amouzou. 2015. "Monitoring Change in Child Mortality through Household Surveys." *PLOS ONE* 10 (11): e0137713. doi:10.1371/journal.pone.0137713.
Hill, Kenneth, Danzhen You, Mie Inoue, Mikkel Z. Oestergaard, and Technical Advisory Group of the United Nations Inter-agency Group for Child Mortality Estimation. 2012. "Child Mortality Estimation: Accelerated Progress in Reducing Global Child Mortality, 1990–2010." *PLoS Med* 9 (8): e1001303. doi:10.1371/journal.pmed.1001303.
ICF International. 2012. *Survey Organization Manual for Demographic and Health Surveys, MEASURE DHS*. Calverton, Maryland, USA: ICF International.
Jones, Rachel K., and Kathryn Kost. 2007. "Underreporting of Induced and Spontaneous Abortion in the United States: An Analysis of the 2002 National Survey of Family Growth." *Studies in Family Planning* 38 (3): 187–97.
Joyce, Ted, Ruoding Tan, and Yuxiu Zhang. 2013. "Abortion Before & After Roe." *Journal of Health Economics* 32 (5): 804–15. doi:10.1016/j.jhealeco.2013.05.004.
Kalbfleisch, John D., and Ross L. Prentice. 2002. *The Statistical Analysis of Failure Time Data*. John Wiley & Sons, Inc. http://dx.doi.org/10.1002/9781118032985.fmatter.
Kalton, Graham, and Howard Schuman. 1982. "The Effect of the Question on Survey Responses: A Review." *Journal of the Royal Statistical Society. Series A (General)* 145 (1): 42–73. doi:10.2307/2981421.
Kost, Kathryn, Susheela Singh, Barbara Vaughan, James Trussell, and Akinrinola Bankole. 2008. "Estimates of Contraceptive Failure from the 2002 National Survey of Family Growth." *Contraception* 77 (1): 10–21. doi:10.1016/j.contraception.2007.09.013.
Liang, JE. 1978. "Use Effectiveness Levels and Trends in the Philippines, 1970-1976." Research Note 14. Manila: Population Institute, University of the Philippines.
Lightbourne, Robert E. 1985. "Individual Preferences and Fertility Behaviour." In *Reproductive Change in Developing Countries: Insights from the World Fertility Survey*, edited by John Cleland and John Hobcraft. Oxford: Oxford University Press.
MEASURE DHS. 2012. "Questionnaires: Household, Woman's, and Man's, MEASURE DHS Phase III Project." Rockville, MD, USA: MEASURE DHS/ICF International.
———. 2013a. "Female Genital Cutting Module, MEASURE DHS Phase III Project." Rockville, MD, USA: MEASURE DHS/ICF International.
———. 2013b. "Maternal Mortality Module, MEASURE DHS Phase III Project." Rockville, MD, USA: MEASURE DHS/ICF International.
Menken, J., J. Trussell, and U. Larsen. 1986. "Age and Infertility." *Science* 233 (4771): 1389–94. doi:10.1126/science.3755843.
Mikkelsen, Lene, Alan Lopez, and David Phillips. 2015. "Why Birth and Death Registration Really Are 'vital' Statistics for Development | Human Development Reports." http://hdr.undp.org/en/content/why-birth-and-death-registration-really-are-%E2%80%9Cvital%E2%80%9D-statistics-development.
Moreau, C., J. Trussell, G. Rodriguez, N. Bajos, and J. Bouyer. 2007. "Contraceptive Failure Rates in France: Results from a Population-Based Survey." *Human Reproduction* 22 (9): 2422–27. doi:10.1093/humrep/dem184.

Moreno, Lorenzo. 1993. "Differences by Residence and Education In Contraceptive Failure Rates in Developing Countries." *International Family Planning Perspectives* 19 (2): 54. doi:10.2307/2133420.

Moreno, Lorenzo, and Noreen Goldman. 1991. "Contraceptive Failure Rates in Developing Countries: Evidence from the Demographic and Health Surveys." *International Family Planning Perspectives* 17 (2): 44. doi:10.2307/2133553.

Moreno, Lorenzo, Noreen Goldman, and Ozer Babakol. 1991. "[Use of a monthly calendar for collecting retrospective data on contraception: an evaluation of the experimental field studies of the Demographic and Health Surveys (DHS)]." *Notas De Población* 18-19 (51-52): 11–37.

NIPORT, Mitra and Associates, and Macro International Inc. 2009. *Bangladesh Demographic and Health Survey 2007*. Dhaka, Bangladesh and Calverton, MD, USA: National Institute of Population Research and Training, Mitra and Associates, and Macro International.

Oehlert, Gary W. 1992. "A Note on the Delta Method." *The American Statistician* 46 (1): 27–29. doi:10.1080/00031305.1992.10475842.

Polis, Chelsea B., Sarah E.K. Bradley, Akinrinola Bankole, Tsuyoshi Onda, Trevor Croft, and Susheela Singh. 2016. "Contraceptive Failure Rates in the Developing World: An Analysis of Demographic and Health Survey Data in 43 Countries." New York: Guttmacher Institute.

Pullum, Thomas W. 2006. "An Assessment of Age and Date Reporting in the DHS Surveys, 1985-2003." DHS Methodological Reports No. 5. Calverton, Maryland, USA: Macro International. http://dhsprogram.com/pubs/pdf/MR5/MR5.pdf.

Pullum, Thomas W., and Stan Becker. 2014. "Evidence of Omission and Displacement in DHS Birth Histories." DHS Methodological Reports No. 11. Rockville, Maryland, USA: ICF International. http://dhsprogram.com/pubs/pdf/MR11/MR11.pdf.

Rabe-Hesketh, Sophia, and Anders Skrondal. 2012. *Multilevel and Longitudinal Modeling Using Stata*. Third Edition. 2 vols. College Station, Texas: Stata Press.

Rasch, Vibeke, and Rose Kipingili. 2009. "Unsafe Abortion in Urban and Rural Tanzania: Method, Provider and Consequences." *Tropical Medicine & International Health: TM & IH* 14 (9): 1128–33. doi:10.1111/j.1365-3156.2009.02327.x.

Rutstein, Shea O., George T. Bicego, Ann K. Blanc, Naomi Rutenberg, Fred Arnold, and Jeremiah A. Sullivan. 1990. "An Assessment of DHS-I Data Quality." DHS Methodological Reports No. 1. Columbia, Maryland, USA: Institute for Resource Development/Macro Systems Inc. http://dhsprogram.com/pubs/pdf/MR1/MR1.pdf.

Rutstein, Shea O., and Kiersten Johnson. 2004. "The DHS Wealth Index." DHS Comparative Reports No. 6. Calverton, Maryland, USA: ORC Macro. http://dhsprogram.com/pubs/pdf/CR6/CR6.pdf.

Rutstein, Shea O., and Guillermo Rojas. 2003. "The DHS Guide to Statistics." Calverton, Maryland, USA: ORC Macro. http://www.dhsprogram.com/pubs/pdf/DHSG1/Guide_to_DHS_Statistics_29Oct2012_DHSG1.pdf.

Sanchez, Maria Elena. 1992. "Effect of Questionnaire Design on the Quality of Survey Data." *Public Opinion Quarterly* 56 (2): 206–17. doi:10.1086/269311.

Schoumaker, Bruno. 2014. "Quality and Consistency of DHS Fertility Estimates, 1990 to 2012." DHS Methodological Reports No. 12. Rockville, Maryland, USA: ICF International. http://dhsprogram.com/pubs/pdf/MR12/MR12.pdf.

Schuman, Howard, and Stanley Presser. 1979. "The Open and Closed Question." *American Sociological Review* 44 (5): 692–712.

Sedgh, Gilda, Susheela Singh, and Rubina Hussain. 2014. "Intended and Unintended Pregnancies Worldwide in 2012 and Recent Trends." *Studies in Family Planning* 45 (3): 301–14. doi:10.1111/j.1728-4465.2014.00393.x.

Short Fabic, Madeleine, YoonJoung Choi, and Sandra Bird. 2012. "A Systematic Review of Demographic and Health Surveys: Data Availability and Utilization for Research." *Bulletin of the World Health Organization* 90 (8): 604–12. doi:10.2471/BLT.11.095513.

Singh, Susheela, Jacqueline E. Darroch, and Lori S. Ashford. 2014. "Adding It Up: The Costs and Bene Ts of Investing in Sexual and Reproductive Health 2014." New York: Guttmacher Institute.

Sivin, I., and J. Stern. 1979. "Long-Acting, More Effective Copper T IUDs: A Summary of U.S. Experience, 1970-75." *Studies in Family Planning* 10 (10): 263–81.

StataCorp. 2015. *Stata 14 Base Reference Manual*. College Station, Texas: Stata Press.

Steele, Fiona, and Siân Curtis. 2003. "Appropriate Methods for Analyzing the Effect of Method Choice on Contraceptive Discontinuation." *Demography* 40 (1): 1–22.

Strickler, Jennifer A., Robert J. Magnani, H. Gilman McCann, Lisanne F. Brown, and Janet C. Rice. 1997. "The Reliability of Reporting of Contraceptive Behavior in DHS Calendar Data: Evidence from Morocco." *Studies in Family Planning* 28 (1): 44. doi:10.2307/2137970.

Sundaram, Aparna, Fatima Juarez, Akinrinola Bankole, and Susheela Singh. 2012. "Factors Associated with Abortion-Seeking and Obtaining a Safe Abortion in Ghana." *Studies in Family Planning* 43 (4): 273–86. doi:10.1111/j.1728-4465.2012.00326.x.

Trussell, James. 2011. "Contraceptive Failure in the United States." *Contraception* 83 (5): 397–404. doi:10.1016/j.contraception.2011.01.021.

Trussell, James, and Barbara Vaughan. 1999. "Contraceptive Failure, Method-Related Discontinuation and Resumption of Use: Results from the 1995 National Survey of Family Growth." *Family Planning Perspectives* 31 (2): 64. doi:10.2307/2991641.

UNICEF. 2013. "Every Child's Birth Right: Inequities and Trends in Birth Registration." New York, NY: UNICEF.

United Nations Statistics Division. 2016. "United Nations Statistics Division - Demographic and Social Statistics." Accessed April 23. http://unstats.un.org/unsd/demographic/CRVS/CR_coverage.htm.

Westoff, Charles F. 1974. "Coital Frequency and Contraception." *Family Planning Perspectives* 6 (3): 136–41. doi:10.2307/2134122.

Westoff, Charles F., Noreen Goldman, and Lorenzo Moreno. 1990. "Dominican Republic Experimental Study." Columbia, MD, USA: Institute for Resource Development/Macro Systems, Inc.

WHO Task Force. 1980. "User Preferences for Contraceptive Methods in India, Korea, the Philippines, and Turkey." *Studies in Family Planning* 11 (9/10): 267–73. doi:10.2307/1966364.

Appendix A: Evaluation of calendar data quality

The collection of retrospective calendar data requires women to accurately recall episodes of contraceptive use that occurred up to seven years in the past. These data are clearly subject to recall issues and other potential biases. Bradley and colleagues (2015) found evidence of underreporting of retrospective contraceptive use in the calendar in 74 percent of comparisons between calendar data and current-use estimates for the same time point. In most calendars, the gap between current-status and retrospective reports of contraceptive use was widest for the earliest time points within each calendar, suggesting that contraceptive use were most poorly reported for the points furthest back in time. We surmised that if contraception was underreported in the earliest part of each calendar, resulting failure rates were most likely to be underreported also. Under the theory that contraceptive failure rates should not change dramatically within the same country across a single five-year period, we tested this concept by splitting each calendar period (typically 5 to 7 years; see Bradley, Winfrey, & Croft, 2015 for detail) into two equal time segments and calculating single-decrement failure rates, as described in Appendix B, separately for each time segment. For example, the Egypt 2014 survey collected calendar data for the period beginning in January of 2009 through the date of interview in 2014. We hypothesized that there was no reason to expect failure rates calculated for the period from 2009 through 2011 to be substantially different from that calculated for 2011 through 2014.

In the majority of comparisons, we found that contraceptive failure rates were substantially lower estimated from the early time segment as compared to the later time segment within each survey. In the aforementioned example using data collected from Egyptian women in 2014, the pill failure rate was estimated at 5.2 percent (CI 3.2 – 7.2) from the early time segment and 9.8 percent (CI 8.3 – 11.3) in the more recent time segment. A similar pattern was found in the majority of survey-method pairs analyzed. Although this pattern was not found in every survey, it does suggest that contraceptive failures are underreported for periods further back in time. The finding further suggests that the problems with underreporting of contraceptive use episodes found by Bradley and colleagues do affect estimates of contraceptive failure and, most likely, discontinuation rates for other and all reasons.

To obtain the best estimates of contraceptive failure from data that are clearly imperfect, we used two strategies. First, we used only the most recent data from each survey, as data quality issues clearly increase for periods further back in time. Following standard methods for calculating contraceptive failure, we exclude the most recent three months from analysis, as women in their first trimesters may not yet recognize they are pregnant. We used the 3 – 38 month period prior to each woman's interview as the window of observation for analysis, thereby excluding the earlier and likely more problematic data. Second, we created multiple indices of factors believed to be associated with poor data quality, and excluded surveys that had outlying values on any index. Specifically, the following indices were created for each survey:

- To indicate surveys in which interviewers displaced women out of the age range 15-49, thereby excluding women in selected households from eligibility for individual interview:
    - The ratio of women age 14:15 listed in the household schedule
    - The ratio of women 50:49 listed in the household schedule
- To indicate surveys in which interviewers displaced the dates of births of children outside the most recent five-year period (which typically coincides with the period covered by the calendar), thereby artificially shortening the questionnaire (see Bradley 2015):

    - The ratio of the number of births in the calendar year 6 years prior to survey: the number of births in the calendar year 5 years prior to survey.
- To indicate surveys with large discrepancies between retrospective reporting of contraceptive use in the calendar versus current-status reports from prior surveys:
    - The gap between the method-specific contraceptive prevalence rate measured from retrospective calendar data and a previous current-status estimate. These estimates come from analyses described in Bradley, Croft, & Winfrey 2015.
- To indicate surveys in which reported durations of contraceptive use were strongly heaped on 12 or 6 months:
    - The ratio of contraceptive use episodes reported to be 12 months duration: the average of episodes reported to be 10, 11, 13, or 14 months duration.
    - The ratio of contraceptive use episodes reported to be 6 months duration: the average of contraceptive use episodes reported to be 4, 5, 7, or 8 months duration.
- To indicate surveys in which the start date of contraceptive use episodes were strongly heaped on the month of January:
    - The ratio of contraceptive use episodes reported to have begun in January: the average of contraceptive use episodes reported to have begun in February or March.[29]

The heaping ratios were all calculated separately for each contraceptive method. Because the injectable is typically effective for three months, we expect reported durations of injectable use to be heaped on 3-month intervals (e.g. 3 months, 6 months, 9 months, 12 months, etc.). The 12 month duration heaping index for injectables was therefore calculated as the ratio of episodes 12 month duration: the average of episodes 9 or 15 months duration, and the 6 month heaping index for injectables was calculated as the ratio of episodes 6 months duration: the average of episodes 3 or 9 months duration.

For each index, we anticipated that many surveys would show values >1 indicating, for example, a larger proportion of 50 year olds than 49 year olds listed in the household questionnaire, or a greater proportion of pill episodes reported to have begun in January than in February or March. We wanted to classify surveys according to whether or not they had extreme values on each index, indicating potential problems with data quality. To indicate extreme values on each index, we calculated the interquartile range (IQR) of the distribution of each index as p75 - p25. Following the standard statistical definition, we defined any value greater than p75 + 3/2*IQR to be an outlier.

For this analysis, we selected for inclusion surveys:

1) For which we were able to assess the matchup between retrospective reports of contraceptive prevalence in the calendar and previous current-status data, i.e. there was another DHS survey conducted in the same country within approximately five years prior to the index survey, and
2) Which did not have outlying values on any index calculated.

In some countries, multiple surveys fit this inclusion criterion. For these countries, the most recent survey that fit the inclusion criteria was selected. The final sample included 16 surveys: Armenia 2005, Bangladesh 2011, Cambodia 2014, Colombia 2010, Dominican Republic 1996, Egypt 2014,

[29] February and March were chosen as the reference start months as exploratory analyses showed evidence of heaping on the month of December as a start date.

Honduras 2011-12, Jordan 2009, Kenya 1998, Morocco 1992, Peru 2012, Philippines 2003, Rwanda 2010, Senegal 2012-13, Turkey 2003, and Zimbabwe 2005-06. Various other, broader inclusion criteria were tested. With wider exclusion criteria (e.g. including surveys that had outliers on one or two indices only), estimated failure rates and correlates were broadly similar in most cases. Use of different selection criteria would clearly produce a different survey sample. For this analysis, however, we felt comfortable using this most restrictive set of selection criteria, which we believe indicates the highest-quality survey data.

Appendix B: Estimation of cumulative failure probabilities and confidence intervals

The cumulative probability of failure by month 12 – AKA the one-year failure rate – can be constructed as the compliment of

$$S_{12} = \prod_{x=1}^{12}(1 - p_x)$$

where *S(12)* is the cumulative probability of "surviving" (i.e., not experiencing contraceptive failure) to and through month 12 of contraceptive use, and p_x is the conditional probability of failure in month *x* in 1, 2, … 12, given that the user did not fail in any prior month. Substituting in logistic regression estimates $invlogit(\hat{B}_x)$ and taking logs gives

$$\log(\hat{S}_{12}) = \sum_{x=1}^{12} \log\left(1 + e^{\hat{\hat{B}}x}\right)$$

The estimates of $\hat{B}_x$ are produced using Stata's svy: logit commands to account for the stratified, clustered sample design and incorporating survey weights, giving

$$\widehat{\boldsymbol{B}} \sim N(\boldsymbol{B}, \boldsymbol{\varepsilon})$$

We define

$$g(\widehat{\boldsymbol{B}}) = \sum_{x=1}^{12} \log\left(1 + e^{\hat{\hat{B}}x}\right)$$

According to the Delta method (Oehlert 1992),

$$g(\widehat{\boldsymbol{B}}) \sim N(g(\boldsymbol{B}), \boldsymbol{V})$$

Where $\boldsymbol{V} = \boldsymbol{A}' * \boldsymbol{\varepsilon} * \boldsymbol{A}$

And $\boldsymbol{A} = \begin{bmatrix} \frac{\partial g(B)}{\partial B_1} \\ \frac{\partial g(B)}{\partial B_2} \\ \vdots \\ \frac{\partial g(B)}{\partial B_{12}} \end{bmatrix}$

We need to ensure that the lower and upper bounds of the confidence interval around 1-S_{12} are constrained to lie in (0,1). We do this by using a log(-log) transformation, noting that the variance of $\log(-\log(\hat{S}_{12}))$ is approximated with the Delta method as

$$\theta = \frac{1}{[-\log(\hat{S}_{12})]^2} * \mathbf{V}$$

The confidence interval for $\log(-\log(\hat{S}_{12}))$ is then

$$\log\left(-\log\left(\hat{S}_{12}\right)\right) \pm z_{0.975} * \sqrt{\mathbf{V}}$$

And the CI for 1- $\hat{S}_{12} = 1 - \exp\left(-exp[\text{ CI for } \log\left(-\log\left(\hat{S}_{12}\right)\right)]\right)$

Appendix Tables

Appendix Table 1: DHS survey characteristics

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information	N of surveys
Survey phase				
Phase 1: 1984-99	288.6	33.2	15.0	27
Phase 2: 1989-93	419.1	35.1	13.3	27
Phase 3: 1993-97	530.6	33.6	12.0	51
Phase 4: 1997-2003	660.6	29.2	7.4	50
Phase 5: 2003-08	668.2	19.7	3.5	48
Phase 6: 2008-13	620.9	29.9	3.6	35
Region				
Latin America & Caribbean	535.4	10.2	1.9	48
North Africa/West and Central Asia/Europe	557.6	22.3	9.0	34
South & Southeast Asia	518.4	29.5	5.5	37
Eastern Africa	576.5	27.7	7.7	49
Western Africa	580.1	58.2	19.5	51
Central/Southern Africa	599.2	18.2	3.1	19
Number of survey rounds in country				
1-2	516.6	22.5	7.4	58
3-4	584.1	41.2	10.8	80
5-6	554.1	28.0	6.8	69
7+	585.3	15.3	8.8	31
Survey includes HIV testing				
no	527.6	28.0	9.2	189
yes	679.4	35.2	6.0	49
Survey includes Anemia testing				
no	496.5	31.8	11.0	145
yes	655.7	25.8	4.7	93
Survey includes BP or Malaria biomarkers				
no	552.7	29.9	9.1	214
yes	614.4	25.7	3.8	24
Total	**559.0**	**29.5**	**8.6**	**238**

Appendix Table 2: Survey characteristics by individual survey

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information
Albania 2008-09	506.53	0.42	0.52
Armenia 2000	650.67	0.08	0.03
Armenia 2005	593.25	0.11	0.13
Armenia 2010	499.28	0.07	0.05
Azerbaijan 2006	548.54	1.35	0.28
Bangladesh 1993-94	352.43	56.46	0.53
Bangladesh 1996-97	406.29	53.90	1.07
Bangladesh 1999-00	488.09	43.78	3.53
Bangladesh 2004	574.76	38.96	0.16
Bangladesh 2007	525.84	32.06	0.35
Bangladesh 2011	442.27	26.08	0.72
Benin 1996	515.93	73.32	49.95
Benin 2001	721.91	64.95	46.16
Benin 2006	854.53	65.06	18.40
Benin 2011-12	651.41	62.55	33.25
Bolivia 1989	285.77	15.35	4.42
Bolivia 1994	443.76	12.72	3.75
Bolivia 1998	495.23	9.58	3.11
Bolivia 2003	784.07	6.34	2.22
Bolivia 2008	819.16	4.42	1.04
Botswana 1988	332.89	20.58	3.10
Brazil 1986	276.37	7.91	3.71
Brazil 1996	561.81	6.10	3.61
Brazil NE 1991	424.84	16.58	3.48
Burkina Faso 1993	458.75	73.47	29.24
Burkina Faso 1998-99	587.19	81.30	46.51
Burkina Faso 2003	722.85	79.38	8.65
Burkina Faso 2010	708.26	72.97	1.09
Burundi 1987	309.35	73.65	20.33
Burundi 2010	597.06	40.86	1.99
Cambodia 2000	603.08	31.59	0.51
Cambodia 2005	660.28	22.42	1.51
Cambodia 2010	555.67	17.08	0.99
Cameroon 1991	409.21	32.96	30.86
Cameroon 1998	555.74	24.16	7.06
Cameroon 2004	686.02	20.09	8.28
Cameroon 2011	612.09	18.13	4.64
Central African Republic 1994-95	531.42	52.40	7.69
Chad 1996-97	588.37	71.97	10.02
Chad 2004	643.06	70.04	2.16
Colombia 1986	258.57	5.84	1.94
Colombia 1990	340.25	3.19	1.23
Colombia 1995	448.11	3.93	0.86
Colombia 2000	643.14	3.49	0.48
Colombia 2005	698.70	3.20	1.22
Colombia 2010	698.93	2.28	0.96
Comoros 1996	386.03	53.61	40.12
Comoros 2012	583.58	28.80	2.79
Congo (Brazzaville) 2005	612.94	6.54	3.55
Congo (Brazzaville) 2011-12	647.78	8.33	1.75
Congo Democratic Republic 2007	708.27	21.08	2.89
Congo Democratic Republic 2013-14	656.42	17.83	0.99
Cote d'Ivoire 1994	453.88	60.61	15.99
Cote d'Ivoire 1998-99	541.59	49.54	17.31
Cote d'Ivoire 2011-12	662.11	57.10	4.03

continued…

Appendix Table 2, continued

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information
Dominican Republic 1986	265.52	6.13	3.19
Dominican Republic 1991	403.03	6.93	4.27
Dominican Republic 1996	601.21	9.42	2.28
Dominican Republic 1999	617.33	3.97	2.33
Dominican Republic 2002	661.36	5.12	3.32
Dominican Republic 2007	631.31	4.83	2.74
Dominican Republic 2013	575.72	2.81	0.79
Ecuador 1987	237.64	7.81	5.84
Egypt 1988	403.85	49.70	36.32
Egypt 1992	544.52	47.02	16.21
Egypt 1995	544.93	45.96	27.09
Egypt 2000	647.14	42.46	14.94
Egypt 2003	628.97	40.19	25.25
Egypt 2005	841.06	35.61	10.98
Egypt 2008	599.17	33.53	5.52
El Salvador 1985	179.20	19.20	1.54
Eritrea 1995	467.33	57.86	5.28
Eritrea 2002	674.42	58.24	11.46
Ethiopia 2000	605.30	68.89	10.68
Ethiopia 2005	676.19	60.09	2.26
Ethiopia 2011	620.02	50.12	3.74
Gabon 2000	599.46	5.60	3.31
Gabon 2012	664.08	4.55	3.29
Ghana 1988	319.45	39.73	24.69
Ghana 1993	412.47	35.01	21.87
Ghana 1998	715.20	35.87	16.36
Ghana 2003	640.47	33.68	3.53
Ghana 2008	666.70	25.28	4.05
Guatemala 1987	283.54	38.35	3.80
Guatemala 1995	562.41	34.93	1.07
Guatemala 1998-99	509.28	31.11	0.97
Guinea 1999	724.91	79.39	62.67
Guinea 2005	757.08	78.30	57.39
Guinea 2012	576.95	67.43	0.19
Guyana 2009	608.18	1.62	2.17
Haiti 1994-95	478.34	34.28	4.60
Haiti 2000	653.16	30.51	1.12
Haiti 2005-06	723.26	24.11	0.46
Haiti 2012	551.87	15.97	0.07
Honduras 2005-06	673.06	7.58	0.33
Honduras 2011-12	638.58	4.78	0.23
India 1992-93	359.68	56.57	3.23
India 1998-99	552.93	49.83	4.34
India 2005-06	675.60	31.97	1.95
Indonesia 1987	265.63	22.12	24.04
Indonesia 1991	400.84	19.55	17.36
Indonesia 1994	526.49	17.05	17.32
Indonesia 1997	534.24	13.42	15.79
Indonesia 2002-03	609.74	7.62	14.79
Indonesia 2007	743.40	6.79	10.24
Indonesia 2012	633.38	3.56	6.17
Jordan 1990	481.42	25.46	1.97
Jordan 1997	664.40	10.71	0.96
Jordan 2002	629.74	8.76	1.66
Jordan 2007	716.69	6.84	0.50
Jordan 2009	345.12	5.21	0.36
Jordan 2012	751.68	3.59	0.04

continued…

Appendix Table 2, continued

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information
Kazakhstan 1995	395.42	0.13	0.60
Kazakhstan 1999	593.48	0.31	0.22
Kazakhstan 1995	395.42	0.13	0.60
Kazakhstan 1999	593.48	0.31	0.22
Kenya 1989	310.06	23.80	3.46
Kenya 1993	435.35	17.20	10.16
Kenya 1998	518.30	12.82	2.91
Kenya 2003	676.00	15.75	9.05
Kenya 2008-09	716.55	14.71	4.30
Kyrgyz Republic 1997	476.54	0.08	0.55
Kyrgyz Republic 2012	679.18	0.09	0.71
Lesotho 2004	676.00	2.38	1.18
Lesotho 2009	607.95	1.50	1.07
Liberia 1986	226.17	63.89	14.82
Liberia 2007	611.57	41.75	2.83
Liberia 2013	603.31	39.82	1.06
Madagascar 1992	386.14	16.79	21.45
Madagascar 1997	504.33	20.75	22.33
Madagascar 2003-04	721.41	15.36	11.02
Madagascar 2008-09	596.79	20.65	2.30
Malawi 1992	444.61	37.82	5.51
Malawi 2000	677.19	25.51	2.10
Malawi 2004	816.02	23.35	1.19
Malawi 2010	679.33	14.73	0.62
Maldives 2009	509.64	27.22	17.87
Mali 1987	275.84	80.38	65.09
Mali 1995-96	555.60	80.10	4.38
Mali 2001	730.88	79.93	7.07
Mali 2006	855.35	77.73	9.24
Mali 2012-13	662.72	74.07	0.60
Mauritania 2000-01	478.72	51.62	23.92
Mexico 1987	162.50	8.73	1.45
Moldova 2005	577.23	0.26	0.08
Morocco 1987	344.60	82.68	42.92
Morocco 1992	370.51	63.38	3.48
Morocco 2003-04	686.13	53.08	16.46
Mozambique 1997	459.13	39.12	33.74
Mozambique 2003	720.50	36.17	4.13
Mozambique 2011	623.14	27.45	4.09
Namibia 1992	404.62	14.74	6.90
Namibia 2000	529.07	11.78	3.82
Namibia 2006-07	634.62	7.90	0.91
Namibia 2013	551.74	6.00	0.85
Nepal 1996	527.11	79.91	0.19
Nepal 2001	574.56	71.84	0.11
Nepal 2006	658.02	52.60	0.09
Nepal 2011	634.11	38.47	0.05
Nicaragua 1998	642.28	17.87	3.22
Nicaragua 2001	775.82	17.34	3.11
Niger 1992	465.92	81.50	42.70
Niger 1998	488.04	80.06	5.93
Niger 2006	757.91	76.75	17.81
Niger 2012	797.01	74.61	17.67

continued…

Appendix Table 2, continued

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information
Nigeria 1990	358.44	51.70	15.33
Nigeria 1999	460.89	40.55	17.74
Nigeria 2003	702.59	39.44	9.54
Nigeria 2008	730.93	39.66	3.43
Nigeria 2013	672.76	35.28	0.94
Pakistan 1990-91	448.04	76.46	10.34
Pakistan 2006-07	520.64	66.50	29.58
Pakistan 2012-13	598.82	56.24	0.83
Paraguay 1990	352.21	3.04	0.12
Peru 1986	252.57	10.94	2.07
Peru 1991-92	403.84	6.56	1.69
Peru 1996	597.20	7.35	2.27
Peru 2000	681.68	6.34	1.87
Peru 2004-06	718.25	4.45	1.10
Peru 2007-08	796.06	3.52	0.61
Peru 2009	723.76	3.60	0.38
Peru 2010	721.05	2.92	0.48
Peru 2011	790.38	3.27	0.55
Peru 2012	780.01	2.91	0.51
Philippines 1993	414.21	2.54	1.40
Philippines 1998	559.84	2.62	1.04
Philippines 2003	635.69	1.69	0.75
Philippines 2008	585.56	1.60	0.48
Philippines 2013	563.96	1.54	0.17
Rwanda 1992	369.96	35.75	9.00
Rwanda 2000	634.54	27.22	5.89
Rwanda 2005	765.86	22.99	4.09
Rwanda 2010	605.18	15.08	0.63
Sao Tome and Principe 2008-09	791.01	6.65	2.03
Senegal 1986	257.47	77.21	23.50
Senegal 1992-93	455.74	73.03	47.17
Senegal 1997	419.15	70.06	23.80
Senegal 2005	670.18	62.89	12.30
Senegal 2010-11	631.41	62.19	22.70
Senegal 2012-13	507.62	56.84	3.58
Sierra Leone 2008	654.16	62.50	4.35
Sierra Leone 2013	609.47	54.87	2.10
South Africa 1998	489.78	6.90	3.03
Sri Lanka 1987	313.09	12.51	6.86
Sudan 1989-90	375.47	58.45	46.24
Swaziland 2006-07	716.21	8.28	0.96
Tajikistan 2012	663.13	1.61	0.22
Tanzania 1991-92	412.07	35.23	23.56
Tanzania 1996	611.35	27.60	10.78
Tanzania 1999	467.29	25.47	6.98
Tanzania 2004-05	814.29	24.51	2.79
Tanzania 2010	716.19	18.86	0.58
Thailand 1987	310.59	8.84	9.35
Timor-Leste 2009-10	593.09	29.85	0.43
Togo 1988	298.71	58.21	50.02
Togo 1998	564.63	51.62	33.40

continued…

Appendix Table 2, continued

	Mean number of variables in dataset	Percent of women with no education	Percentage of births with imputed date information
Trinidad and Tobago 1987	267.49	0.84	0.98
Tunisia 1988	356.34	56.69	5.17
Turkey 1993	537.52	27.14	3.90
Turkey 1998	533.91	18.54	15.47
Turkey 2003	594.31	19.64	8.47
Uganda 1988-89	293.08	34.48	0.11
Uganda 1995	645.94	25.57	7.06
Uganda 2000-01	743.45	20.14	6.47
Uganda 2006	751.77	20.72	3.73
Uganda 2011	628.85	15.36	2.21
Ukraine 2007	537.89	0.03	0.12
Uzbekistan 1996	422.86	0.07	0.49
Vietnam 1997	416.12	5.38	0.01
Vietnam 2002	405.38	6.27	1.03
Yemen 1997	590.74	78.93	66.03
Zambia 1992	401.76	17.17	2.97
Zambia 1996	581.65	14.56	1.41
Zambia 2001-02	758.92	13.08	2.11
Zambia 2007	735.60	10.37	0.96
Zimbabwe 1988	331.73	13.47	0.58
Zimbabwe 1994	492.98	11.62	0.72
Zimbabwe 1999	572.45	7.40	0.77
Zimbabwe 2005-06	709.24	4.27	0.64
Zimbabwe 2010-11	627.15	2.44	1.21

Appendix Table 3: Displacement ratios by survey

	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of displacement ratios (deceased/ surviving)
Albania 2008-09	93.17	94.24	54.55	0.58
Armenia 2000	86.51	89.41	37.50	0.42
Armenia 2005	91.72	91.81	88.89	0.97
Armenia 2010	86.16	87.59	28.57	0.33
Azerbaijan 2006	83.58	85.14	56.00	0.66
Bangladesh 1993-94	94.61	96.33	83.01	0.86
Bangladesh 1996-97	85.48	86.24	80.79	0.94
Bangladesh 1999-00	95.43	101.56	56.59	0.56
Bangladesh 2004	103.22	106.75	74.83	0.70
Bangladesh 2007	93.65	94.69	81.19	0.86
Bangladesh 2011	89.41	88.97	96.43	1.08
Benin 1996	89.93	95.55	65.24	0.68
Benin 2001	83.99	89.00	63.27	0.71
Benin 2006	69.10	72.44	51.13	0.71
Benin 2011-12	76.59	78.23	60.14	0.77
Bolivia 1989	85.53	88.74	68.06	0.77
Bolivia 1994	83.30	88.23	51.55	0.58
Bolivia 1998	88.04	92.61	54.79	0.59
Bolivia 2003	90.56	94.24	61.54	0.65
Bolivia 2008	87.97	89.37	72.08	0.81
Botswana 1988	81.66	83.29	54.76	0.66
Brazil 1986	92.59	96.05	64.37	0.67
Brazil 1996	90.22	93.87	54.37	0.58
Brazil NE 1991	94.96	97.69	74.42	0.76
Burkina Faso 1993	70.03	73.98	56.83	0.77
Burkina Faso 1998-99	78.08	80.32	71.63	0.89
Burkina Faso 2003	74.53	81.24	51.96	0.64
Burkina Faso 2010	75.20	79.56	54.35	0.68
Burundi 1987	79.55	79.63	79.10	0.99
Burundi 2010	94.23	102.18	52.63	0.52
Cambodia 2000	62.50	64.20	52.74	0.82
Cambodia 2005	99.95	103.62	79.37	0.77
Cambodia 2010	89.31	90.80	70.40	0.78
Cameroon 1991	87.35	92.24	61.11	0.66
Cameroon 1998	82.22	86.23	58.40	0.68
Cameroon 2004	86.08	90.61	65.28	0.72
Cameroon 2011	77.54	79.94	63.74	0.80
Central African Republic 1994-95	85.95	91.08	61.67	0.68
Chad 1996-97	70.80	75.94	54.08	0.71
Chad 2004	72.60	79.21	49.84	0.63
Colombia 1986	97.37	98.52	78.13	0.79
Colombia 1990	98.40	98.62	92.00	0.93
Colombia 1995	91.16	91.30	87.80	0.96
Colombia 2000	97.79	98.69	73.53	0.75
Colombia 2005	94.51	95.70	63.39	0.66
Colombia 2010	96.93	97.84	66.67	0.68
Comoros 1996	79.31	81.53	59.57	0.73
Comoros 2012	83.98	84.65	72.97	0.86
Congo (Brazzaville) 2005	90.53	96.63	58.78	0.61
Congo (Brazzaville) 2011-12	85.68	88.40	60.47	0.68
Congo Democratic Republic 2007	97.65	102.10	77.85	0.76
Congo Democratic Republic 2013-14	88.60	92.35	65.88	0.71
Cote d'Ivoire 1994	72.77	81.10	37.78	0.47
Cote d'Ivoire 1998-99	75.66	76.36	71.64	0.94
Cote d'Ivoire 2011-12	70.70	72.86	58.14	0.80

continued…

Appendix Table 3, continued

	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of displacement ratios (deceased/ surviving)
Dominican Republic 1986	100.55	103.67	74.23	0.72
Dominican Republic 1991	90.42	93.04	61.19	0.66
Dominican Republic 1996	94.29	97.49	62.50	0.64
Dominican Republic 1999	97.10	100.00	66.67	0.67
Dominican Republic 2002	98.78	101.15	56.56	0.56
Dominican Republic 2007	92.86	93.65	71.11	0.76
Dominican Republic 2013	103.00	103.26	96.15	0.93
Ecuador 1987	104.73	107.88	76.19	0.71
Egypt 1988	88.63	97.01	47.85	0.49
Egypt 1992	93.52	98.11	60.82	0.62
Egypt 1995	92.66	96.86	60.92	0.63
Egypt 2000	79.62	81.96	51.53	0.63
Egypt 2003	82.95	84.07	65.52	0.78
Egypt 2005	86.93	89.32	51.31	0.57
Egypt 2008	72.58	73.35	52.58	0.72
El Salvador 1985	100.79	102.98	83.53	0.81
Eritrea 1995	87.47	96.92	43.97	0.45
Eritrea 2002	86.04	92.63	51.07	0.55
Ethiopia 2000	78.87	85.44	55.82	0.65
Ethiopia 2005	69.92	74.57	44.92	0.60
Ethiopia 2011	85.06	89.77	54.05	0.60
Gabon 2000	82.49	85.13	59.34	0.70
Gabon 2012	89.28	90.51	73.49	0.81
Ghana 1988	101.15	102.30	95.42	0.93
Ghana 1993	62.69	63.18	59.13	0.94
Ghana 1998	88.32	91.83	67.65	0.74
Ghana 2003	77.01	81.93	47.90	0.58
Ghana 2008	72.28	73.42	62.32	0.85
Guatemala 1987	80.21	82.68	62.79	0.76
Guatemala 1995	86.26	90.00	54.34	0.60
Guatemala 1998-99	93.46	96.64	54.93	0.57
Guinea 1999	88.20	94.64	63.67	0.67
Guinea 2005	71.62	77.79	49.21	0.63
Guinea 2012	69.69	75.39	42.37	0.56
Guyana 2009	92.37	93.18	73.68	0.79
Haiti 1994-95	78.97	80.48	70.94	0.88
Haiti 2000	90.38	95.81	59.91	0.63
Haiti 2005-06	82.76	87.14	52.66	0.60
Haiti 2012	90.38	92.24	73.19	0.79
Honduras 2005-06	91.92	92.22	86.05	0.93
Honduras 2011-12	91.84	92.51	73.33	0.79
India 1992-93	80.33	83.33	58.67	0.70
India 1998-99	80.87	84.25	52.88	0.63
India 2005-06	89.71	91.21	71.28	0.78
Indonesia 1987	104.15	104.57	100.51	0.96
Indonesia 1991	78.86	81.53	57.48	0.71
Indonesia 1994	80.95	82.81	64.83	0.78
Indonesia 1997	75.07	77.10	53.14	0.69
Indonesia 2002-03	66.27	67.53	48.87	0.72
Indonesia 2007	86.28	87.74	67.14	0.77
Indonesia 2012	92.26	93.30	72.34	0.78
Jordan 1990	98.30	99.94	63.64	0.64
Jordan 1997	100.16	100.00	104.76	1.05
Jordan 2002	85.11	86.04	61.54	0.72
Jordan 2007	93.91	94.42	77.42	0.82
Jordan 2009	94.86	94.73	100.00	1.06
Jordan 2012	116.56	117.66	80.70	0.69

continued…

Appendix Table 3, continued

	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of displacement ratios (deceased/ surviving)
Kazakhstan 1995	91.59	91.16	100.00	1.10
Kazakhstan 1999	90.96	93.31	65.63	0.70
Kenya 1989	75.80	77.86	57.93	0.74
Kenya 1993	82.70	85.10	62.84	0.74
Kenya 1998	92.23	95.16	67.77	0.71
Kenya 2003	94.51	96.49	80.60	0.84
Kenya 2008-09	75.35	76.25	65.49	0.86
Kyrgyz Republic 1997	89.15	89.41	85.19	0.95
Kyrgyz Republic 2012	100.43	99.85	125.00	1.25
Lesotho 2004	94.13	94.04	94.87	1.01
Lesotho 2009	89.34	91.08	73.61	0.81
Liberia 1986	65.37	66.56	61.56	0.92
Liberia 2007	65.09	70.06	40.27	0.57
Liberia 2013	78.31	80.10	65.75	0.82
Madagascar 1992	85.95	90.91	67.42	0.74
Madagascar 1997	81.83	85.83	62.98	0.73
Madagascar 2003-04	69.04	70.30	58.09	0.83
Madagascar 2008-09	71.77	73.69	53.77	0.73
Malawi 1992	84.80	90.95	67.21	0.74
Malawi 2000	64.34	69.23	47.00	0.68
Malawi 2004	74.51	78.90	56.91	0.72
Malawi 2010	86.76	89.31	67.51	0.76
Maldives 2009	90.00	91.47	55.56	0.61
Mali 1987	79.31	90.53	53.10	0.59
Mali 1995-96	83.87	88.57	69.48	0.78
Mali 2001	83.33	95.77	55.18	0.58
Mali 2006	60.92	66.11	44.78	0.68
Mali 2012-13	80.73	82.61	67.26	0.81
Mauritania 2000-01	57.69	61.34	31.68	0.52
Mexico 1987	105.40	106.55	91.14	0.86
Moldova 2005	97.92	97.53	120.00	1.23
Morocco 1987	88.87	89.42	84.71	0.95
Morocco 1992	101.12	103.64	70.73	0.68
Morocco 2003-04	92.17	95.14	56.19	0.59
Mozambique 1997	69.78	82.67	26.42	0.32
Mozambique 2003	78.73	81.74	66.67	0.82
Mozambique 2011	87.11	89.01	72.20	0.81
Namibia 1992	91.74	91.64	92.75	1.01
Namibia 2000	83.59	86.28	51.52	0.60
Namibia 2006-07	79.95	82.72	53.77	0.65
Namibia 2013	84.68	84.55	87.04	1.03
Nepal 1996	96.90	102.97	63.83	0.62
Nepal 2001	97.89	103.24	65.22	0.63
Nepal 2006	90.75	93.01	67.26	0.72
Nepal 2011	89.98	90.36	84.62	0.94
Nicaragua 1998	91.14	91.38	86.87	0.95
Nicaragua 2001	78.66	78.44	83.33	1.06
Niger 1992	82.89	92.11	65.38	0.71
Niger 1998	82.90	88.33	66.19	0.75
Niger 2006	60.61	65.78	42.51	0.65
Niger 2012	55.89	57.13	48.34	0.85

continued…

Appendix Table 3, continued

	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of displacement ratios (deceased/ surviving)
Nigeria 1990	68.00	72.86	50.46	0.69
Nigeria 1999	79.16	81.16	66.83	0.82
Nigeria 2003	103.51	108.92	86.74	0.80
Nigeria 2008	78.92	85.09	55.26	0.65
Nigeria 2013	111.17	120.12	71.43	0.59
Pakistan 1990-91	54.73	57.09	37.40	0.66
Pakistan 2006-07	76.14	77.34	64.36	0.83
Pakistan 2012-13	92.17	95.32	65.68	0.69
Paraguay 1990	99.76	100.51	85.71	0.85
Peru 1986	99.71	103.04	76.74	0.74
Peru 1991-92	90.89	92.79	76.02	0.82
Peru 1996	87.59	91.43	53.83	0.59
Peru 2000	86.87	89.40	58.49	0.65
Peru 2004-06	87.86	88.55	71.62	0.81
Peru 2007-08	105.05	107.09	62.20	0.58
Peru 2009	103.03	104.42	67.53	0.65
Peru 2010	95.90	96.67	75.64	0.78
Peru 2011	90.93	91.98	59.09	0.64
Peru 2012	89.89	90.63	70.67	0.78
Philippines 1993	96.26	97.64	78.52	0.80
Philippines 1998	93.36	95.58	65.35	0.68
Philippines 2003	87.67	88.63	66.18	0.75
Philippines 2008	94.90	95.66	77.59	0.81
Philippines 2013	101.46	100.75	126.83	1.26
Rwanda 1992	96.55	102.52	70.22	0.69
Rwanda 2000	79.32	89.05	50.91	0.57
Rwanda 2005	98.89	103.26	80.90	0.78
Rwanda 2010	94.21	97.49	66.84	0.69
Sao Tome and Principe 2008-09	74.63	80.55	26.67	0.33
Senegal 1986	79.81	83.36	66.50	0.80
Senegal 1992-93	80.03	84.60	59.07	0.70
Senegal 1997	93.33	94.19	88.44	0.94
Senegal 2005	89.06	94.10	63.74	0.68
Senegal 2010-11	79.81	81.44	65.54	0.80
Senegal 2012-13	85.86	88.27	64.44	0.73
Sierra Leone 2008	60.55	65.07	42.62	0.66
Sierra Leone 2013	88.25	97.63	54.36	0.56
South Africa 1998	78.58	79.09	71.05	0.90
Sri Lanka 1987	92.04	94.33	54.00	0.57
Sudan 1989-90	80.07	85.89	53.48	0.62
Swaziland 2006-07	73.30	76.34	51.95	0.68
Tajikistan 2012	95.42	94.54	118.75	1.26
Tanzania 1991-92	84.89	91.58	56.63	0.62
Tanzania 1996	77.32	82.49	52.85	0.64
Tanzania 1999	101.99	102.75	97.89	0.95
Tanzania 2004-05	100.86	109.59	57.98	0.53
Tanzania 2010	88.55	89.58	76.69	0.86
Thailand 1987	93.61	95.35	69.23	0.73
Timor-Leste 2009-10	74.49	77.09	49.78	0.65
Togo 1988	84.24	84.81	81.42	0.96
Togo 1998	86.20	93.17	49.38	0.53
Trinidad and Tobago 1987	90.49	93.11	33.33	0.36

continued…

Appendix Table 3, continued

	Displacement ratio, all children	Displacement ratio, surviving children	Displacement ratio, deceased children	Ratio of displacement ratios (deceased/ surviving)
Tunisia 1988	101.02	102.62	85.37	0.83
Turkey 1993	76.52	76.60	75.64	0.99
Turkey 1998	84.61	85.20	76.36	0.90
Turkey 2003	87.54	88.51	70.37	0.80
Uganda 1988-89	90.96	91.45	88.76	0.97
Uganda 1995	74.92	77.75	60.00	0.77
Uganda 2000-01	78.27	80.65	65.50	0.81
Uganda 2006	74.61	78.65	56.34	0.72
Uganda 2011	94.84	99.64	63.85	0.64
Ukraine 2007	98.35	100.00	33.33	0.33
Uzbekistan 1996	84.79	86.48	61.11	0.71
Vietnam 1997	80.89	81.17	71.43	0.88
Vietnam 2002	94.34	95.71	56.25	0.59
Yemen 1997	86.33	91.89	55.96	0.61
Zambia 1992	89.83	91.40	83.40	0.91
Zambia 1996	81.06	87.00	60.13	0.69
Zambia 2001-02	85.85	88.58	73.88	0.83
Zambia 2007	97.47	99.89	81.56	0.82
Zimbabwe 1988	97.89	96.94	108.62	1.12
Zimbabwe 1994	96.65	99.08	71.23	0.72
Zimbabwe 1999	99.85	101.47	85.07	0.84
Zimbabwe 2005-06	97.81	96.12	120.83	1.26
Zimbabwe 2010-11	86.16	85.15	97.59	1.15

The displacement ratio is defined as $100 * (B_t/B_{t-1})$, where B is the reported number of births in the calendar year, and t is the boundary year defined in the survey questionnaire

Appendix Table 4: Comparison of calendar and current status data for Ethiopia 2000, 2005, and 2011

	Women ages 15-43 at time of survey				Women ages 15-43 in April 2000				Women ages 15-43 at time of survey				Women ages 15-43 in September 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	93.8	0.3	93.2	94.4	95.8	0.3	95.2	96.3	89.4	0.5	88.3	90.3	88.8	0.7	87.4	90.1
Pill	2.0	0.2	1.7	2.5	1.5	0.2	1.2	1.9	2.2	0.2	1.8	2.6	1.5	0.2	1.2	1.9
IUD	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.3	0.1	0.0	0.1	0.2	0.2	0.1	0.1	0.3
Injections	2.2	0.2	1.8	2.7	1.6	0.2	1.3	2.1	7.0	0.4	6.2	7.9	8.2	0.6	7.1	9.3
Male Condom	0.4	0.1	0.3	0.7	0.2	0.1	0.1	0.3	0.3	0.1	0.2	0.5	0.2	0.1	0.1	0.3
Sterilization	0.2	0.0	0.1	0.3	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.2	0.3	0.1	0.2	0.5
Periodic Abstinence	1.1	0.1	0.8	1.3	0.3	0.1	0.2	0.5	0.5	0.1	0.4	0.7	0.4	0.1	0.3	0.6
Withdrawal	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.3
Implant	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.3	0.3	0.1	0.1	0.4
LAM					0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.0
Other Traditional Methods	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1					0.0	0.0	0.0	0.1
Other Modern Methods									0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Any Method	6.2	0.3	5.6	6.8	4.2	0.3	3.7	4.8	10.7	0.5	9.7	11.7	11.2	0.7	9.9	12.6
Any Modern Method	4.9	0.3	4.3	5.5	3.7	0.3	3.3	4.3	9.8	0.5	8.9	10.8	10.4	0.6	9.2	11.7
N	13,886				10,485				12,792				11,902			

Appendix Table 5: Comparison of calendar and current status data for Kenya 1993, 1998, 2003, and 2008-09

	Current-status data from 1993				Calendar data from 1998				Current-status data from 1998				Calendar data from 2003				Current-status data from 2003				Calendar data from 2008-09			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 1993				Women ages 15-43 at time of survey				Women ages 15-43 in April 1998				Women ages 15-43 at time of survey				Women ages 15-43 in June 2003			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	74.3	0.8	72.7	75.8	71.8	0.8	70.2	73.3	70.2	0.7	68.7	71.6	76.2	0.8	74.5	77.8	70.9	0.7	69.5	72.3	74.1	1.1	71.8	76.2
Pill	7.9	0.5	6.9	8.9	7.8	0.5	7.0	8.8	6.8	0.4	6.0	7.6	5.8	0.4	5.1	6.6	5.3	0.4	4.6	6.0	5.7	0.5	4.8	6.8
IUD	2.8	0.3	2.3	3.4	2.6	0.3	2.1	3.2	1.7	0.2	1.4	2.1	2.0	0.2	1.6	2.5	1.5	0.2	1.2	1.9	1.0	0.2	0.7	1.4
Injections	5.6	0.3	5.0	6.3	6.3	0.4	5.6	7.1	9.1	0.5	8.3	10.0	7.6	0.5	6.8	8.6	11.3	0.5	10.4	12.3	11.5	0.7	10.2	12.9
Male Condom	0.9	0.1	0.7	1.2	1.0	0.2	0.7	1.4	1.5	0.2	1.2	1.9	0.7	0.1	0.5	1.0	1.9	0.2	1.5	2.3	1.3	0.2	1.0	1.7
Sterilization	3.3	0.3	2.9	3.8	3.4	0.3	2.9	4.0	3.6	0.3	3.1	4.2	2.5	0.2	2.1	2.9	2.2	0.2	1.9	2.6	1.9	0.2	1.5	2.5
Periodic Abstinence	4.5	0.3	3.9	5.2	6.0	0.4	5.3	6.8	5.4	0.3	4.8	6.1	4.0	0.3	3.4	4.7	4.6	0.3	4.0	5.3	2.9	0.5	2.1	4.0
Withdrawal	0.3	0.1	0.2	0.4	0.2	0.1	0.1	0.4	0.4	0.1	0.3	0.7	0.2	0.1	0.1	0.5	0.5	0.1	0.3	0.7	0.4	0.1	0.2	0.7
Implant	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.4	0.7	0.1	0.5	1.0	0.6	0.1	0.4	0.9	1.3	0.2	1.0	1.7	0.8	0.2	0.5	1.2
LAM																					0.2	0.1	0.1	0.4
Other Traditional Methods	0.4	0.1	0.2	0.6	0.4	0.1	0.2	0.7	0.6	0.1	0.4	0.8	0.3	0.1	0.2	0.5	0.5	0.1	0.3	0.7	0.2	0.1	0.1	0.3
Other Modern Methods	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.3	0.0	0.0	0.0	0.2					0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Missing/Unknown if Using					0.1	0.1	0.1	0.3																
Any Method, Including Missing	25.7	0.8	24.2	27.3	28.2	0.8	26.7	29.8	29.8	0.7	28.4	31.3	23.8	0.8	22.2	25.5	29.1	0.7	27.7	30.5	25.9	1.1	23.8	28.2
Any Method, Excluding Missing					28.1	0.8	26.6	29.6					23.8	0.8	22.2	25.5					25.9	1.1	23.8	28.2
Any Modern Method	20.5	0.8	19.1	22.1	21.3	0.8	19.8	22.8	22.8	0.7	21.4	24.2	18.6	0.8	17.1	20.2	22.2	0.7	20.8	23.7	21.6	1.0	19.8	23.6
Any Traditional Method	5.2	0.4	4.5	5.9	6.6	0.4	5.9	7.5	6.4	0.4	5.7	7.2	4.6	0.4	3.9	5.3	5.6	0.3	4.9	6.3	3.5	0.5	2.6	4.6
N	7,003				5,979				7,285				6,225				7,255				6,380			

Appendix Table 6: Comparison of calendar and current status data for Lesotho 2004 and 200

	Current-status data from 2004				Calendar data from 2009			
	Women ages 15-43 at time of survey				Women ages 15-43 in November 2004			
	%	SE	CI		%	SE	CI	
Not using	70.4	0.7	68.9	71.8	76.0	0.8	74.4	77.5
Pill	7.5	0.4	6.7	8.3	6.0	0.4	5.2	6.8
IUD	1.4	0.2	1.1	1.8	1.6	0.2	1.3	2.1
Injections	11.3	0.5	10.3	12.3	7.8	0.5	6.9	8.7
Male Condom	6.6	0.4	5.9	7.3	6.0	0.4	5.3	6.8
Sterilization	1.6	0.2	1.3	2.0	1.4	0.2	1.1	1.8
Periodic Abstinence	0.0	0.0			0.1	0.1	0.0	0.3
Withdrawal	0.5	0.1	0.3	0.7	0.6	0.1	0.4	0.9
LAM	0.1	0.0	0.0	0.3				
Other Traditional Methods	0.8	0.1	0.5	1.1	0.4	0.1	0.2	0.6
Other Modern Methods	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.6
Any Method	29.6	0.7	28.2	31.1	23.9	0.8	22.4	25.4
Any Modern Method	28.4	0.8	27.0	29.9	22.9	0.7	21.4	24.4
Any Traditional Method	1.2	0.2	1.0	1.6	1.0	0.2	0.7	1.4
N	6,343				5,703			

Appendix Table 7: Comparison of calendar and current status data for Madagascar 2003-04 and 2008-09

	Current-status data from 2003-04				Calendar data from 2008-09			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2004			
	%	SE	CI		%	SE	CI	
Not using	77.9	1.2	75.4	80.2	81.4	0.6	80.3	82.6
Pill	3.1	0.3	2.5	3.9	2.8	0.2	2.3	3.3
IUD	0.4	0.1	0.2	0.7	0.2	0.1	0.1	0.5
Injections	7.9	0.7	6.6	9.3	6.9	0.4	6.2	7.7
Male Condom	1.2	0.2	0.9	1.5	0.6	0.1	0.5	0.8
Sterilization	0.5	0.1	0.3	0.8	0.5	0.1	0.4	0.7
Periodic Abstinence	7.0	0.7	5.8	8.5	6.2	0.3	5.7	6.8
Withdrawal	0.4	0.1	0.3	0.6	0.3	0.1	0.2	0.5
Implant	0.3	0.1	0.1	0.6	0.3	0.1	0.2	0.4
LAM	1.3	0.2	1.0	1.7	0.3	0.1	0.2	0.5
Other Traditional Methods	0.1	0.0	0.0	0.3	0.4	0.1	0.3	0.6
Other Modern Methods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Any Method	22.1	1.2	19.8	24.6	18.6	0.6	17.4	19.7
Any Modern Method	14.3	0.9	12.6	16.2	11.3	0.5	10.5	12.3
Any Traditional Method	7.5	0.7	6.3	9.0	6.9	0.3	6.4	7.5
N	7,119				13,157			

Appendix Table 8: Comparison of calendar and current status data for Malawi 2000, 2004, and 2010

	Current-status data from 2000				Calendar data from 2004				Current-status data from 2004				Calendar data from 2010			
	Women ages 15-43 at time of survey				Women ages 15-43 in September 2000				Women ages 15-43 at time of survey				Women ages 15-43 in January 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	74.9	0.6	73.7	76.1	85.7	0.5	84.6	86.6	74.7	0.6	73.5	75.8	80.8	0.4	80.0	81.6
Pill	2.4	0.2	2.1	2.8	1.2	0.1	0.9	1.5	1.5	0.1	1.3	1.8	1.3	0.1	1.1	1.5
IUD	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Injections	13.5	0.5	12.5	14.5	7.8	0.4	7.2	8.6	14.6	0.5	13.7	15.5	11.0	0.3	10.4	11.7
Male Condom	2.0	0.2	1.7	2.4	0.4	0.1	0.3	0.6	1.9	0.2	1.6	2.2	1.0	0.1	0.8	1.2
Sterilization	3.3	0.2	2.9	3.7	2.6	0.2	2.2	3.0	3.7	0.2	3.3	4.2	3.7	0.2	3.4	4.2
Periodic Abstinence	0.7	0.1	0.5	0.9	0.3	0.1	0.2	0.5	0.4	0.1	0.3	0.5	0.4	0.1	0.3	0.5
Withdrawal	1.1	0.1	0.9	1.4	1.2	0.2	0.9	1.6	1.6	0.2	1.3	1.9	0.9	0.1	0.8	1.1
Implant	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.4	0.1	0.3	0.6	0.2	0.0	0.2	0.4
LAM	0.4	0.1	0.3	0.5												
Other Traditional Methods	1.5	0.1	1.3	1.8	0.6	0.1	0.5	0.9	1.2	0.1	1.0	1.4	0.6	0.1	0.4	0.7
Other Modern Methods	0.0	0.0	0.0	0.1									0.0	0.0	0.0	0.1
Any Method	25.1	0.6	23.9	26.3	14.3	0.5	13.4	15.4	25.3	0.6	24.2	26.5	19.2	0.4	18.4	20.0
Any Modern Method	21.7	0.6	20.4	22.9	12.1	0.4	11.3	13.0	21.8	0.5	20.8	22.9	17.1	0.4	16.3	17.9
Any Traditional Method	3.4	0.2	3.0	3.8	2.2	0.2	1.8	2.6	3.1	0.2	2.7	3.6	1.9	0.1	1.6	2.2
N	12,099				9,466				10,778				17,373			

Appendix Table 9: Comparison of calendar and current status data for Namibia 2000, 2006-07, and 2013

	Current-status data from 2000				Calendar data from 2006-07				Current-status data from 2006-07				Calendar data from 2013			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2001				Women ages 15-43 at time of survey				Women ages 15-43 in January 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	61.8	1.2	59.3	64.2	76.1	0.8	74.5	77.6	53.1	0.7	51.7	54.6	67.2	0.6	65.9	68.4
Pill	6.0	0.4	5.2	6.8	3.6	0.3	3.0	4.2	5.6	0.3	5.0	6.3	4.0	0.3	3.4	4.7
IUD	0.7	0.1	0.4	1.0	0.4	0.1	0.3	0.7	0.6	0.1	0.4	0.8	0.4	0.1	0.3	0.7
Injections	17.9	0.9	16.3	19.7	8.1	0.5	7.3	9.1	18.3	0.6	17.2	19.5	12.4	0.5	11.4	13.4
Male Condom	9.4	0.6	8.3	10.7	7.4	0.5	6.5	8.3	17.7	0.6	16.5	19.0	13.3	0.5	12.3	14.4
Sterilization	3.4	0.3	2.8	4.1	3.8	0.3	3.2	4.4	3.3	0.3	2.8	3.9	2.1	0.2	1.8	2.6
Periodic Abstinence	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.4	0.3	0.1	0.2	0.5	0.0	0.0	0.0	0.1
Withdrawal	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.4	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2
Implant					0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.1
Other Traditional Methods	0.5	0.1	0.4	0.8	0.2	0.1	0.1	0.4	0.5	0.1	0.4	0.7	0.1	0.0	0.0	0.2
Other Modern Methods	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.3	0.4	0.1	0.3	0.6	0.3	0.1	0.2	0.5
Any Method	38.2	1.2	35.8	40.7	23.9	0.8	22.4	25.5	46.9	0.7	45.4	48.3	32.8	0.6	31.6	34.1
Any Modern Method	37.5	1.3	35.1	40.0	23.4	0.8	21.8	25.0	45.9	0.8	44.4	47.4	32.6	0.6	31.4	33.8
Any Traditional Method	0.7	0.1	0.5	1.0	0.5	0.1	0.3	0.8	0.9	0.1	0.7	1.2	0.2	0.1	0.1	0.3
N	6,244				7,162				8,960				6,994			

Appendix Table 10: Comparison of calendar and current status data for Rwanda 2005, 2007-08, and 2010

	Current-status data from 2005				Calendar data from 2010				Current-status data from 2008				Calendar data from 2010			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 2005				Women ages 15-43 at time of survey				Women ages 15-43 in February 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	90.5	0.3	89.8	91.2	94.7	0.3	94.1	95.3	75.6	0.9	73.7	77.4	85.4	0.4	84.6	86.2
Pill	1.3	0.1	1.1	1.7	0.9	0.1	0.7	1.1	3.7	0.3	3.1	4.3	2.2	0.2	1.9	2.5
IUD	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.2	0.0	0.1	0.2
Injections	2.4	0.2	2.1	2.8	2.3	0.2	1.9	2.6	9.4	0.5	8.4	10.4	8.1	0.3	7.5	8.7
Male Condom	0.9	0.1	0.7	1.1	0.3	0.1	0.2	0.4	1.5	0.2	1.2	1.9	0.7	0.1	0.5	0.9
Sterilization	0.2	0.0	0.1	0.3	0.2	0.0	0.2	0.3	0.5	0.1	0.3	0.6	0.3	0.1	0.2	0.4
Periodic Abstinence	2.3	0.2	2.0	2.6	0.6	0.1	0.5	0.8	6.0	0.6	4.8	7.4	0.9	0.1	0.7	1.1
Withdrawal	1.4	0.1	1.2	1.7	0.7	0.1	0.5	0.9	1.6	0.2	1.3	2.0	1.0	0.1	0.8	1.2
Implant	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2	1.0	0.1	0.7	1.3	1.1	0.1	0.9	1.3
LAM	0.4	0.1	0.3	0.6	0.1	0.0	0.0	0.1	0.6	0.1	0.4	0.9	0.2	0.0	0.1	0.3
Other Traditional Methods					0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Other Modern Methods	0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.4	0.2	0.0	0.1	0.3
Any Method	9.5	0.3	8.8	10.2	5.3	0.3	4.8	5.9	24.4	0.9	22.6	26.3	14.6	0.4	13.8	15.4
Any Modern Method	5.7	0.3	5.1	6.2	3.9	0.2	3.4	4.4	15.9	0.6	14.7	17.2	11.6	0.4	10.9	12.3
Any Traditional Method	3.7	0.2	3.3	4.1	1.3	0.1	1.1	1.5	7.6	0.7	6.3	9.0	1.9	0.1	1.6	2.2
N	10,220				10,326				6,564				11,149			

Appendix Table 11: Comparison of calendar and current status data for Tanzania 1999, 2004-05, and 2010

	Current-status data from 1999				Calendar data from 2004-05				Current-status data from 2004-05				Calendar data from 2010			
	Women ages 15-43 at time of survey				Women ages 15-43 in October 1999				Women ages 15-43 at time of survey				Women ages 15-43 in January 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	77.0	1.3	74.3	79.5	85.4	0.6	84.2	86.6	77.3	0.6	76.1	78.5	80.8	0.7	79.4	82.1
Pill	5.0	0.7	3.8	6.5	3.5	0.3	3.0	4.1	4.9	0.3	4.4	5.5	4.1	0.3	3.6	4.7
IUD	0.4	0.1	0.2	0.8	0.2	0.1	0.1	0.4	0.1	0.0	0.1	0.3	0.2	0.1	0.1	0.4
Injections	5.6	0.6	4.5	6.8	4.5	0.3	3.8	5.2	7.2	0.4	6.4	8.1	7.5	0.4	6.7	8.4
Male Condom	3.8	0.6	2.7	5.2	0.8	0.1	0.6	1.1	3.3	0.3	2.8	3.8	1.8	0.2	1.4	2.3
Sterilization	1.1	0.3	0.6	1.9	1.3	0.2	1.0	1.7	1.4	0.2	1.1	1.7	1.4	0.2	1.1	1.8
Periodic Abstinence	2.3	0.4	1.7	3.1	1.4	0.2	1.0	1.8	1.8	0.2	1.5	2.3	1.9	0.2	1.6	2.4
Withdrawal	2.7	0.5	1.8	3.9	1.6	0.2	1.2	2.0	2.2	0.2	1.7	2.7	1.0	0.2	0.7	1.4
Implant	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.4	0.4	0.1	0.3	0.6	0.5	0.1	0.3	0.8
LAM	1.4	0.3	0.9	2.1	0.3	0.1	0.2	0.5	0.4	0.1	0.2	0.6	0.4	0.2	0.2	0.9
Other Traditional Methods	0.6	0.2	0.4	1.2	0.8	0.2	0.5	1.2	0.9	0.2	0.6	1.3	0.3	0.1	0.2	0.5
Other Modern Methods	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1				
Any Method	23.0	1.3	20.5	25.7	14.6	0.6	13.4	15.8	22.7	0.6	21.5	23.9	19.2	0.7	17.9	20.6
Any Modern Method	17.2	1.2	14.9	19.8	10.7	0.6	9.6	11.9	17.4	0.7	16.1	18.7	15.4	0.6	14.3	16.6
Any Traditional Method	5.6	0.6	4.5	7.0	3.7	0.3	3.1	4.4	4.9	0.4	4.2	5.7	3.3	0.3	2.8	3.9
N	3,682				7,896				9,422				7,810			

Appendix Table 12: Comparison of calendar and current status data for Uganda 2000-01, 2006, and 2011

	Current-status data from 2000-01				Calendar data from 2006				Current-status data from 2006				Calendar data from 2011			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2001				Women ages 15-43 at time of survey				Women ages 15-43 in July 2006			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	79.4	0.9	77.6	81.1	88.9	0.6	87.8	90.0	80.4	0.6	79.1	81.6	87.0	0.8	85.4	88.4
Pill	2.8	0.3	2.3	3.5	1.8	0.2	1.5	2.2	2.5	0.2	2.1	3.0	1.7	0.2	1.4	2.2
IUD	0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.2
Injections	5.2	0.3	4.6	5.9	4.0	0.3	3.4	4.6	8.0	0.4	7.3	8.9	6.6	0.5	5.7	7.5
Male Condom	4.0	0.3	3.4	4.7	1.7	0.2	1.3	2.2	3.4	0.2	2.9	3.9	1.0	0.2	0.8	1.4
Sterilization	1.3	0.2	0.9	1.7	1.1	0.1	0.8	1.4	1.3	0.1	1.1	1.6	1.4	0.2	1.0	1.8
Periodic Abstinence	2.1	0.2	1.7	2.6	1.3	0.2	1.0	1.7	2.0	0.2	1.7	2.4	0.5	0.1	0.3	0.8
Withdrawal	0.9	0.1	0.6	1.1	0.7	0.1	0.5	1.0	1.4	0.2	1.1	1.7	1.1	0.2	0.8	1.6
Implant	0.2	0.1	0.1	0.4	0.1	0.0	0.0	0.2	0.3	0.1	0.2	0.5	0.3	0.1	0.1	0.4
LAM	3.2	0.3	2.6	4.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2
Other Traditional Methods	0.7	0.1	0.5	0.9	0.3	0.1	0.2	0.4	0.6	0.1	0.4	0.9	0.1	0.0	0.0	0.2
Other Modern Methods	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2					0.2	0.1	0.1	0.4
Any Method	20.6	0.9	18.9	22.4	11.1	0.6	10.0	12.2	19.6	0.6	18.4	20.9	13.0	0.8	11.6	14.6
Any Modern Method	16.7	0.8	15.2	18.4	8.7	0.5	7.8	9.7	15.4	0.6	14.2	16.5	11.0	0.6	9.9	12.3
Any Traditional Method	3.6	0.3	3.1	4.2	2.3	0.2	1.9	2.8	4.0	0.3	3.5	4.6	1.7	0.3	1.2	2.4
N	6,755				6,269				7,813				6,457			

Appendix Table 13: Comparison of calendar and current status data for Zambia 2001-02, 2007, and 2013-14

	Current-status data from 2001-02				Calendar data from 2007				Current-status data from 2007				Calendar data from 2013-14			
	Women ages 15-43 at time of survey				Women ages 15-43 in February 2002				Women ages 15-43 at time of survey				Women ages 15-43 in January 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	74.6	0.7	73.3	75.9	82.3	0.7	80.9	83.7	69.7	0.7	68.2	71.1	82.2	0.5	81.1	83.3
Pill	8.6	0.5	7.7	9.6	7.0	0.5	6.1	7.9	7.8	0.4	7.1	8.5	7.6	0.4	7.0	8.3
IUD	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.3
Injections	3.2	0.3	2.7	3.9	2.2	0.2	1.8	2.7	6.5	0.4	5.7	7.3	4.5	0.3	4.1	5.1
Male Condom	4.3	0.3	3.8	4.9	1.8	0.2	1.4	2.3	5.3	0.4	4.6	6.1	1.5	0.1	1.3	1.8
Sterilization	1.2	0.2	0.9	1.5	1.1	0.2	0.7	1.5	0.9	0.2	0.7	1.3	1.0	0.1	0.8	1.3
Periodic Abstinence	0.8	0.1	0.6	1.0	0.6	0.1	0.4	0.9	0.9	0.1	0.6	1.1	0.4	0.1	0.3	0.6
Withdrawal	3.4	0.3	2.9	3.9	2.3	0.3	1.8	2.9	3.6	0.4	2.9	4.4	1.5	0.2	1.2	1.8
Implant	0.2	0.1	0.1	0.5	0.2	0.1	0.1	0.4	0.3	0.1	0.2	0.5	0.6	0.1	0.4	0.8
LAM	1.8	0.2	1.5	2.2	1.9	0.2	1.5	2.5	4.3	0.3	3.7	5.1	0.1	0.0	0.1	0.3
Other Traditional Methods	1.7	0.2	1.4	2.1	0.6	0.1	0.4	0.9	0.7	0.1	0.5	0.9	0.2	0.0	0.1	0.3
Other Modern Methods	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.3
Any Method	25.4	0.7	24.1	26.7	17.7	0.7	16.3	19.1	30.3	0.7	28.9	31.8	17.8	0.5	16.8	18.9
Any Modern Method	19.3	0.7	18.0	20.6	14.0	0.6	12.8	15.3	24.9	0.6	23.6	26.1	15.1	0.5	14.2	16.1
Any Traditional Method	5.9	0.3	5.2	6.6	3.5	0.3	2.9	4.2	5.2	0.4	4.4	6.0	2.1	0.2	1.8	2.5
N	7,079				5,424				6,569				12,179			

Appendix Table 14: Comparison of calendar and current status data for Zimbabwe 1988, 1994, 1999, 2005-06, and 2010-11

	Current-status data from 1988				Calendar data from 1994				Current-status data from 1994				Calendar data from 1999				Current-status data from 1999				Calendar data from 2005-06				Current-status data from 2005-06				Calendar data from 2010-11			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 1989				Women ages 15-43 at time of survey				Women ages 15-43 in September 1994				Women ages 15-43 at time of survey				Women ages 15-43 in January 2000				Women ages 15-43 at time of survey				Women ages 15-43 in October 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	66.9	0.9	65.0	68.6	67.3	1.0	65.4	69.2	64.1	0.8	62.4	65.7	65.9	0.9	64.2	67.6	61.7	1.0	59.8	63.7	64.8	0.7	63.4	66.3	59.1	0.7	57.6	60.5	67.6	0.6	66.3	68.8
Pill	25.0	0.9	23.1	26.9	25.0	0.9	23.2	26.8	24.9	0.8	23.3	26.5	25.8	0.9	24.1	27.5	25.0	1.0	23.2	27.0	25.2	0.6	24.0	26.5	28.2	0.8	26.7	29.8	22.3	0.6	21.2	23.6
IUD	0.7	0.2	0.4	1.1	0.7	0.1	0.5	1.1	0.7	0.1	0.5	1.0	0.8	0.2	0.5	1.1	0.6	0.1	0.4	0.9	0.2	0.1	0.1	0.4	0.2	0.0	0.1	0.3	0.2	0.1	0.1	0.4
Injections	0.2	0.1	0.1	0.5	0.5	0.1	0.3	0.8	2.5	0.3	2.0	3.1	2.5	0.3	2.1	3.1	5.9	0.4	5.2	6.7	5.6	0.3	4.9	6.3	7.3	0.4	6.6	8.1	5.4	0.3	4.9	6.1
Male Condom	0.9	0.2	0.7	1.3	1.1	0.2	0.8	1.5	2.6	0.2	2.1	3.1	1.0	0.2	0.7	1.4	2.5	0.3	2.0	3.0	1.3	0.2	1.0	1.7	2.0	0.2	1.7	2.4	2.0	0.2	1.7	2.4
Sterilization	1.4	0.2	1.0	2.0	1.0	0.2	0.7	1.3	1.3	0.2	1.0	1.7	1.4	0.2	1.0	1.8	1.5	0.2	1.1	1.9	1.2	0.2	0.9	1.5	0.8	0.1	0.7	1.1	0.8	0.1	0.6	1.0
Periodic Abstinence	0.5	0.2	0.3	0.9	0.2	0.1	0.1	0.5	0.2	0.1	0.1	0.4	0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.2
Withdrawal	3.2	0.4	2.6	4.0	3.1	0.3	2.5	3.8	2.5	0.3	2.0	3.2	1.7	0.3	1.3	2.3	1.4	0.2	1.0	2.0	0.8	0.1	0.6	1.0	0.7	0.1	0.5	0.9	0.5	0.1	0.4	0.8
Implant									0.1	0.1	0.0	0.3	0.1	0.0	0.0	0.3	0.4	0.1	0.2	0.7	0.2	0.1	0.1	0.3	0.9	0.1	0.7	1.2	0.8	0.2	0.5	1.1
LAM													0.4	0.1	0.3	0.7	0.6	0.1	0.4	0.9	0.1	0.1	0.1	0.3	0.4	0.1	0.3	0.6	0.0	0.0	0.0	0.1
Other Traditional Methods	1.2	0.2	0.9	1.6	1.1	0.2	0.9	1.5	1.2	0.2	0.9	1.6	0.3	0.1	0.2	0.6	0.3	0.1	0.2	0.5	0.4	0.1	0.3	0.6	0.2	0.1	0.1	0.3	0.1	0.0	0.1	0.3
Other Modern Methods	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1					0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3
Any Method	33.1	0.9	31.4	35.0	32.7	1.0	30.8	34.6	35.9	0.8	34.3	37.6	34.1	0.9	32.4	35.8	38.3	1.0	36.3	40.2	35.2	0.7	33.7	36.6	40.9	0.7	39.5	42.4	32.4	0.6	31.2	33.7
Any Modern Method	28.3	1.0	26.4	30.2	28.3	0.9	26.4	30.2	31.9	0.9	30.2	33.6	31.9	0.9	30.2	33.6	36.1	1.0	34.1	38.2	33.7	0.7	32.3	35.2	39.0	0.7	37.6	40.5	30.9	0.7	29.7	32.2
Any Traditional Method	4.9	0.4	4.1	5.8	4.4	0.3	3.8	5.2	3.9	0.4	3.3	4.7	2.1	0.3	1.6	2.7	1.8	0.3	1.3	2.4	1.2	0.1	1.0	1.6	1.0	0.1	0.8	1.3	0.7	0.1	0.5	1.0
N	3,871				4,451				5,637				4,400				5,471				6,438				8,210				7,083			

Appendix Table 15: Comparison of calendar and current status data for Benin 2006 and 2011-12

	Current-status data from 2006				Calendar data from 2011-12			
	Women ages 15-43 at time of survey				Women ages 15-43 in September 2006			
	%	SE	CI		%	SE	CI	
Not using	82.3	0.5	81.4	83.2	93.1	0.4	92.3	93.8
Pill	1.4	0.1	1.2	1.6	0.5	0.1	0.4	0.7
IUD	0.5	0.1	0.4	0.6	0.2	0.0	0.1	0.2
Injections	1.5	0.1	1.3	1.7	0.6	0.1	0.5	0.8
Male Condom	2.8	0.2	2.5	3.1	0.8	0.1	0.6	1.1
Sterilization	0.2	0.0	0.2	0.3	0.1	0.0	0.0	0.1
Periodic Abstinence	7.4	0.3	6.9	8.0	1.2	0.2	1.0	1.6
Withdrawal	2.9	0.2	2.6	3.3	0.3	0.1	0.2	0.4
Implant	0.5	0.1	0.4	0.6	0.2	0.0	0.1	0.3
LAM	0.2	0.0	0.1	0.3	0.0	0.0	0.0	0.1
Other Traditional Methods	0.2	0.0	0.1	0.3	0.2	0.0	0.2	0.3
Other Modern Methods	0.2	0.0	0.1	0.3	0.4	0.1	0.3	0.6
Missing/Unknown if Using					2.3	0.2	1.9	2.8
Any Method, Including Missing	17.7	0.5	16.8	18.6	6.9	0.4	6.2	7.7
Any Method, Excluding Missing					4.6	0.3	4.1	5.2
Any Modern Method	6.7	0.3	6.2	7.2	2.7	0.2	2.3	3.1
Any Traditional Method	10.5	0.4	9.9	11.3	1.7	0.2	1.4	2.1
N	16,217				13,346			

Appendix Table 16: Comparison of calendar and current status data for Ghana 2003 and 2008

	Current-status data from 2003				Calendar data from 2008			
	Women ages 15-43 at time of survey				Women ages 15-43 in September 2003			
	%	SE	CI		%	SE	CI	
Not using	78.9	0.8	77.3	80.4	88.3	0.6	87.0	89.5
Pill	4.3	0.4	3.6	5.1	2.2	0.3	1.7	2.9
IUD	0.6	0.1	0.4	0.9	0.3	0.1	0.2	0.6
Injections	3.7	0.3	3.2	4.4	2.4	0.3	1.9	3.1
Male Condom	4.8	0.4	4.1	5.6	1.7	0.2	1.3	2.2
Sterilization	0.9	0.2	0.6	1.2	0.7	0.1	0.5	1.0
Periodic Abstinence	4.2	0.4	3.5	5.1	3.0	0.3	2.4	3.7
Withdrawal	0.8	0.1	0.6	1.1	0.8	0.2	0.5	1.1
Implant	0.6	0.1	0.4	0.9	0.3	0.1	0.1	0.7
LAM	0.2	0.1	0.1	0.4				
Other Traditional Methods	0.5	0.1	0.3	0.8	0.2	0.1	0.1	0.4
Other Modern Methods	0.5	0.1	0.3	0.8	0.1	0.1	0.0	0.3
Any Method	21.1	0.8	19.6	22.7	11.7	0.6	10.5	13.0
Any Modern Method	15.0	0.7	13.7	16.3	7.5	0.5	6.5	8.6
Any Traditional Method	5.5	0.5	4.7	6.5	3.9	0.4	3.3	4.7
N	5,136				3,829			

Appendix Table 17: Comparison of calendar and current status data for Mali 2006 and 2012-13

	Current-status data from 2006				Calendar data from 2012-13			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2007			
	%	SE	CI		%	SE	CI	
Not using	92.2	0.5	91.2	93.1	98.5	0.2	98.2	98.8
Pill	2.7	0.2	2.3	3.2	0.4	0.1	0.3	0.6
IUD	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Injections	2.3	0.2	2.0	2.7	0.5	0.1	0.3	0.8
Male Condom	0.5	0.1	0.4	0.7	0.0	0.0	0.0	0.1
Sterilization	0.2	0.1	0.1	0.3	0.0	0.0	0.0	0.1
Periodic Abstinence	0.7	0.1	0.5	1.0				
Withdrawal	0.0	0.0	0.0	0.1				
Implant	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2
LAM	0.5	0.1	0.4	0.7	0.0	0.0	0.0	0.1
Other Traditional Methods	0.5	0.1	0.4	0.7	0.1	0.0	0.0	0.2
Other Modern Methods	0.1	0.0	0.0	0.2				
Missing/Unknown if Using					0.2	0.1	0.1	0.3
Any Method, Including Missing	7.8	0.5	6.9	8.8	1.5	0.2	1.2	1.8
Any Method, Excluding Missing					1.2	0.2	1.0	1.6
Any Modern Method	6.4	0.4	5.6	7.2	1.0	0.2	0.8	1.4
Any Traditional Method	1.3	0.2	1.0	1.7	0.1	0.0	0.0	0.2
N	13,276				7,932			

Appendix Table 18: Comparison of calendar and current status data for Nigeria 2003, 2008, and 2013

	Current-status data from 2003				Calendar data from 2008				Current-status data from 2008				Calendar data from 2013			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 2003				Women ages 15-43 at time of survey				Women ages 15-43 in August 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	86.3	0.7	84.7	87.7	92.0	0.3	91.3	92.6	84.1	0.4	83.2	84.9	91.9	0.3	91.3	92.6
Pill	2.1	0.2	1.6	2.6	0.8	0.1	0.6	0.9	1.6	0.1	1.4	1.8	1.1	0.1	0.9	1.2
IUD	0.6	0.1	0.4	0.8	0.5	0.1	0.4	0.6	0.6	0.1	0.5	0.7	0.5	0.1	0.4	0.6
Injections	1.6	0.2	1.2	2.0	0.9	0.1	0.8	1.0	2.0	0.1	1.8	2.2	1.2	0.1	1.0	1.4
Male Condom	3.6	0.3	3.0	4.4	1.9	0.1	1.7	2.2	5.1	0.2	4.7	5.5	1.9	0.1	1.6	2.1
Sterilization	0.1	0.0	0.1	0.2	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3
Periodic Abstinence	2.3	0.3	1.7	3.0	1.6	0.1	1.4	1.8	2.1	0.1	1.9	2.4	1.4	0.1	1.2	1.7
Withdrawal	1.3	0.2	0.9	1.7	1.0	0.1	0.8	1.2	1.9	0.1	1.6	2.1	1.0	0.1	0.8	1.2
Implant	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1
LAM	1.1	0.2	0.8	1.4	0.4	0.1	0.4	0.6	1.2	0.1	1.0	1.4	0.2	0.0	0.2	0.3
Other Traditional Methods	1.0	0.2	0.7	1.3	0.7	0.1	0.6	0.9	1.2	0.1	1.0	1.4	0.3	0.0	0.2	0.4
Other Modern Methods	0.2	0.1	0.1	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.2	0.3
Any Method	13.7	0.7	12.4	15.3	8.0	0.3	7.4	8.7	15.9	0.4	15.1	16.8	8.1	0.3	7.4	8.7
Any Modern Method	9.2	0.5	8.3	10.2	4.7	0.2	4.3	5.1	10.8	0.3	10.2	11.4	5.3	0.2	4.9	5.8
Any Traditional Method	4.5	0.5	3.7	5.5	3.3	0.2	2.9	3.8	5.1	0.2	4.7	5.6	2.7	0.2	2.4	3.0
N	6,976				25,992				30,178				30,499			

Appendix Table 19: Comparison of calendar and current status data for Niger 2006 and 2012

	Current-status data from 2006				Calendar data from 2012			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2007			
	%	SE	CI		%	SE	CI	
Not using	89.9	0.6	88.6	91.1	95.5	0.3	94.8	96.1
Pill	2.8	0.3	2.3	3.3	2.0	0.2	1.7	2.4
IUD	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2
Injections	1.3	0.2	1.0	1.7	0.7	0.1	0.5	1.0
Male Condom	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Sterilization	0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.1
Periodic Abstinence	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Withdrawal	0.0	0.0	0.0	0.1				
Implant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
LAM	4.2	0.5	3.3	5.4	1.1	0.2	0.8	1.4
Other Traditional Methods	1.3	0.2	1.0	1.7	0.5	0.1	0.3	0.7
Other Modern Methods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Any Method	10.1	0.6	8.9	11.4	4.5	0.3	3.9	5.2
Any Modern Method	8.7	0.6	7.6	9.8	3.9	0.3	3.4	4.6
Any Traditional Method	1.4	0.2	1.1	1.8	0.5	0.1	0.4	0.7
N	8,498				9,003			

Appendix Table 20: Comparison of calendar and current status data for Sierra Leone 2008 and 2013

	Current-status data from 2008				Calendar data from 2013			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 2008			
	%	SE	CI		%	SE	CI	
Not using	89.5	0.6	88.3	90.6	94.6	0.6	93.2	95.7
Pill	3.1	0.3	2.7	3.7	1.8	0.3	1.3	2.5
IUD	0.3	0.1	0.2	0.5	0.1	0.0	0.1	0.3
Injections	3.2	0.3	2.6	3.9	1.7	0.2	1.4	2.1
Male Condom	1.2	0.1	0.9	1.5	0.5	0.2	0.3	0.9
Sterilization	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.4
Periodic Abstinence	0.6	0.1	0.4	0.9	0.1	0.1	0.1	0.3
Withdrawal	0.2	0.1	0.1	0.3	0.1	0.0	0.0	0.2
Implant					0.2	0.1	0.1	0.5
LAM	0.6	0.1	0.4	0.9	0.2	0.1	0.1	0.4
Other Traditional Methods	1.2	0.2	0.9	1.7	0.4	0.1	0.3	0.6
Other Modern Methods					0.0	0.0	0.0	0.1
Any Method	10.5	0.6	9.4	11.7	5.4	0.6	4.3	6.8
Any Modern Method	8.5	0.5	7.6	9.6	4.6	0.5	3.7	5.7
Any Traditional Method	2.0	0.2	1.6	2.5	0.6	0.1	0.4	0.9
N	6,774				12,414			

Appendix Table 21: Comparison of calendar and current status data for Senegal 2005, 2010-11, 2012-13, and 2014

	Current-status data from 2005				Calendar data from 2010-11				Current-status data from 2010-11				Calendar data from 2012-13				Current-status data from 2010-11				Calendar data from 2014				Current-status data from 2012-13				Calendar data from 2014			
	Women ages 15-43 at time of survey				Women ages 15-43 in April 2005				Women ages 15-43 at time of survey				Women ages 15-43 in January 2011				Women ages 15-43 at time of survey				Women ages 15-43 in January 2011				Women ages 15-43 at time of survey				Women ages 15-43 in March 2013			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	91.6	0.4	90.8	92.3	96.2	0.3	95.7	96.7	90.5	0.4	89.7	91.2	91.4	0.5	90.3	92.3	90.5	0.4	89.7	91.2	92.1	0.6	90.8	93.2	87.4	0.7	86.1	88.6	89.1	0.6	87.8	90.2
Pill	2.5	0.2	2.2	2.9	1.2	0.2	0.9	1.6	2.9	0.2	2.5	3.4	2.9	0.4	2.3	3.8	2.9	0.2	2.5	3.4	2.7	0.3	2.2	3.4	3.5	0.4	2.8	4.3	2.8	0.3	2.3	3.4
IUD	0.3	0.1	0.2	0.5	0.3	0.1	0.1	0.5	0.4	0.1	0.3	0.6	0.4	0.1	0.2	0.8	0.4	0.1	0.3	0.6	0.2	0.1	0.1	0.5	0.6	0.2	0.4	1.0	0.3	0.1	0.2	0.7
Injections	2.3	0.2	2.0	2.7	1.0	0.1	0.8	1.4	3.7	0.2	3.3	4.1	2.9	0.2	2.5	3.4	3.7	0.2	3.3	4.1	3.0	0.5	2.2	4.1	4.4	0.4	3.7	5.1	4.2	0.4	3.4	5.2
Male Condom	1.4	0.1	1.1	1.7	0.3	0.1	0.2	0.5	0.7	0.1	0.5	0.9	0.5	0.1	0.4	0.8	0.7	0.1	0.5	0.9	0.7	0.2	0.4	1.2	0.7	0.1	0.5	1.0	0.8	0.2	0.5	1.3
Sterilization	0.2	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.4	0.2	0.1	0.1	0.5
Periodic Abstinence	0.4	0.1	0.3	0.6	0.2	0.1	0.1	0.4	0.2	0.1	0.1	0.4					0.2	0.1	0.1	0.4	0.2	0.1	0.1	0.5	0.3	0.1	0.2	0.5	0.4	0.1	0.2	0.8
Withdrawal	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.1	0.0	0.1	0.3	0.3	0.1	0.2	0.6	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1
Implant	0.4	0.1	0.3	0.5	0.3	0.1	0.2	0.5	0.9	0.1	0.7	1.2	0.8	0.1	0.6	1.2	0.9	0.1	0.7	1.2	0.7	0.1	0.5	1.0	2.0	0.3	1.5	2.8	1.8	0.2	1.4	2.3
LAM	0.2	0.1	0.1	0.4	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.3	0.0	0.0	0.0	0.1
Other Traditional Methods	0.5	0.1	0.4	0.7	0.1	0.0	0.1	0.2	0.3	0.1	0.2	0.5	0.4	0.1	0.3	0.6	0.3	0.1	0.2	0.5	0.2	0.1	0.1	0.4	0.7	0.1	0.5	1.0	0.3	0.1	0.2	0.4
Other Modern Methods	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1					0.1	0.0	0.0	0.2				
Any Method	8.4	0.4	7.7	9.2	3.8	0.3	3.3	4.3	9.5	0.4	8.8	10.3	8.6	0.5	7.7	9.7	9.5	0.4	8.8	10.3	7.9	0.6	6.8	9.2	12.6	0.7	11.4	13.9	10.9	0.6	9.8	12.1
Any Modern Method	7.1	0.4	6.4	7.8	3.0	0.2	2.6	3.5	7.9	0.3	7.3	8.6	7.0	0.5	6.2	8.0	7.9	0.3	7.3	8.6	6.8	0.5	5.8	7.9	9.5	0.6	8.3	10.8	8.4	0.6	7.3	9.5
Any Traditional Method	1.0	0.1	0.8	1.2	0.4	0.1	0.3	0.7	0.7	0.1	0.5	1.0	0.8	0.1	0.6	1.1	0.7	0.1	0.5	1.0	0.5	0.1	0.3	0.8	1.1	0.1	0.8	1.4	0.7	0.1	0.5	1.1
N	13,376				11,606				14,525				7,420				14,525				7,014				7,950				7,499			

Appendix Table 22: Comparison of calendar and current status data for Armenia 2000, 2005, and 2010

	Current-status data from 2000				Calendar data from 2005				Current-status data from 2005				Calendar data from 2010			
	Women ages 15-43 at time of survey				Women ages 15-43 in October 2000				Women ages 15-43 at time of survey				Women ages 15-43 in October 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	59.9	0.8	58.4	61.4	65.9	1.0	63.8	67.9	65.9	0.9	64.1	67.6	67.7	1.0	65.7	69.6
Pill	0.8	0.1	0.6	1.1	0.9	0.2	0.6	1.2	0.6	0.1	0.4	0.8	0.7	0.1	0.4	1.0
IUD	6.3	0.4	5.6	7.2	5.0	0.4	4.4	5.8	6.5	0.5	5.6	7.4	5.8	0.4	5.0	6.8
Injections	0.0	0.0	0.0	0.2									0.1	0.0	0.0	0.3
Male Condom	4.9	0.3	4.2	5.6	5.0	0.4	4.2	5.9	5.9	0.5	5.1	6.8	8.1	0.8	6.6	9.9
Sterilization	1.4	0.2	1.1	1.7	0.4	0.1	0.2	0.7	0.3	0.1	0.2	0.6	0.2	0.1	0.1	0.5
Periodic Abstinence	2.9	0.2	2.5	3.5	2.4	0.3	1.9	3.0	2.1	0.3	1.7	2.7	1.3	0.2	1.0	1.7
Withdrawal	21.2	0.6	20.0	22.5	19.1	0.7	17.7	20.6	17.1	0.7	15.8	18.5	15.5	0.6	14.3	16.7
Implant	0.0	0.0	0.0	0.1												
LAM	1.4	0.2	1.1	1.9	0.0	0.0	0.0	0.2	0.3	0.1	0.2	0.5	0.1	0.0	0.0	0.2
Other Traditional Methods	0.8	0.1	0.6	1.2	1.2	0.2	0.9	1.5	1.2	0.2	0.9	1.7	0.3	0.1	0.2	0.6
Other Modern Methods	0.1	0.1	0.1	0.3	0.1	0.1	0.0	0.3	0.1	0.1	0.0	0.6	0.3	0.1	0.2	0.6
Any Method	40.1	0.8	38.6	41.6	34.1	1.0	32.1	36.2	34.1	0.9	32.4	35.9	32.3	1.0	30.4	34.3
Any Modern Method	15.0	0.6	13.9	16.2	11.5	0.6	10.3	12.8	13.7	0.6	12.5	14.9	15.2	0.9	13.6	17.0
Any Traditional Method	25.0	0.7	23.7	26.3	22.7	0.8	21.1	24.4	20.5	0.8	19.0	22.0	17.1	0.6	15.9	18.4
N	5,437				5,300				5,404				4,905			

Appendix Table 23: Comparison of calendar and current status data for currently married women in Egypt 1988, 1992, 1995, 2000, 2003, 2005, 2008, and 2014

	Current-status data from 1988				Calendar data from 1992				Current-status data from 1992				Calendar data from 1995				Current-status data from 1995				Calendar data from 2000				Current-status data from 2000			
	Women ages 15-43 at time of survey				Women ages 15-43 in November 1988				Women ages 15-43 at time of survey				Women ages 15-43 in November 1992				Women ages 15-43 at time of survey				Women ages 15-43 in November 1995				Women ages 15-43 at time of survey			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	60.7	1.1	58.5	62.9	61.6	0.9	59.7	63.4	51.7	1.0	49.7	53.6	52.9	0.8	51.3	54.5	50.3	0.8	48.8	51.8	49.1	0.7	47.8	50.4	41.9	0.6	40.6	43.1
Pill	15.9	0.6	14.8	17.2	14.8	0.5	13.8	15.9	13.6	0.5	12.6	14.6	13.2	0.4	12.4	14.1	10.8	0.4	10.0	11.6	11.4	0.4	10.6	12.2	9.9	0.4	9.3	10.7
IUD	16.8	0.7	15.4	18.3	17.9	0.7	16.5	19.4	29.4	0.8	27.9	31.0	28.9	0.8	27.4	30.5	31.8	0.7	30.4	33.3	33.4	0.6	32.2	34.6	37.4	0.6	36.2	38.6
Injections	0.1	0.0	0.0	0.2	0.3	0.1	0.2	0.4	0.5	0.1	0.3	0.7	0.7	0.1	0.5	1.0	2.6	0.2	2.2	3.0	2.4	0.2	2.1	2.7	6.3	0.3	5.8	6.9
Male Condom	2.5	0.2	2.1	3.0	1.8	0.2	1.5	2.3	1.7	0.2	1.4	2.1	1.2	0.1	0.9	1.4	1.3	0.1	1.0	1.6	0.8	0.1	0.6	1.0	0.8	0.1	0.7	1.0
Sterilization	1.2	0.1	1.0	1.5	0.8	0.1	0.6	1.1	0.8	0.1	0.6	1.1	0.8	0.1	0.6	1.0	0.9	0.1	0.7	1.2	1.0	0.1	0.8	1.2	1.0	0.1	0.9	1.3
Periodic Abstinence	0.5	0.1	0.4	0.8	0.8	0.1	0.6	1.0	0.6	0.1	0.4	0.8	0.6	0.1	0.4	0.8	0.6	0.1	0.5	0.8	0.5	0.1	0.4	0.7	0.5	0.1	0.4	0.7
Withdrawal	0.4	0.1	0.3	0.6	0.5	0.1	0.3	0.7	0.5	0.1	0.4	0.7	0.3	0.1	0.2	0.5	0.4	0.1	0.3	0.6	0.1	0.0	0.0	0.2	0.2	0.1	0.2	0.4
Implant					0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.3	0.1	0.2	0.4
Other Traditional Methods	1.4	0.2	1.1	1.7	1.3	0.2	0.9	1.7	1.0	0.2	0.7	1.4	1.2	0.1	0.9	1.5	1.2	0.1	0.9	1.5	1.2	0.1	1.0	1.5	1.5	0.1	1.3	1.8
Other Modern Methods	0.4	0.1	0.2	0.5	0.3	0.1	0.2	0.5	0.3	0.1	0.2	0.5	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2
Any Method	39.3	1.1	37.1	41.5	38.4	0.9	36.6	40.3	48.3	1.0	46.4	50.3	47.1	0.8	45.5	48.7	49.7	0.8	48.2	51.2	50.9	0.7	49.6	52.2	58.1	0.6	56.9	59.4
Any Modern Method	36.9	1.1	34.8	39.1	35.9	0.9	34.2	37.7	46.3	1.0	44.4	48.2	45.0	0.8	43.4	46.6	47.5	0.8	45.9	49.0	49.1	0.7	47.8	50.4	55.6	0.6	54.4	56.9
Any Traditional Method	2.3	0.2	2.0	2.8	2.5	0.2	2.1	3.0	2.0	0.2	1.7	2.5	2.1	0.2	1.8	2.5	2.2	0.2	1.9	2.6	1.8	0.1	1.6	2.1	2.2	0.2	2.0	2.6
N	7,260				7,619				8,051				11,387				11,881				11,432				12,239			

	Calendar data from 2003				Current-status data from 2000				Calendar data from 2005				Current-status data from 2003				Calendar data from 2005				Current-status data from 2003				Calendar data from 2008			
	Women ages 15-43 in March 2000				Women ages 15-43 at time of survey				Women ages 15-43 in March 2000				Women ages 15-43 at time of survey				Women ages 15-43 in June 2003				Women ages 15-43 at time of survey				Women ages 15-43 in June 2003			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	39.8	0.7	38.4	41.3	41.9	0.6	40.6	43.1	44.5	0.6	43.3	45.7	38.3	0.7	36.9	39.7	40.0	0.6	38.9	41.2	38.3	0.7	36.9	39.7	38.7	0.5	37.7	39.8
Pill	10.6	0.4	9.7	11.5	9.9	0.4	9.3	10.7	9.6	0.3	9.0	10.3	9.7	0.4	8.9	10.5	10.0	0.3	9.5	10.6	9.7	0.4	8.9	10.5	10.3	0.3	9.7	11.0
IUD	39.1	0.8	37.5	40.7	37.4	0.6	36.2	38.6	36.0	0.7	34.8	37.3	38.1	0.8	36.6	39.7	37.8	0.6	36.5	39.0	38.1	0.8	36.6	39.7	39.7	0.6	38.6	40.8
Injections	5.7	0.3	5.1	6.4	6.3	0.3	5.8	6.9	5.6	0.3	5.2	6.2	8.1	0.4	7.4	8.9	7.1	0.3	6.6	7.7	8.1	0.4	7.4	8.9	7.8	0.3	7.2	8.5
Male Condom	0.5	0.1	0.4	0.7	0.8	0.1	0.7	1.0	0.7	0.1	0.6	0.9	0.8	0.1	0.6	1.1	0.7	0.1	0.5	0.9	0.8	0.1	0.6	1.1	0.5	0.1	0.3	0.6
Sterilization	0.7	0.1	0.5	1.0	1.0	0.1	0.9	1.3	0.9	0.1	0.7	1.1	0.6	0.1	0.4	0.8	0.9	0.1	0.8	1.1	0.6	0.1	0.4	0.8	0.8	0.1	0.6	1.0
Periodic Abstinence	0.5	0.1	0.3	0.7	0.5	0.1	0.4	0.7	0.5	0.1	0.4	0.7	0.6	0.1	0.4	0.9	0.6	0.1	0.4	0.8	0.6	0.1	0.4	0.9	0.4	0.1	0.3	0.5
Withdrawal	0.3	0.1	0.2	0.5	0.2	0.1	0.2	0.4	0.3	0.1	0.2	0.4	0.4	0.1	0.3	0.6	0.2	0.0	0.2	0.4	0.4	0.1	0.3	0.6	0.1	0.0	0.1	0.2
Implant	0.3	0.1	0.1	0.5	0.3	0.1	0.2	0.4	0.4	0.1	0.3	0.5	0.9	0.1	0.7	1.3	0.7	0.1	0.6	0.9	0.9	0.1	0.7	1.3	0.7	0.1	0.5	0.9
Other Traditional Methods	2.5	0.2	2.1	3.0	1.5	0.1	1.3	1.8	1.4	0.1	1.2	1.7	2.5	0.2	2.1	3.0	1.8	0.1	1.5	2.0	2.5	0.2	2.1	3.0	1.0	0.1	0.8	1.2
Other Modern Methods					0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Any Method	60.1	0.7	58.7	61.6	58.1	0.6	56.9	59.4	55.5	0.6	54.2	56.7	61.7	0.7	60.3	63.1	59.9	0.6	58.7	61.1	61.7	0.7	60.3	63.1	61.3	0.5	60.2	62.3
Any Modern Method	56.6	0.7	55.1	58.1	55.6	0.6	54.4	56.9	53.0	0.6	51.7	54.2	57.3	0.7	55.8	58.7	56.6	0.6	55.4	57.8	57.3	0.7	55.8	58.7	59.1	0.5	58.0	60.1
Any Traditional Method	3.3	0.3	2.8	3.8	2.2	0.2	2.0	2.6	2.2	0.2	1.9	2.5	3.5	0.2	3.0	4.0	2.6	0.2	2.3	2.9	3.5	0.2	3.0	4.0	1.5	0.1	1.3	1.8
N	6,866				12,239				13,913				7,225				14,962				7,225				11,657			

(Continued…)

Appendix Table 23. – *Continued*

	Current-status data from 2005				Calendar data from 2008				Current-status data from 2008				Calendar data from 2014			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 2005				Women ages 15-43 at time of survey				Women ages 15-43 in January 2009			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	39.4	0.6	38.2	40.5	37.2	0.5	36.2	38.2	38.8	0.5	37.8	39.8	41.7	0.5	40.7	42.8
Pill	10.3	0.3	9.7	11.0	10.9	0.3	10.2	11.6	12.5	0.3	11.8	13.2	13.6	0.4	12.9	14.3
IUD	37.6	0.6	36.3	38.8	39.7	0.6	38.6	40.9	36.4	0.6	35.3	37.5	33.6	0.6	32.5	34.6
Injections	7.4	0.3	6.9	8.0	7.9	0.3	7.2	8.5	7.7	0.3	7.1	8.3	8.8	0.3	8.2	9.5
Male Condom	0.8	0.1	0.7	1.0	0.5	0.1	0.3	0.6	0.6	0.1	0.4	0.8	0.3	0.1	0.2	0.4
Sterilization	0.9	0.1	0.7	1.1	0.7	0.1	0.5	0.8	0.8	0.1	0.6	0.9	0.8	0.1	0.6	1.0
Periodic Abstinence	0.6	0.1	0.5	0.8	0.4	0.1	0.3	0.6	0.4	0.1	0.3	0.5	0.3	0.1	0.2	0.4
Withdrawal	0.3	0.0	0.2	0.4	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3
Implant	0.8	0.1	0.7	1.0	0.8	0.1	0.7	1.0	0.5	0.1	0.4	0.6	0.5	0.1	0.4	0.7
Other Traditional Methods	1.9	0.2	1.6	2.2	1.8	0.1	1.6	2.1	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3
Other Modern Methods	0.0	0.0	0.0	0.1					2.3	0.1	2.0	2.6	0.0	0.0	0.0	0.1
Any Method	60.6	0.6	59.5	61.8	62.8	0.5	61.8	63.8	61.2	0.5	60.2	62.2	58.3	0.5	57.2	59.3
Any Modern Method	57.0	0.6	55.8	58.2	59.6	0.5	58.5	60.6	60.1	0.5	59.1	61.2	57.1	0.6	56.0	58.1
Any Traditional Method	2.8	0.2	2.4	3.1	2.4	0.2	2.1	2.8	0.6	0.1	0.5	0.8	0.6	0.1	0.5	0.8
N	15,582				12,116				13,206				15,524			

Appendix Table 24: Comparison of calendar and current status data for ever-married women in Jordan 1997, 2002, 2007, 2009, and 2012

	Current-status data from 1997				Calendar data from 2002				Current-status data from 2002				Calendar data from 2007				Current-status data from 2007				Calendar data from 2009			
	Women ages 15-43 at time of survey				Women ages 15-43 in July 1997				Women ages 15-43 at time of survey				Women ages 15-43 in August 2002				Women ages 15-43 at time of survey				Women ages 15-43 in August 2007			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	48.7	0.8	47.1	50.4	51.0	1.0	49.1	52.9	45.4	0.9	43.7	47.2	52.7	0.9	50.9	54.6	44.7	0.9	43.0	46.3	46.7	0.9	44.9	48.4
Pill	6.8	0.4	6.0	7.6	7.9	0.5	7.0	8.9	7.8	0.5	6.9	8.8	8.0	0.5	7.1	9.0	8.9	0.5	8.0	9.9	8.4	0.5	7.5	9.5
IUD	23.4	0.7	22.2	24.7	23.0	0.9	21.3	24.8	23.5	0.9	21.8	25.3	21.1	0.7	19.7	22.6	21.7	0.7	20.4	23.0	21.9	0.8	20.4	23.4
Injections	0.8	0.1	0.6	1.1	0.5	0.1	0.3	0.8	0.9	0.2	0.7	1.3	0.8	0.1	0.5	1.1	0.7	0.1	0.5	1.0	0.6	0.1	0.4	0.8
Male Condom	2.5	0.2	2.0	3.0	1.8	0.3	1.4	2.4	3.4	0.3	2.9	4.0	2.5	0.3	2.1	3.2	5.6	0.4	4.9	6.4	4.1	0.4	3.5	4.9
Sterilization	2.9	0.3	2.4	3.5	2.0	0.2	1.6	2.5	1.8	0.2	1.4	2.3	2.4	0.3	2.0	3.0	2.1	0.2	1.7	2.7	1.6	0.2	1.2	2.1
Periodic Abstinence	4.4	0.3	3.7	5.1	4.4	0.4	3.7	5.2	4.8	0.4	4.1	5.6	3.2	0.3	2.6	3.9	3.7	0.3	3.2	4.4	3.5	0.4	2.9	4.3
Withdrawal	7.4	0.4	6.7	8.3	6.4	0.4	5.6	7.2	9.1	0.5	8.3	10.1	7.2	0.5	6.3	8.1	10.8	0.5	9.9	11.8	10.9	0.6	9.8	12.1
Implant	0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0				
LAM					2.4	0.2	2.0	2.9	2.9	0.2	2.4	3.4	1.9	0.3	1.4	2.4	1.5	0.2	1.2	2.0	2.0	0.2	1.6	2.5
Other Traditional Methods	2.5	0.2	2.1	3.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1					0.0	0.0			0.4	0.1	0.2	0.6
Other Modern Methods	0.5	0.1	0.3	0.8	0.5	0.1	0.3	0.8	0.2	0.1	0.1	0.5	0.2	0.1	0.1	0.4	0.3	0.1	0.1	0.5	0.0	0.0	0.0	0.1
Any Method	51.3	0.8	49.6	52.9	49.0	1.0	47.1	50.9	54.6	0.9	52.8	56.3	47.3	0.9	45.4	49.1	55.4	0.9	53.7	57.0	53.3	0.9	51.6	55.1
Any Modern Method	36.8	0.8	35.3	38.4	38.2	0.9	36.4	40.0	40.6	0.9	38.8	42.3	36.9	0.9	35.2	38.6	40.8	0.8	39.2	42.5	38.6	0.9	36.8	40.4
Any Traditional Method	14.3	0.6	13.3	15.4	10.8	0.5	9.8	11.8	13.9	0.6	12.8	15.1	10.4	0.5	9.4	11.5	14.5	0.5	13.5	15.6	14.8	0.6	13.5	16.1
N	4,829				4,649				5,189				8,492				9,315				8,317			

	Current-status data from 2007				Calendar data from 2012				Current-status data from 2009				Calendar data from 2012			
	Women ages 15-43 at time of survey				Women ages 15-43 in August 2007				Women ages 15-43 at time of survey				Women ages 15-43 in November 2009			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	44.7	0.9	43.0	46.3	48.6	1.0	46.6	50.6	42.3	0.9	40.6	44.0	43.5	0.9	41.6	45.3
Pill	8.9	0.5	8.0	9.9	8.4	0.5	7.5	9.5	8.9	0.5	8.0	9.9	9.2	0.5	8.2	10.2
IUD	21.7	0.7	20.4	23.0	20.6	0.8	19.0	22.2	21.7	0.8	20.1	23.4	21.3	0.8	19.8	23.0
Injections	0.7	0.1	0.5	1.0	0.6	0.1	0.5	0.9	0.8	0.1	0.6	1.1	0.7	0.1	0.5	1.0
Male Condom	5.6	0.4	4.9	6.4	4.3	0.4	3.6	5.2	6.4	0.4	5.7	7.2	5.8	0.5	4.9	6.7
Sterilization	2.1	0.2	1.7	2.7	1.4	0.3	1.0	2.1	1.5	0.2	1.1	2.0	1.3	0.3	0.9	1.9
Periodic Abstinence	3.7	0.3	3.2	4.4	3.3	0.5	2.5	4.4	2.9	0.3	2.3	3.6	3.1	0.4	2.4	3.9
Withdrawal	10.8	0.5	9.9	11.8	9.9	0.5	8.9	11.0	13.3	0.6	12.1	14.6	11.9	0.6	10.7	13.1
Implant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1
LAM	1.5	0.2	1.2	2.0	1.9	0.2	1.5	2.5	1.7	0.2	1.3	2.1	1.7	0.2	1.3	2.1
Other Traditional Methods	0.0	0.0			0.7	0.2	0.5	1.1	0.4	0.1	0.2	0.7	1.5	0.2	1.2	2.0
Other Modern Methods	0.3	0.1	0.1	0.5	0.1	0.1	0.0	0.3	0.1	0.1	0.0	0.4	0.1	0.1	0.1	0.4
Any Method	55.4	0.9	53.7	57.0	51.4	1.0	49.4	53.4	57.7	0.9	56.0	59.4	56.5	0.9	54.7	58.4
Any Modern Method	40.8	0.8	39.2	42.5	37.4	0.9	35.7	39.2	41.1	0.9	39.2	42.9	40.1	0.8	38.6	41.6
Any Traditional Method	14.5	0.5	13.5	15.6	14.0	0.7	12.7	15.3	16.6	0.8	15.1	18.1	16.4	0.7	15.1	17.8
N	9,315				8,810				8,523				9,185			

Appendix Table 25: Comparison of calendar and current status data for Kazakhstan 1995 and 1999

	Current-status data from 1995				Calendar data from 1999			
	Women ages 15-43 at time of survey				Women ages 15-43 in July 1995			
	%	SE	CI		%	SE	CI	
Not using	55.5	1.2	53.2	57.8	50.8	1.1	48.8	52.9
Pill	1.7	0.3	1.2	2.2	2.0	0.4	1.4	2.9
IUD	29.1	0.9	27.3	31.0	33.6	0.9	31.9	35.3
Injections	0.2	0.1	0.1	0.5	0.0	0.0	0.0	0.2
Male Condom	3.5	0.4	2.8	4.4	3.6	0.4	3.0	4.5
Sterilization	0.5	0.1	0.3	0.8	1.5	0.3	1.1	2.1
Periodic Abstinence	4.9	0.5	4.0	6.0	3.4	0.4	2.8	4.2
Withdrawal	2.5	0.5	1.7	3.6	1.3	0.2	1.0	1.9
Other Traditional Methods	2.1	0.3	1.6	2.8	2.5	0.3	2.0	3.1
Other Modern Methods	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.3
Any Method, Including Missing	44.5	1.2	42.2	46.8	48.1	1.1	46.0	50.3
Any Modern Method	35.0	1.0	33.2	37.0	40.9	1.0	39.0	42.8
Any Traditional Method	9.4	0.9	7.8	11.3	7.2	0.5	6.3	8.3
N	3,322				3,972			

Appendix Table 26: Comparison of calendar and current status data for ever-married women in Morocco 1987 and 1992

	Current-status data from 1987				Calendar data from 1992			
	Women ages 15-43 at time of survey				Women ages 15-43 in June 1987			
	%	SE	CI		%	SE	CI	
Not using	66.5	1.3	64.0	68.9	70.3	1.2	67.9	72.7
Pill	22.2	1.0	20.3	24.2	20.0	1.0	18.1	22.0
IUD	2.6	0.3	2.1	3.2	2.6	0.3	2.1	3.3
Injections	0.3	0.1	0.1	0.5	0.1	0.1	0.1	0.3
Male Condom	0.5	0.1	0.3	0.7	0.4	0.1	0.2	0.7
Sterilization	1.6	0.2	1.3	2.0	1.8	0.2	1.4	2.2
Periodic Abstinence	2.0	0.3	1.6	2.6	2.5	0.3	2.0	3.2
Withdrawal	2.9	0.4	2.2	3.7	1.8	0.3	1.3	2.4
Other Traditional Methods	1.2	0.2	0.9	1.5	0.4	0.1	0.2	0.6
Other Modern Methods	0.1	0.0	0.1	0.3	0.1	0.1	0.0	0.3
Any Method	33.4	1.3	31.0	35.9	29.7	1.2	27.3	32.1
Any Modern Method	27.3	1.1	25.2	29.6	25.0	1.1	23.0	27.2
Any Traditional Method	6.1	0.5	5.2	7.1	4.6	0.4	3.8	5.6
N	5,094				4,413			

Appendix Table 27: Comparison of calendar and current status data for Turkey 1993 and 1998

	Current-status data from 1993				Calendar data from 1998				Current-status data from 1998				Calendar data from 2004			
	Women ages 15-43 at time of survey				Women ages 15-43 in September 1993				Women ages 15-43 at time of survey				Women ages 15-43 in September 1998			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	34.9	1.0	33.0	36.8	38.0	1.0	36.2	40.0	33.3	0.8	31.7	34.9	30.8	0.8	29.3	32.4
Pill	5.3	0.4	4.6	6.1	5.9	0.4	5.1	6.8	4.7	0.4	4.0	5.6	5.3	0.3	4.7	6.0
IUD	20.3	0.7	18.9	21.7	20.7	0.8	19.2	22.3	21.5	0.7	20.1	23.0	22.6	0.7	21.2	24.0
Injections	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.5	0.1	0.4	0.8	0.3	0.1	0.2	0.5
Male Condom	7.0	0.4	6.2	7.8	5.9	0.4	5.1	6.7	9.0	0.5	8.0	10.1	8.6	0.6	7.6	9.8
Sterilization	2.7	0.2	2.3	3.1	2.4	0.3	1.9	2.9	4.0	0.3	3.4	4.7	3.6	0.3	3.1	4.2
Periodic Abstinence	1.0	0.2	0.7	1.4	1.3	0.2	0.9	1.8	0.9	0.2	0.6	1.3	1.3	0.2	1.0	1.7
Withdrawal	26.9	0.8	25.3	28.5	24.8	0.8	23.2	26.4	25.0	0.8	23.4	26.6	25.7	0.7	24.2	27.1
LAM													0.8	0.1	0.6	1.1
Other Traditional Methods	0.7	0.1	0.5	1.0	0.6	0.1	0.4	0.9	0.5	0.1	0.3	0.8	0.4	0.1	0.3	0.7
Other Modern Methods	1.2	0.1	1.0	1.6	0.5	0.1	0.4	0.8	0.6	0.1	0.4	0.9	0.5	0.1	0.3	0.8
Any Method	65.1	1.0	63.2	67.0	62.0	1.0	60.0	63.8	66.7	0.8	65.1	68.3	69.2	0.8	67.6	70.7
Any Modern Method	36.5	0.8	34.9	38.2	35.4	1.0	33.5	37.3	40.4	0.9	38.5	42.2	41.7	0.9	40.0	43.5
Any Traditional Method	28.6	0.8	27.0	30.2	26.6	0.8	25.0	28.2	26.4	0.8	24.8	28.0	27.4	0.8	26.0	28.9
N	5,528				4,696				5,131				6,241			

Appendix Table 28: Comparison of calendar and current status data for ever-married women in Bangladesh 1993-94, 1996-97, 1999-00, 2004, 2007, and 2011

	Current-status data from 1994				Calendar data from 1997				Current-status data from 1994				Calendar data from 2000				Current-status data from 1997				Calendar data from 2000			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 1994				Women ages 15-43 at time of survey				Women ages 15-43 in April 1994				Women ages 15-43 at time of survey				Women ages 15-43 in January 1997			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	56.4	0.8	54.9	58.0	59.8	0.8	58.2	61.3	56.4	0.8	54.9	58.0	59.2	0.9	57.5	61.0	52.0	0.9	50.3	53.7	56.8	0.8	55.2	58.4
Pill	17.4	0.6	16.3	18.6	17.6	0.6	16.5	18.7	17.4	0.6	16.3	18.6	18.0	0.7	16.8	19.4	21.0	0.7	19.8	22.4	19.5	0.6	18.3	20.7
IUD	2.2	0.2	1.9	2.7	1.7	0.2	1.3	2.1	2.2	0.2	1.9	2.7	1.5	0.2	1.2	1.9	1.7	0.2	1.4	2.1	1.5	0.2	1.2	1.8
Injections	4.5	0.3	3.9	5.2	3.7	0.3	3.2	4.3	4.5	0.3	3.9	5.2	4.1	0.3	3.5	4.8	6.3	0.4	5.6	7.0	5.3	0.3	4.7	6.0
Male Condom	3.0	0.2	2.6	3.4	2.3	0.2	1.9	2.8	3.0	0.2	2.6	3.4	2.4	0.2	2.0	2.8	3.8	0.3	3.3	4.4	2.6	0.2	2.3	3.1
Sterilization	8.8	0.5	7.9	9.7	8.9	0.5	8.0	10.0	8.8	0.5	7.9	9.7	7.9	0.5	7.1	8.9	7.8	0.5	7.0	8.8	6.9	0.4	6.1	7.7
Periodic Abstinence	4.4	0.3	3.9	5.0	4.3	0.3	3.8	4.8	4.4	0.3	3.9	5.0	4.1	0.3	3.6	4.7	4.7	0.3	4.1	5.3	4.1	0.2	3.6	4.6
Withdrawal	2.3	0.2	2.0	2.7	1.3	0.2	1.0	1.6	2.3	0.2	2.0	2.7	2.1	0.2	1.7	2.4	1.8	0.2	1.5	2.1	2.6	0.2	2.2	3.1
Implant					0.1	0.0	0.0	0.2					0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.3
LAM																								
Other Traditional Methods	0.9	0.1	0.8	1.2	0.5	0.1	0.3	0.6	0.9	0.1	0.8	1.2	0.5	0.1	0.4	0.7	0.7	0.1	0.5	1.0	0.6	0.1	0.4	0.8
Other Modern Methods																	0.0	0.0	0.0	0.1				
Any Method	43.6	0.8	42.0	45.1	40.2	0.8	38.7	41.8	43.6	0.8	42.0	45.1	40.7	0.9	39.0	42.5	48.0	0.9	46.3	49.7	43.1	0.8	41.6	44.8
Any Modern Method	35.9	0.8	34.4	37.4	34.2	0.8	32.7	35.7	35.9	0.8	34.4	37.4	34.0	0.9	32.3	35.7	40.7	0.8	39.1	42.4	35.7	0.8	34.3	37.3
Any Traditional Method	7.7	0.4	7.1	8.4	6.0	0.3	5.4	6.7	7.7	0.4	7.1	8.4	6.7	0.4	6.0	7.5	7.2	0.4	6.5	7.9	7.3	0.4	6.6	8.0
N	8,693				7,490				8,693				7,807				8,167				8,556			

	Current-status data from 2000				Calendar data from 2004				Current-status data from 2004				Calendar data from 2007				Current-status data from 2007				Calendar data from 2011			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2000				Women ages 15-43 at time of survey				Women ages 15-43 in March 2004				Women ages 15-43 at time of survey				Women ages 15-43 in June 2007			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	48.4	0.8	46.8	49.9	53.8	0.9	52.1	55.5	44.0	0.7	42.6	45.4	51.7	0.8	50.2	53.2	45.9	0.8	44.3	47.4	46.7	0.6	45.5	47.8
Pill	23.2	0.7	21.9	24.5	22.8	0.6	21.6	24.1	26.5	0.6	25.3	27.8	24.5	0.6	23.3	25.8	28.8	0.7	27.4	30.3	28.9	0.6	27.8	30.0
IUD	1.2	0.1	1.0	1.5	1.0	0.1	0.8	1.4	0.6	0.1	0.5	0.8	0.8	0.1	0.6	1.1	0.9	0.1	0.7	1.2	0.6	0.1	0.5	0.8
Injections	7.4	0.4	6.5	8.3	6.0	0.4	5.3	6.8	9.8	0.5	8.8	10.8	9.0	0.5	8.1	10.1	7.1	0.4	6.3	8.0	8.8	0.4	8.1	9.5
Male Condom	4.2	0.3	3.7	4.8	2.3	0.2	1.9	2.8	4.1	0.3	3.6	4.7	3.1	0.3	2.7	3.7	4.6	0.3	4.0	5.2	3.0	0.2	2.7	3.5
Sterilization	5.8	0.4	5.2	6.6	6.0	0.4	5.2	6.8	4.5	0.3	3.9	5.2	4.2	0.3	3.6	4.8	4.5	0.3	3.9	5.1	4.0	0.2	3.5	4.5
Periodic Abstinence	4.7	0.3	4.2	5.3	5.4	0.3	4.8	6.0	5.8	0.3	5.2	6.5	3.8	0.2	3.4	4.3	4.3	0.3	3.8	4.8	5.9	0.2	5.5	6.4
Withdrawal	3.8	0.2	3.4	4.3	1.8	0.2	1.5	2.2	3.2	0.2	2.8	3.6	1.6	0.2	1.3	2.0	2.7	0.2	2.4	3.2	1.2	0.1	1.0	1.5
Implant	0.5	0.1	0.3	0.6	0.5	0.1	0.3	0.8	0.8	0.1	0.6	1.1	0.8	0.1	0.6	1.1	0.8	0.1	0.6	1.0	0.7	0.1	0.5	0.9
LAM	0.0	0.0	0.0	0.1																				
Other Traditional Methods	0.8	0.1	0.6	1.0	0.3	0.1	0.2	0.5	0.6	0.1	0.4	0.8	0.3	0.1	0.2	0.5	0.5	0.1	0.3	0.7	0.2	0.0	0.1	0.3
Other Modern Methods																								
Any Method	51.7	0.8	50.1	53.2	46.2	0.9	44.5	47.9	56.0	0.7	54.6	57.4	48.3	0.8	46.8	49.8	54.2	0.8	52.6	55.7	53.3	0.6	52.2	54.5
Any Modern Method	41.9	0.8	40.3	43.5	38.1	0.8	36.5	39.8	45.5	0.7	44.1	47.0	41.7	0.8	40.2	43.2	45.9	0.8	44.4	47.4	45.3	0.6	44.2	46.5
Any Traditional Method	9.3	0.4	8.5	10.2	7.5	0.4	6.8	8.3	9.6	0.4	8.9	10.4	5.8	0.3	5.2	6.4	7.5	0.4	6.8	8.2	7.4	0.3	6.8	7.9
N	9,291				8,975				10,029				8,902				9,735				14,254			

Appendix Table 29: Comparison of calendar and current status data for Cambodia 2005 and 2010

	Current-status data from 2005				Calendar data from 2010			
	Women ages 15-43 at time of survey				Women ages 15-43 in December 2005			
	%	SE	CI		%	SE	CI	
Not using	75.2	0.5	74.3	76.1	81.5	0.5	80.5	82.4
Pill	7.1	0.3	6.6	7.7	6.5	0.3	5.9	7.2
IUD	1.1	0.1	0.8	1.4	0.7	0.1	0.6	0.9
Injections	5.0	0.3	4.5	5.6	3.8	0.2	3.3	4.3
Male Condom	1.9	0.1	1.6	2.1	0.7	0.1	0.5	0.9
Sterilization	0.9	0.1	0.7	1.1	0.7	0.1	0.5	0.9
Periodic Abstinence	2.6	0.2	2.3	2.9	1.6	0.2	1.3	1.9
Withdrawal	5.0	0.2	4.6	5.5	4.4	0.3	3.9	4.9
Implant	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2
LAM	0.1	0.0	0.0	0.2				
Other Traditional Methods	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Other Modern Methods	1.0	0.1	0.8	1.2	0.0	0.0	0.0	0.0
Any Method	24.8	0.5	23.9	25.7	18.5	0.5	17.6	19.4
Any Modern Method	17.0	0.4	16.2	17.9	12.4	0.4	11.6	13.2
Any Traditional Method	7.7	0.3	7.1	8.2	6.0	0.3	5.5	6.6
N	14,705				14,692			

Appendix Table 30: Comparison of calendar and current status data for ever-married women in Indonesia 1987, 1991, 1994, 1997, 2002, 2007, and 2012

	Current-status data from 1987				Calendar data from 1991				Current-status data from 1991				Calendar data from 1994				Current-status data from 1991				Calendar data from 1997				Current-status data from 1994			
	Women ages 15-43 at time of survey				Women ages 15-43 in October 1987				Women ages 15-43 at time of survey				Women ages 15-43 in June 1991				Women ages 15-43 at time of survey				Women ages 15-43 in January 1992				Women ages 15-43 at time of survey			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	52.5	1.1	50.3	54.7	60.7	0.7	59.3	62.2	50.7	0.8	49.2	52.2	55.1	0.7	53.6	56.5	50.7	0.8	49.2	52.2	54.9	0.7	53.5	56.3	46.0	0.7	44.6	47.4
Pill	16.5	0.8	14.9	18.2	12.8	0.5	11.9	13.8	14.9	0.5	13.9	16.0	14.3	0.5	13.4	15.4	14.9	0.5	13.9	16.0	13.5	0.5	12.5	14.5	17.2	0.6	16.1	18.4
IUD	12.8	0.9	11.1	14.8	11.8	0.6	10.7	13.1	12.8	0.6	11.7	14.1	10.8	0.5	9.8	11.9	12.8	0.6	11.7	14.1	9.6	0.5	8.7	10.6	9.4	0.5	8.5	10.4
Injections	9.7	0.6	8.6	10.9	8.7	0.4	8.0	9.5	12.3	0.5	11.4	13.2	10.8	0.5	9.8	11.7	12.3	0.5	11.4	13.2	13.3	0.5	12.4	14.2	15.8	0.5	14.7	16.8
Male Condom	1.5	0.2	1.2	1.9	0.8	0.1	0.6	1.0	0.8	0.1	0.6	0.9	0.7	0.1	0.5	0.9	0.8	0.1	0.6	0.9	0.4	0.1	0.3	0.5	0.8	0.1	0.7	1.0
Sterilization	2.8	0.3	2.3	3.5	2.3	0.2	2.0	2.7	2.9	0.2	2.5	3.3	2.8	0.2	2.4	3.3	2.9	0.2	2.5	3.3	2.7	0.2	2.3	3.1	3.2	0.2	2.8	3.7
Periodic Abstinence	1.2	0.1	0.9	1.4	0.9	0.1	0.7	1.2	1.0	0.1	0.9	1.3	1.0	0.1	0.9	1.2	1.0	0.1	0.9	1.3	1.0	0.1	0.8	1.2	1.0	0.1	0.8	1.2
Withdrawal	1.2	0.2	0.9	1.6	0.6	0.1	0.5	0.7	0.7	0.1	0.5	0.8	0.7	0.1	0.5	0.8	0.7	0.1	0.5	0.8	0.5	0.1	0.4	0.6	0.8	0.1	0.6	1.0
Implant	0.4	0.1	0.2	0.8	0.5	0.1	0.4	0.7	3.2	0.3	2.7	3.8	3.1	0.3	2.6	3.6	3.2	0.3	2.7	3.8	3.4	0.3	2.9	4.0	5.1	0.4	4.3	5.9
LAM																												
Other Traditional Methods	1.4	0.2	1.1	1.8	0.8	0.1	0.6	0.9	0.7	0.1	0.6	0.9	0.7	0.1	0.6	0.9	0.7	0.1	0.6	0.9	0.8	0.1	0.6	1.0	0.8	0.1	0.6	0.9
Other Modern Methods	0.0	0.0	0.0	0.0					0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Any Method	47.5	1.1	45.3	49.7	39.3	0.7	37.8	40.7	49.3	0.8	47.8	50.8	44.9	0.7	43.5	46.4	49.3	0.8	47.8	50.8	45.1	0.7	43.7	46.5	54.0	0.7	52.6	55.4
Any Modern Method	43.4	1.1	41.1	45.6	36.5	0.7	35.0	37.9	43.7	0.8	42.1	45.2	39.4	0.7	38.0	40.9	43.7	0.8	42.1	45.2	39.4	0.7	38.0	40.8	46.4	0.8	44.9	47.9
Any Traditional Method	3.7	0.3	3.3	4.3	2.3	0.2	2.0	2.6	2.4	0.2	2.1	2.7	2.4	0.2	2.1	2.7	2.4	0.2	2.1	2.7	2.3	0.2	2.0	2.6	2.5	0.2	2.2	2.8
N	10,153				18,728				19,816				23,466				19,816				22,007				24,564			

	Calendar data from 1997				Current-status data from 1997				Calendar data from 2002				Current-status data from 2002				Calendar data from 2007				Current-status data from 2007				Calendar data from 2012			
	Women ages 15-43 in August 1994				Women ages 15-43 at time of survey				Women ages 15-43 in October 1997				Women ages 15-43 at time of survey				Women ages 15-43 in December 2002				Women ages 15-43 at time of survey				Women ages 15-43 in August 2007			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	51.3	0.7	50.0	52.7	42.7	0.6	41.4	43.9	49.8	0.8	48.2	51.4	39.2	0.7	37.9	40.6	46.9	0.6	45.8	48.1	38.3	0.6	37.2	39.4	44.7	0.5	43.7	45.6
Pill	14.0	0.5	13.0	15.0	15.8	0.5	14.8	16.9	12.8	0.5	11.8	13.9	13.6	0.5	12.6	14.6	11.0	0.4	10.2	11.8	13.5	0.4	12.6	14.3	12.5	0.4	11.7	13.2
IUD	8.6	0.5	7.7	9.6	7.2	0.4	6.4	8.1	6.8	0.4	6.1	7.6	5.5	0.3	4.9	6.2	5.3	0.3	4.7	6.0	4.0	0.3	3.5	4.5	3.7	0.2	3.3	4.2
Injections	15.7	0.5	14.7	16.7	22.2	0.7	21.0	23.6	20.0	0.6	18.9	21.2	29.7	0.7	28.4	31.1	26.6	0.6	25.5	27.7	34.0	0.6	32.8	35.3	30.7	0.5	29.8	31.7
Male Condom	0.4	0.1	0.3	0.5	0.6	0.1	0.5	0.8	0.4	0.1	0.3	0.5	0.8	0.1	0.6	1.0	0.7	0.1	0.6	0.9	1.3	0.1	1.1	1.6	0.9	0.1	0.7	1.1
Sterilization	2.6	0.2	2.3	3.0	2.7	0.2	2.4	3.2	3.5	0.3	3.0	4.1	3.1	0.3	2.6	3.7	2.6	0.3	2.2	3.2	2.2	0.2	1.8	2.6	2.2	0.2	1.9	2.6
Periodic Abstinence	1.0	0.1	0.8	1.2	1.0	0.1	0.9	1.2	1.2	0.1	1.0	1.5	1.5	0.1	1.2	1.8	1.3	0.1	1.1	1.5	1.5	0.1	1.2	1.7	1.1	0.1	1.0	1.3
Withdrawal	0.6	0.1	0.5	0.8	0.8	0.1	0.6	1.0	1.1	0.2	0.8	1.5	1.5	0.2	1.1	1.9	1.4	0.1	1.2	1.6	2.0	0.1	1.7	2.2	1.7	0.1	1.5	2.0
Implant	4.9	0.4	4.2	5.8	6.2	0.4	5.4	7.1	3.8	0.3	3.2	4.4	4.5	0.4	3.7	5.4	3.8	0.3	3.3	4.4	2.9	0.2	2.5	3.4	2.2	0.2	1.9	2.5
LAM									0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Other Traditional Methods	0.7	0.1	0.6	0.9	0.7	0.1	0.6	0.8	0.5	0.1	0.3	0.7	0.5	0.1	0.3	0.6	0.4	0.1	0.3	0.5	0.4	0.1	0.3	0.5	0.3	0.0	0.2	0.4
Other Modern Methods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									0.0	0.0	0.0	0.0
Any Method	48.7	0.7	47.3	50.0	57.3	0.6	56.1	58.6	50.2	0.8	48.6	51.8	60.8	0.7	59.4	62.1	53.1	0.6	51.9	54.2	61.7	0.6	60.6	62.8	55.3	0.5	54.4	56.3
Any Modern Method	41.3	0.7	39.9	42.8	48.7	0.8	47.2	50.1	43.6	0.9	41.9	45.3	52.9	0.8	51.4	54.4	46.3	0.6	45.0	47.5	55.0	0.6	53.9	56.1	50.0	0.5	49.0	51.0
Any Traditional Method	2.4	0.2	2.1	2.7	2.5	0.2	2.2	2.8	2.8	0.2	2.4	3.3	3.4	0.3	2.9	4.0	3.0	0.2	2.7	3.3	3.8	0.2	3.4	4.2	3.1	0.2	2.8	3.5
N	23,715				24,741				23,607				24,748				26,382				27,105				28,134			

Appendix Table 31: Comparison of calendar and current status data for ever-married women in Nepal 2001, 2006, and 2011

	Current-status data from 2001				Calendar data from 2006				Current-status data from 2006				Calendar data from 2011			
	Women ages 15-43 at time of survey				Women ages 15-43 in April 2001				Women ages 15-43 at time of survey				Women ages 15-43 in June 2006			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	62.1	1.2	59.7	64.5	62.3	1.6	59.1	65.3	53.3	2.0	49.3	57.2	57.5	1.3	55.0	60.0
Pill	1.7	0.2	1.3	2.2	2.8	0.4	2.0	3.8	3.7	0.4	2.9	4.6	3.2	0.3	2.6	4.0
IUD	0.4	0.1	0.3	0.6	0.4	0.1	0.2	0.8	0.7	0.1	0.5	0.9	0.7	0.1	0.5	1.1
Injections	8.8	0.6	7.7	10.0	9.1	0.8	7.7	10.8	10.4	0.8	9.0	12.0	9.3	0.5	8.3	10.4
Male Condom	3.1	0.3	2.6	3.7	1.8	0.2	1.4	2.2	5.1	0.4	4.3	6.0	2.7	0.3	2.2	3.3
Sterilization	19.2	1.0	17.4	21.2	20.3	1.4	17.7	23.2	22.5	1.8	19.2	26.2	21.1	1.1	18.9	23.3
Periodic Abstinence	1.1	0.1	0.9	1.5	0.7	0.1	0.5	1.0	1.0	0.2	0.7	1.4	0.9	0.1	0.6	1.2
Withdrawal	2.6	0.3	2.1	3.1	1.8	0.2	1.4	2.4	2.6	0.3	2.2	3.2	3.7	0.4	3.0	4.5
Implant	0.7	0.2	0.4	1.1	0.8	0.2	0.5	1.2	0.7	0.1	0.5	1.0	0.8	0.1	0.5	1.1
Other Traditional Methods	0.2	0.1	0.1	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Other Modern Methods	0.1	0.0	0.0	0.1									0.0	0.0	0.0	0.1
Any Method	37.9	1.2	35.5	40.3	37.7	1.6	34.7	40.9	46.7	2.0	42.8	50.7	42.5	1.3	40.0	45.0
Any Modern Method	33.3	1.2	31.1	35.6	34.4	1.6	31.3	37.7	42.3	2.1	38.3	46.4	37.1	1.2	34.7	39.5
Any Traditional Method	3.9	0.3	3.3	4.5	2.5	0.3	2.0	3.2	3.6	0.3	3.1	4.3	4.6	0.4	3.8	5.5
N	7,719				6,762				7,521				7,829			

Appendix Table 32: Comparison of calendar and current status data for ever-married women in Pakistan 2006-07 and 2012-13

	Current-status data from 2006-07				Calendar data from 2012-13			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2007			
	%	SE	CI		%	SE	CI	
Not using	72.1	0.7	70.7	73.5	78.7	0.9	76.9	80.3
Pill	2.1	0.2	1.8	2.4	1.0	0.1	0.7	1.2
IUD	2.3	0.2	2.0	2.7	1.7	0.2	1.3	2.1
Injections	2.3	0.2	2.0	2.8	1.5	0.2	1.2	1.9
Male Condom	7.0	0.4	6.3	7.8	5.5	0.4	4.7	6.3
Sterilization	6.6	0.3	5.9	7.3	6.5	0.4	5.7	7.3
Periodic Abstinence	3.3	0.3	2.7	4.0	0.2	0.1	0.1	0.4
Withdrawal	4.0	0.3	3.4	4.7	4.4	0.3	3.8	5.1
Implant	0.1	0.1	0.0	0.3	0.1	0.0	0.0	0.2
LAM					0.5	0.1	0.3	0.8
Other Traditional Methods	0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.2
Other Modern Methods					0.0	0.0	0.0	0.1
Any Method	27.9	0.7	26.5	29.3	21.3	0.9	19.7	23.1
Any Modern Method	20.3	0.6	19.2	21.5	16.6	0.7	15.3	18.0
Any Traditional Method	7.4	0.4	6.7	8.3	4.7	0.3	4.1	5.4
N	8,598				9,931			

Appendix Table 33: Comparison of calendar and current status data for Philippines 1993, 1998, and 2003

	Current-status data from 1993				Calendar data from 1998				Current-status data from 1998				Calendar data from 2003			
	Women ages 15-43 at time of survey				Women ages 15-43 in May 1993				Women ages 15-43 at time of survey				Women ages 15-43 in March 1998			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	76.0	0.4	75.1	76.9	78.4	0.5	77.3	79.4	71.2	0.5	70.1	72.3	77.2	0.5	76.3	78.1
Pill	5.5	0.2	5.1	6.0	4.5	0.3	4.0	5.1	6.5	0.3	6.0	7.1	6.0	0.3	5.5	6.5
IUD	1.9	0.1	1.6	2.2	1.6	0.2	1.3	1.9	2.3	0.2	2.0	2.7	2.0	0.2	1.8	2.4
Injections	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3	1.6	0.2	1.3	1.9	1.3	0.1	1.1	1.5
Male Condom	0.6	0.1	0.5	0.8	0.5	0.1	0.3	0.7	1.0	0.1	0.8	1.3	0.6	0.1	0.5	0.8
Sterilization	6.7	0.2	6.2	7.2	6.0	0.3	5.5	6.6	5.4	0.3	4.9	5.9	6.0	0.3	5.5	6.5
Periodic Abstinence	4.5	0.2	4.1	4.9	4.6	0.2	4.2	5.1	5.1	0.2	4.7	5.6	3.2	0.2	2.9	3.6
Withdrawal	4.5	0.2	4.1	4.9	3.5	0.2	3.1	4.0	5.4	0.2	4.9	5.8	3.3	0.2	3.0	3.7
LAM									0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Other Traditional Methods	0.2	0.0	0.2	0.3	0.2	0.1	0.2	0.4	1.4	0.1	1.1	1.6	0.2	0.1	0.2	0.4
Other Modern Methods	0.0	0.0	0.0	0.1					0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Any Method	24.0	0.4	23.1	24.9	21.0	0.5	20.0	22.1	28.8	0.5	27.7	29.9	22.8	0.5	21.9	23.7
Any Modern Method	14.8	0.4	14.1	15.5	12.7	0.4	11.8	13.6	17.0	0.4	16.1	17.8	16.0	0.4	15.2	16.8
Any Traditional Method	9.2	0.3	8.6	9.7	8.4	0.3	7.8	9.0	11.8	0.3	11.2	12.5	6.8	0.3	6.3	7.4
N	13,625				10,847				12,544				10,691			

Appendix Table 34: Comparison of calendar and current status data for Vietnam 1997 and 2002

	Current-status data from 1997				Calendar data from 2002			
	Women ages 15-43 at time of survey				Women ages 15-43 in August 1997			
	%	SE	CI		%	SE	CI	
Not using	23.5	1.0	21.5	25.5	27.9	1.0	26.1	29.8
Pill	4.8	0.6	3.8	6.0	4.0	0.3	3.5	4.7
IUD	39.7	1.3	37.0	42.3	37.9	1.3	35.4	40.5
Injections	0.2	0.1	0.1	0.4	0.2	0.1	0.1	0.4
Male Condom	6.3	0.5	5.3	7.4	4.5	0.4	3.7	5.3
Sterilization	6.3	0.6	5.2	7.6	5.1	0.5	4.2	6.1
Periodic Abstinence	7.3	0.6	6.2	8.5	7.3	0.5	6.4	8.4
Withdrawal	11.7	0.8	10.3	13.3	13.0	1.0	11.2	15.1
Other Traditional Methods	0.3	0.1	0.2	0.6	0.0	0.0	0.0	0.2
Any Method	76.5	1.0	74.5	78.5	72.1	1.0	70.2	73.9
Any Modern Method	57.2	1.2	54.8	59.5	51.7	1.3	49.2	54.2
Any Traditional Method	19.3	1.0	17.4	21.4	20.4	1.2	18.1	22.9
N	4,706				4,466			

Appendix Table 35: Comparison of calendar and current status data for Bolivia 1989, 1994, 2003, and 2008

	Current-status data from 1989				Calendar data from 1994				Current-status data from 2003				Calendar data from 2008			
	Women ages 15-43 at time of survey				Women ages 15-43 in April 1989				Women ages 15-43 at time of survey				Women ages 15-43 in November 2003			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	79.4	0.7	78.0	80.7	75.0	0.7	73.6	76.3	60.3	0.5	59.2	61.4	61.2	0.6	60.1	62.4
Pill	1.3	0.2	1.0	1.7	1.9	0.2	1.6	2.4	2.6	0.2	2.3	3.0	3.0	0.2	2.6	3.4
IUD	3.4	0.3	2.9	4.0	4.0	0.3	3.5	4.6	7.0	0.3	6.5	7.6	6.9	0.3	6.4	7.5
Injections	0.5	0.1	0.3	0.7	0.7	0.1	0.5	1.0	5.7	0.3	5.2	6.2	5.2	0.3	4.8	5.8
Male Condom	0.2	0.1	0.1	0.4	0.4	0.1	0.3	0.6	3.4	0.2	3.0	3.8	2.4	0.2	2.1	2.7
Sterilization	2.7	0.2	2.3	3.2	2.3	0.2	1.9	2.7	3.6	0.2	3.2	3.9	3.0	0.2	2.6	3.4
Periodic Abstinence	11.1	0.5	10.1	12.2	13.5	0.5	12.5	14.5	12.9	0.5	12.0	13.9	14.5	0.4	13.7	15.4
Withdrawal	0.7	0.1	0.5	1.0	1.0	0.1	0.8	1.3	2.4	0.2	2.0	2.9	3.0	0.2	2.6	3.4
LAM									1.7	0.1	1.5	2.0	0.4	0.1	0.3	0.6
Other Traditional Methods	0.6	0.1	0.4	0.9	1.1	0.1	0.9	1.5	0.2	0.0	0.1	0.3	0.1	0.0	0.1	0.2
Other Modern Methods	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.2	0.2	0.0	0.1	0.3
Any Method	20.6	0.7	19.3	22.0	25.0	0.7	23.7	26.4	39.7	0.5	38.6	40.8	38.8	0.6	37.6	39.9
Any Modern Method	8.2	0.4	7.4	9.1	9.4	0.5	8.5	10.4	24.2	0.5	23.1	25.2	21.2	0.5	20.2	22.2
Any Traditional Method	12.4	0.6	11.3	13.5	15.6	0.5	14.6	16.7	15.5	0.5	14.6	16.6	17.6	0.5	16.7	18.6
N	7,115				6,706				15,812				13,294			

Appendix Table 36: Comparison of calendar and current status data for Colombia 1986, 1990, 1995, 2000, 2005, and 2010

	Current-status data from 1986				Calendar data from 1990				Current-status data from 1990				Calendar data from 1995				Current-status data from 1995			
	Women ages 15-43 at time of survey				Women ages 15-43 in October 1986				Women ages 15-43 at time of survey				Women ages 15-43 in July 1990				Women ages 15-43 at time of survey			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	61.4	1.0	59.3	63.3	62.9	0.9	61.0	64.6	60.5	0.7	59.0	61.9	54.3	0.6	53.1	55.5	52.6	0.6	51.4	53.8
Pill	10.6	0.6	9.4	11.9	10.0	0.5	9.1	11.1	9.1	0.5	8.2	10.1	11.7	0.4	10.9	12.5	9.2	0.4	8.6	9.9
IUD	6.7	0.4	5.9	7.6	7.7	0.4	6.8	8.6	7.9	0.5	7.1	8.9	7.1	0.3	6.5	7.7	7.7	0.3	7.1	8.3
Injections	1.6	0.2	1.2	2.0	1.4	0.2	1.1	1.8	1.5	0.2	1.2	1.9	1.1	0.1	0.9	1.3	2.0	0.1	1.7	2.3
Male Condom	1.1	0.2	0.8	1.4	1.3	0.3	0.9	1.9	1.6	0.2	1.3	2.0	1.8	0.2	1.5	2.2	3.4	0.2	3.0	3.8
Sterilization	10.3	0.6	9.2	11.5	9.5	0.5	8.5	10.5	11.6	0.5	10.7	12.7	13.2	0.6	12.1	14.3	15.0	0.5	14.0	16.1
Periodic Abstinence	3.3	0.3	2.8	4.0	3.9	0.3	3.4	4.5	3.5	0.3	3.1	4.1	5.1	0.3	4.6	5.7	4.1	0.2	3.7	4.6
Withdrawal	2.9	0.3	2.3	3.5	2.0	0.3	1.5	2.7	2.8	0.4	2.2	3.6	3.3	0.2	2.9	3.8	3.6	0.2	3.2	4.0
Implant													0.1	0.0	0.0	0.2	0.4	0.1	0.3	0.6
LAM																				
Other Traditional Methods	0.6	0.1	0.4	0.8	0.3	0.1	0.2	0.5	0.3	0.1	0.2	0.5	1.2	0.1	1.0	1.5	1.0	0.1	0.8	1.2
Other Modern Methods	1.7	0.2	1.3	2.1	1.1	0.1	0.8	1.3	1.1	0.1	0.9	1.4	1.1	0.1	0.9	1.3	1.0	0.1	0.8	1.2
Any Method	38.7	1.0	36.7	40.7	37.1	0.9	35.4	39.0	39.5	0.7	38.1	41.0	45.7	0.6	44.5	46.9	47.4	0.6	46.2	48.6
Any Modern Method	31.9	1.0	30.0	33.9	30.9	0.8	29.3	32.6	32.8	0.8	31.4	34.4	36.0	0.6	34.7	37.2	38.2	0.6	37.0	39.4
Any Traditional Method	6.8	0.4	6.0	7.7	6.2	0.4	5.4	7.1	6.7	0.4	5.9	7.6	9.7	0.4	9.0	10.4	8.7	0.3	8.1	9.3
N	4,869				6,798				7,681				8,854				9,951			

	Calendar data from 2000				Current-status data from 2000				Calendar data from 2005				Current-status data from 2005				Calendar data from 2010			
	Women ages 15-43 in May 1995				Women ages 15-43 at time of survey				Women ages 15-43 in April 2000				Women ages 15-43 at time of survey				Women ages 15-43 in March 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	49.6	0.6	48.4	50.7	48.1	0.6	47.0	49.2	46.3	0.4	45.5	47.2	44.6	0.4	43.8	45.4	44.7	0.3	44.0	45.3
Pill	10.7	0.4	10.0	11.4	8.8	0.3	8.2	9.5	10.7	0.3	10.2	11.2	7.9	0.2	7.5	8.3	8.8	0.2	8.4	9.2
IUD	8.5	0.3	7.8	9.2	8.5	0.3	7.8	9.2	8.8	0.2	8.3	9.3	8.5	0.3	8.0	9.0	8.4	0.2	8.0	8.7
Injections	2.0	0.2	1.7	2.3	3.5	0.2	3.1	3.9	4.3	0.2	4.0	4.7	5.6	0.2	5.3	6.0	6.2	0.2	5.9	6.6
Male Condom	3.3	0.2	2.9	3.8	6.0	0.3	5.5	6.6	5.2	0.2	4.8	5.6	7.3	0.2	6.8	7.8	6.0	0.2	5.7	6.4
Sterilization	14.8	0.4	14.0	15.7	15.2	0.4	14.4	16.0	15.8	0.3	15.2	16.3	18.4	0.3	17.8	19.0	20.0	0.3	19.5	20.5
Periodic Abstinence	5.4	0.3	4.9	5.9	4.0	0.2	3.6	4.4	3.9	0.2	3.6	4.2	2.5	0.1	2.3	2.8	2.4	0.1	2.2	2.6
Withdrawal	3.4	0.2	3.0	3.9	4.4	0.2	4.0	4.9	3.5	0.1	3.2	3.8	4.0	0.1	3.8	4.3	2.5	0.1	2.3	2.7
Implant	0.4	0.1	0.2	0.5	0.2	0.1	0.1	0.4	0.3	0.0	0.2	0.4	0.2	0.0	0.2	0.3	0.4	0.0	0.4	0.5
LAM	0.5	0.1	0.4	0.7	0.4	0.1	0.3	0.6	0.4	0.0	0.4	0.5	0.4	0.0	0.3	0.5				
Other Traditional Methods	0.6	0.1	0.4	0.8	0.5	0.1	0.4	0.7	0.3	0.0	0.3	0.5	0.4	0.0	0.3	0.5	0.2	0.0	0.2	0.3
Other Modern Methods	0.8	0.1	0.6	1.0	0.5	0.1	0.4	0.7	0.5	0.1	0.4	0.7	0.2	0.0	0.1	0.3	0.3	0.0	0.2	0.4
Any Method	50.4	0.6	49.3	51.6	51.9	0.6	50.8	53.0	53.7	0.4	52.8	54.5	55.4	0.4	54.6	56.2	55.3	0.3	54.7	56.0
Any Modern Method	40.7	0.6	39.5	41.8	42.9	0.6	41.8	44.0	45.7	0.4	44.8	46.5	48.2	0.4	47.4	49.0	49.7	0.3	49.1	50.4
Any Traditional Method	9.4	0.4	8.7	10.1	8.9	0.3	8.3	9.5	7.8	0.2	7.3	8.2	6.9	0.2	6.6	7.3	5.2	0.1	4.9	5.5
N	9,139				10,258				30,717				33,051				39,410			

Appendix Table 37: Comparison of calendar and current status data for Dominican Republic 1986, 1991, 1996, 1999, and 2002

	Current-status data from 1986				Calendar data from 1991				Current-status data from 1991				Calendar data from 1996				Current-status data from 1996			
	Women ages 15-43 at time of survey				Women ages 15-43 in October 1986				Women ages 15-43 at time of survey				Women ages 15-43 in September 1991				Women ages 15-43 at time of survey			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	69.8	0.7	68.5	71.1	68.9	0.9	67.1	70.6	64.3	0.7	63.0	65.6	63.7	0.7	62.3	65.1	57.0	0.8	55.5	58.5
Pill	5.8	0.3	5.2	6.5	5.6	0.4	4.9	6.4	6.6	0.4	5.9	7.4	7.5	0.4	6.7	8.3	9.1	0.4	8.3	10.0
IUD	2.0	0.2	1.6	2.5	2.1	0.3	1.6	2.8	1.4	0.2	1.1	1.9	1.6	0.2	1.2	2.1	2.0	0.2	1.7	2.5
Injections	0.0	0.0	0.0	0.2					0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.4	0.1	0.3	0.6
Male Condom	0.8	0.1	0.6	1.1	0.6	0.2	0.3	1.0	0.8	0.2	0.6	1.2	0.6	0.1	0.4	0.9	1.3	0.2	1.1	1.6
Sterilization	19.4	0.6	18.3	20.5	20.1	0.8	18.6	21.6	23.6	0.6	22.4	24.8	23.1	0.6	21.9	24.4	25.9	0.6	24.7	27.1
Periodic Abstinence	0.8	0.1	0.5	1.1	1.6	0.3	1.1	2.2	1.4	0.2	1.0	1.9	1.5	0.2	1.2	2.0	1.6	0.2	1.2	2.0
Withdrawal	0.9	0.1	0.6	1.2	0.8	0.2	0.5	1.1	1.5	0.2	1.1	2.0	1.0	0.2	0.7	1.3	1.5	0.2	1.2	1.9
Implant	0.1	0.1	0.0	0.3	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.4	0.6	0.1	0.4	0.8
LAM													0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.3
Other Traditional Methods	0.3	0.1	0.2	0.5	0.3	0.1	0.2	0.6	0.2	0.1	0.1	0.4	0.4	0.1	0.3	0.7	0.3	0.1	0.2	0.5
Other Modern Methods	0.2	0.1	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.3
Any Method	30.2	0.7	28.9	31.5	31.1	0.9	29.4	32.9	35.7	0.7	34.4	37.0	36.3	0.7	34.9	37.7	43.0	0.8	41.5	44.5
Any Modern Method	28.2	0.7	26.9	29.5	28.4	0.9	26.8	30.1	32.5	0.7	31.2	33.9	33.1	0.7	31.8	34.5	39.1	0.8	37.6	40.6
Any Traditional Method	1.9	0.2	1.5	2.4	2.6	0.3	2.1	3.3	3.1	0.3	2.6	3.7	3.0	0.2	2.5	3.4	3.4	0.2	2.9	3.9
N	7,034				5,545				6,761				6,502				7,704			

	Calendar data from 1999				Current-status data from 1996				Calendar data from 2002				Current-status data from 1999				Calendar data from 2002			
	Women ages 15-43 in October 1996				Women ages 15-43 at time of survey				Women ages 15-43 in January 1997				Women ages 15-43 at time of survey				Women ages 15-43 in September 1999			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	57.0	1.8	53.3	60.6	57.0	0.8	55.5	58.5	56.8	0.5	55.7	57.8	53.2	1.6	50.0	56.3	52.8	0.5	51.8	53.8
Pill	9.3	1.0	7.6	11.5	9.1	0.4	8.3	10.0	9.4	0.3	8.8	10.0	10.7	0.9	9.1	12.5	10.9	0.3	10.3	11.5
IUD	1.4	0.4	0.8	2.4	2.0	0.2	1.7	2.5	1.9	0.2	1.6	2.2	2.3	0.5	1.4	3.5	2.3	0.2	1.9	2.6
Injections	0.5	0.2	0.2	1.3	0.4	0.1	0.3	0.6	0.5	0.1	0.4	0.7	0.6	0.2	0.3	1.3	0.9	0.1	0.7	1.1
Male Condom	0.5	0.3	0.2	1.4	1.3	0.2	1.1	1.6	0.7	0.1	0.5	1.0	1.6	0.4	1.0	2.8	1.0	0.1	0.8	1.2
Sterilization	26.2	1.8	22.8	29.9	25.9	0.6	24.7	27.1	27.9	0.5	27.0	28.9	27.2	1.5	24.3	30.2	28.2	0.5	27.3	29.1
Periodic Abstinence	2.1	0.5	1.3	3.4	1.6	0.2	1.2	2.0	1.3	0.1	1.1	1.6	1.4	0.4	0.8	2.4	1.4	0.1	1.2	1.7
Withdrawal	1.9	0.5	1.2	3.1	1.5	0.2	1.2	1.9	0.6	0.1	0.5	0.8	2.1	0.5	1.3	3.2	1.1	0.1	0.9	1.3
Implant	0.5	0.3	0.2	1.5	0.6	0.1	0.4	0.8	0.4	0.1	0.2	0.5	0.6	0.3	0.2	1.7	0.4	0.1	0.3	0.6
LAM					0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.1	0.2	0.2	0.1	1.0	0.3	0.1	0.2	0.4
Other Traditional Methods	0.3	0.2	0.1	1.1	0.3	0.1	0.2	0.5	0.5	0.1	0.4	0.6	0.1	0.1	0.0	0.9	0.7	0.1	0.6	0.9
Other Modern Methods					0.2	0.1	0.1	0.3	0.0	0.0	0.0	0.2					0.0	0.0	0.0	0.1
Any Method	42.7	1.8	39.1	46.3	43.0	0.8	41.5	44.5	43.2	0.5	42.2	44.3	46.8	1.6	43.7	50.0	47.2	0.5	46.2	48.2
Any Modern Method	37.9	2.0	34.1	41.9	39.1	0.8	37.6	40.6	40.5	0.5	39.5	41.5	42.7	1.6	39.5	45.9	43.6	0.5	42.6	44.5
Any Traditional Method	4.2	0.7	3.1	5.8	3.4	0.2	2.9	3.9	2.4	0.2	2.1	2.8	3.6	0.6	2.5	5.0	3.2	0.2	2.9	3.6
N	1,039				7,704				18,063				1,149				19,374			

Appendix Table 38: Comparison of calendar and current status data for Guatemala 1995 and 1998-99

	Current-status data from 1995				Calendar data from 1998-99			
	Women ages 15-43 at time of survey				Women ages 15-43 in September 1995			
	%	SE	CI		%	SE	CI	
Not using	79.1	0.9	77.2	80.9	77.5	1.9	73.6	80.9
Pill	2.9	0.2	2.4	3.4	2.9	0.4	2.2	3.7
IUD	1.9	0.3	1.5	2.5	1.3	0.3	0.8	2.0
Injections	1.8	0.2	1.4	2.2	2.1	0.4	1.4	3.0
Male Condom	1.6	0.2	1.3	2.1	1.0	0.4	0.5	2.1
Sterilization	9.7	0.5	8.7	10.8	10.0	0.9	8.3	11.9
Periodic Abstinence	2.4	0.2	2.0	2.9	3.9	0.5	3.0	5.1
Withdrawal	0.6	0.1	0.4	0.9	0.9	0.3	0.6	1.6
Other Traditional Methods	0.1	0.0	0.0	0.1	0.2	0.1	0.1	0.6
Other Modern Methods	0.0	0.0	0.0	0.1	0.3	0.1	0.1	0.8
Any Method	20.9	0.9	19.1	22.8	22.5	1.9	19.1	26.4
Any Modern Method	17.9	0.9	16.2	19.7	17.5	1.6	14.6	20.8
Any Traditional Method	3.1	0.2	2.6	3.6	5.1	0.7	3.8	6.7
N	11,133				4,835			

Appendix Table 39: Comparison of calendar and current status data for Honduras 2005-06 and 2011-12

	Current-status data from 2005-06				Calendar data from 2011-12			
	Women ages 15-43 at time of survey				Women ages 15-43 in March 2006			
	%	SE	CI		%	SE	CI	
Not using	57.7	0.5	56.7	58.6	56.3	0.5	55.4	57.3
Pill	7.6	0.3	7.1	8.1	8.1	0.3	7.5	8.6
IUD	4.5	0.2	4.2	4.9	5.3	0.2	4.8	5.8
Injections	9.4	0.3	8.8	9.9	9.6	0.3	9.1	10.2
Male Condom	2.3	0.1	2.1	2.6	2.0	0.1	1.8	2.3
Sterilization	13.1	0.3	12.4	13.7	12.8	0.4	12.1	13.5
Periodic Abstinence	1.8	0.1	1.5	2.0	2.1	0.1	1.9	2.4
Withdrawal	3.5	0.2	3.2	3.8	3.7	0.2	3.3	4.0
LAM	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1
Other Traditional Methods	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2
Other Modern Methods	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1
Any Method	42.3	0.5	41.4	43.3	43.7	0.5	42.7	44.6
Any Modern Method	37.1	0.5	36.2	38.0	37.8	0.5	36.8	38.8
Any Traditional Method	5.2	0.2	4.9	5.6	5.9	0.2	5.5	6.4
N	18,053				16,890			

Appendix Table 40: Comparison of calendar and current status data for Peru 1986, 1991-92, 1996, 2000, 2004-06, 2007-08, 2009, 2010, 2011, and 2012

	Current-status data from 1986				Calendar data from 1991-92				Current-status data from 1991-92				Calendar data from 1996				Current-status data from 1996				Calendar data from 2000			
	Women ages 15-43 at time of survey				Women ages 15-43 in November 1986				Women ages 15-43 at time of survey				Women ages 15-43 in December 1991				Women ages 15-43 at time of survey				Women ages 15-43 in September 1996			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	71.7	0.8	70.1	73.2	67.6	0.5	66.6	68.5	64.6	0.5	63.7	65.5	64.7	0.4	63.9	65.6	59.0	0.4	58.1	59.8	59.8	0.5	58.9	60.7
Pill	4.3	0.4	3.6	5.1	4.3	0.2	3.9	4.8	3.8	0.2	3.5	4.2	4.4	0.2	4.0	4.8	4.2	0.2	3.9	4.6	4.9	0.2	4.5	5.3
IUD	4.7	0.4	4.0	5.4	5.6	0.2	5.1	6.1	8.3	0.3	7.8	8.9	7.7	0.3	7.2	8.2	8.0	0.2	7.5	8.4	7.9	0.3	7.4	8.4
Injections	0.9	0.1	0.7	1.3	1.1	0.1	0.9	1.3	1.2	0.1	1.0	1.5	1.2	0.1	1.1	1.4	5.5	0.2	5.1	5.9	5.1	0.2	4.7	5.5
Male Condom	0.5	0.1	0.3	0.7	1.2	0.1	1.0	1.5	1.9	0.2	1.7	2.3	1.6	0.1	1.4	1.9	3.2	0.2	2.9	3.5	2.8	0.2	2.6	3.2
Sterilization	3.1	0.3	2.6	3.8	3.6	0.2	3.2	4.0	3.9	0.2	3.6	4.3	3.6	0.2	3.2	4.0	5.4	0.2	5.0	5.8	5.2	0.2	4.9	5.6
Periodic Abstinence	11.1	0.5	10.2	12.2	12.9	0.3	12.2	13.6	12.3	0.3	11.7	12.9	13.2	0.3	12.6	13.9	11.2	0.3	10.7	11.8	10.6	0.3	10.1	11.2
Withdrawal	2.2	0.2	1.8	2.7	1.9	0.1	1.7	2.2	2.2	0.1	2.0	2.5	1.8	0.1	1.6	2.1	2.0	0.1	1.8	2.3	1.9	0.1	1.7	2.2
Implant													0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.2
LAM																					0.6	0.1	0.5	0.7
Other Traditional Methods	0.9	0.1	0.7	1.2	1.1	0.1	0.9	1.3	0.9	0.1	0.8	1.1	1.1	0.1	1.0	1.3	0.9	0.1	0.8	1.1	0.6	0.1	0.5	0.7
Other Modern Methods	0.7	0.1	0.5	1.0	0.8	0.1	0.7	1.0	0.7	0.1	0.6	0.9	0.6	0.1	0.4	0.7	0.5	0.1	0.4	0.6	0.3	0.0	0.2	0.4
Missing/Unknown if Using																								
Any Method, Including Missing	28.3	0.8	26.8	29.9	32.4	0.5	31.5	33.4	35.4	0.5	34.5	36.3	35.3	0.4	34.4	36.1	41.0	0.4	40.2	41.9	40.2	0.5	39.3	41.1
Any Method, Excluding Missing					32.4	0.5	31.5	33.4					35.3	0.4	34.4	36.1					40.2	0.5	39.3	41.1
Any Modern Method	14.1	0.6	12.9	15.4	16.6	0.4	15.8	17.4	20.0	0.4	19.2	20.8	19.1	0.4	18.4	19.8	26.7	0.4	25.9	27.5	26.9	0.4	26.1	27.7
Any Traditional Method	14.2	0.6	13.1	15.4	15.8	0.4	15.1	16.6	15.4	0.3	14.8	16.1	16.2	0.3	15.5	16.9	14.2	0.3	13.6	14.8	13.1	0.3	12.5	13.8
N	4,515				12,163				14,403				22,660				26,135				22,344			

	Current-status data from 2000				Calendar data from 2004-06				Current-status data from 2004-06				Calendar data from 2007-08				Current-status data from 2004-06				Calendar data from 2009			
	Women ages 15-43 at time of survey				Women ages 15-43 in January 2001				Women ages 15-43 at time of survey				Women ages 15-43 in June 2005				Women ages 15-43 at time of survey				Women ages 15-43 in June 2005			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	55.9	0.5	55.0	56.8	51.9	0.6	50.8	53.1	54.4	0.5	53.4	55.5	48.3	0.6	47.1	49.5	54.4	0.5	53.4	55.5	50.3	0.5	49.3	51.4
Pill	4.6	0.2	4.3	5.0	5.0	0.2	4.5	5.5	4.9	0.2	4.5	5.4	6.2	0.3	5.7	6.7	4.9	0.2	4.5	5.4	5.6	0.2	5.1	6.1
IUD	5.9	0.2	5.5	6.4	5.8	0.3	5.3	6.4	3.6	0.2	3.1	4.0	3.2	0.2	2.8	3.7	3.6	0.2	3.1	4.0	4.0	0.2	3.6	4.5
Injections	10.1	0.3	9.5	10.6	10.5	0.4	9.8	11.3	9.5	0.4	8.8	10.2	12.1	0.4	11.3	12.9	9.5	0.4	8.8	10.2	12.2	0.3	11.6	12.9
Male Condom	4.0	0.2	3.7	4.4	4.4	0.3	3.9	4.9	6.9	0.3	6.3	7.6	7.8	0.3	7.2	8.5	6.9	0.3	6.3	7.6	6.7	0.3	6.1	7.2
Sterilization	6.9	0.2	6.5	7.4	6.4	0.3	5.9	7.0	5.2	0.2	4.7	5.7	5.6	0.3	5.1	6.1	5.2	0.2	4.7	5.7	5.4	0.2	5.0	5.8
Periodic Abstinence	9.0	0.2	8.6	9.5	12.2	0.4	11.5	13.0	11.2	0.3	10.5	11.9	12.4	0.4	11.7	13.1	11.2	0.3	10.5	11.9	10.9	0.3	10.4	11.5
Withdrawal	2.1	0.1	1.9	2.3	2.1	0.2	1.8	2.5	2.7	0.2	2.4	3.1	3.3	0.2	2.9	3.7	2.7	0.2	2.4	3.1	3.6	0.2	3.3	4.0
Implant	0.2	0.0	0.1	0.2	0.2	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
LAM	0.4	0.0	0.4	0.5	0.2	0.1	0.1	0.3	0.4	0.1	0.3	0.5	0.2	0.0	0.1	0.2	0.4	0.1	0.3	0.5	0.2	0.0	0.1	0.3
Other Traditional Methods	0.5	0.1	0.4	0.6	1.0	0.1	0.8	1.2	0.9	0.1	0.7	1.1	0.7	0.1	0.6	0.9	0.9	0.1	0.7	1.1	0.8	0.1	0.7	1.0
Other Modern Methods	0.4	0.1	0.3	0.5	0.2	0.1	0.1	0.3	0.3	0.1	0.2	0.5	0.2	0.0	0.1	0.3	0.3	0.1	0.2	0.5	0.2	0.0	0.1	0.3
Missing/Unknown if Using																								
Any Method, Including Missing	44.1	0.5	43.2	45.0	48.1	0.6	46.9	49.2	45.6	0.5	44.5	46.6	51.7	0.6	50.4	52.9	45.6	0.5	44.5	46.6	49.7	0.5	48.6	50.7
Any Method, Excluding Missing					48.1	0.6	46.9	49.2					51.7	0.6	50.4	52.9					49.7	0.5	48.6	50.7
Any Modern Method	32.3	0.5	31.4	33.2	32.6	0.6	31.5	33.7	30.8	0.5	29.7	31.8	35.2	0.6	33.9	36.4	30.8	0.5	29.7	31.8	34.2	0.5	33.2	35.3
Any Traditional Method	11.6	0.3	11.1	12.1	15.4	0.4	14.5	16.2	14.8	0.4	14.0	15.6	16.4	0.4	15.6	17.2	14.8	0.4	14.0	15.6	15.4	0.4	14.7	16.1
N	24,769				14,069				15,306				18,874				15,306				19,401			

(Continued…)

Appendix Table 40. – *Continued*

	Current-status data from 2004-06				Calendar data from 2010				Current-status data from 2004-06				Calendar data from 2011				Current-status data from 2007-08				Calendar data from 2009			
	Women ages 15-43 at time of survey				Women ages 15-43 in June 2005				Women ages 15-43 at time of survey				Women ages 15-43 in January 2006				Women ages 15-43 at time of survey				Women ages 15-43 in April 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	54.4	0.5	53.4	55.5	50.5	0.6	49.4	51.6	54.4	0.5	53.4	55.5	49.5	0.5	48.4	50.5	52.4	0.6	51.2	53.5	49.4	0.5	48.4	50.3
Pill	4.9	0.2	4.5	5.4	5.6	0.3	5.1	6.1	4.9	0.2	4.5	5.4	5.5	0.2	5.1	6.0	5.8	0.3	5.2	6.3	5.8	0.2	5.3	6.3
IUD	3.6	0.2	3.1	4.0	3.5	0.2	3.1	4.0	3.6	0.2	3.1	4.0	3.7	0.2	3.3	4.1	2.5	0.2	2.2	3.0	2.9	0.2	2.5	3.3
Injections	9.5	0.4	8.8	10.2	12.0	0.4	11.3	12.7	9.5	0.4	8.8	10.2	12.9	0.4	12.2	13.7	11.4	0.4	10.7	12.1	12.6	0.3	12.0	13.3
Male Condom	6.9	0.3	6.3	7.6	7.0	0.3	6.4	7.6	6.9	0.3	6.3	7.6	7.1	0.3	6.5	7.7	8.4	0.4	7.7	9.1	8.1	0.3	7.6	8.7
Sterilization	5.2	0.2	4.7	5.7	5.5	0.2	5.1	6.0	5.2	0.2	4.7	5.7	5.0	0.2	4.6	5.4	4.2	0.2	3.8	4.6	4.5	0.2	4.2	4.9
Periodic Abstinence	11.2	0.3	10.5	11.9	10.9	0.3	10.3	11.6	11.2	0.3	10.5	11.9	11.4	0.3	10.8	12.0	10.6	0.3	9.9	11.2	11.2	0.3	10.6	11.8
Withdrawal	2.7	0.2	2.4	3.1	3.9	0.2	3.5	4.3	2.7	0.2	2.4	3.1	4.0	0.2	3.6	4.4	3.6	0.2	3.2	4.0	4.4	0.2	4.0	4.8
Implant	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.3	0.1	0.0	0.0	0.2
LAM	0.4	0.1	0.3	0.5	0.1	0.0	0.1	0.2	0.4	0.1	0.3	0.5	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.1	0.0	0.1	0.2
Other Traditional Methods	0.9	0.1	0.7	1.1	0.7	0.1	0.5	0.8	0.9	0.1	0.7	1.1	0.7	0.1	0.6	0.9	0.6	0.1	0.5	0.7	0.6	0.1	0.5	0.8
Other Modern Methods	0.3	0.1	0.2	0.5	0.2	0.1	0.1	0.4	0.3	0.1	0.2	0.5	0.2	0.0	0.1	0.3	0.3	0.1	0.2	0.5	0.3	0.1	0.2	0.4
Missing/Unknown if Using Any Method, Including Missing	45.6	0.5	44.5	46.6	49.5	0.6	48.4	50.6	45.6	0.5	44.5	46.6	50.5	0.5	49.5	51.6	47.6	0.6	46.5	48.8	50.6	0.5	49.7	51.6
Any Method, Excluding Missing					49.5	0.6	48.4	50.6					50.5	0.5	49.5	51.6					50.6	0.5	49.7	51.6
Any Modern Method	30.8	0.5	29.7	31.8	34.0	0.5	33.0	35.1	30.8	0.5	29.7	31.8	34.4	0.5	33.4	35.5	32.8	0.6	31.6	33.9	34.4	0.5	33.4	35.4
Any Traditional Method	14.8	0.4	14.0	15.6	15.5	0.4	14.8	16.2	14.8	0.4	14.0	15.6	16.0	0.4	15.3	16.8	14.7	0.4	14.0	15.5	16.2	0.4	15.5	17.0
N	15,306				18,155				15,306				17,838				19,860				20,567			

	Current-status data from 2007-08				Calendar data from 2010				Current-status data from 2007-08				Calendar data from 2011				Current-status data from 2007-08				Calendar data from 2012			
	Women ages 15-43 at time of survey				Women ages 15-43 in April 2008				Women ages 15-43 at time of survey				Women ages 15-43 in April 2008				Women ages 15-43 at time of survey				Women ages 15-43 in April 2008			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	52.4	0.6	51.2	53.5	48.4	0.5	47.4	49.5	52.4	0.6	51.2	53.5	49.1	0.5	48.1	50.1	52.4	0.6	51.2	53.5	47.8	0.5	46.7	48.8
Pill	5.8	0.3	5.2	6.3	5.7	0.3	5.3	6.2	5.8	0.3	5.2	6.3	5.8	0.2	5.4	6.3	5.8	0.3	5.2	6.3	6.2	0.3	5.7	6.7
IUD	2.5	0.2	2.2	3.0	2.6	0.2	2.3	2.9	2.5	0.2	2.2	3.0	3.0	0.2	2.6	3.4	2.5	0.2	2.2	3.0	2.8	0.2	2.4	3.3
Injections	11.4	0.4	10.7	12.1	12.8	0.4	12.1	13.5	11.4	0.4	10.7	12.1	12.6	0.4	11.9	13.3	11.4	0.4	10.7	12.1	13.9	0.4	13.2	14.6
Male Condom	8.4	0.4	7.7	9.1	9.0	0.3	8.4	9.7	8.4	0.4	7.7	9.1	8.6	0.3	8.0	9.2	8.4	0.4	7.7	9.1	8.9	0.3	8.2	9.6
Sterilization	4.2	0.2	3.8	4.6	4.8	0.2	4.4	5.2	4.2	0.2	3.8	4.6	4.5	0.2	4.1	4.9	4.2	0.2	3.8	4.6	4.5	0.2	4.2	4.9
Periodic Abstinence	10.6	0.3	9.9	11.2	10.9	0.3	10.3	11.4	10.6	0.3	9.9	11.2	11.0	0.3	10.4	11.6	10.6	0.3	9.9	11.2	10.7	0.3	10.2	11.3
Withdrawal	3.6	0.2	3.2	4.0	4.6	0.2	4.2	5.1	3.6	0.2	3.2	4.0	4.3	0.2	3.9	4.8	3.6	0.2	3.2	4.0	4.1	0.2	3.7	4.5
Implant	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1
LAM	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.1	0.0	0.0	0.1
Other Traditional Methods	0.6	0.1	0.5	0.7	0.7	0.1	0.6	0.9	0.6	0.1	0.5	0.7	0.9	0.1	0.7	1.1	0.6	0.1	0.5	0.7	0.8	0.1	0.6	1.0
Other Modern Methods	0.3	0.1	0.2	0.5	0.3	0.1	0.2	0.4	0.3	0.1	0.2	0.5	0.2	0.0	0.1	0.3	0.3	0.1	0.2	0.5	0.2	0.1	0.1	0.4
Missing/Unknown if Using Any Method, Including Missing	47.6	0.6	46.5	48.8	51.6	0.5	50.5	52.6	47.6	0.6	46.5	48.8	50.9	0.5	49.9	51.9	47.6	0.6	46.5	48.8	52.2	0.5	51.2	53.3
Any Method, Excluding Missing					51.6	0.5	50.5	52.6					50.9	0.5	49.9	51.9					52.2	0.5	51.2	53.3
Any Modern Method	32.8	0.6	31.6	33.9	35.3	0.5	34.3	36.4	32.8	0.6	31.6	33.9	34.7	0.5	33.7	35.7	32.8	0.6	31.6	33.9	36.6	0.6	35.5	37.7
Any Traditional Method	14.7	0.4	14.0	15.5	16.2	0.4	15.5	16.9	14.7	0.4	14.0	15.5	16.2	0.4	15.4	17.0	14.7	0.4	14.0	15.5	15.6	0.3	15.0	16.3
N	19,860				18,992				19,860				18,425				19,860				19,226			

(Continued…)

Appendix Table 40. – *Continued*

	Current-status data from 2009				Calendar data from 2010				Current-status data from 2009				Calendar data from 2011				Current-status data from 2009				Calendar data from 2012			
	Women ages 15-43 at time of survey				Women ages 15-43 in June 2009				Women ages 15-43 at time of survey				Women ages 15-43 in June 2009				Women ages 15-43 at time of survey				Women ages 15-43 in June 2009			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	50.9	0.5	50.0	51.8	48.9	0.5	47.8	49.9	50.9	0.5	50.0	51.8	48.2	0.5	47.1	49.2	50.9	0.5	50.0	51.8	47.4	0.5	46.5	48.4
Pill	5.6	0.2	5.2	6.1	5.7	0.2	5.3	6.2	5.6	0.2	5.2	6.1	5.7	0.2	5.3	6.2	5.6	0.2	5.2	6.1	6.5	0.2	6.0	7.0
IUD	2.4	0.2	2.1	2.8	2.3	0.2	2.0	2.7	2.4	0.2	2.1	2.8	2.6	0.2	2.3	2.9	2.4	0.2	2.1	2.8	2.5	0.2	2.1	2.9
Injections	12.8	0.3	12.2	13.5	12.8	0.4	12.1	13.5	12.8	0.3	12.2	13.5	12.8	0.4	12.1	13.5	12.8	0.3	12.2	13.5	14.3	0.4	13.6	15.1
Male Condom	8.7	0.3	8.1	9.4	9.3	0.3	8.7	10.0	8.7	0.3	8.1	9.4	9.5	0.3	8.9	10.2	8.7	0.3	8.1	9.4	9.1	0.3	8.4	9.8
Sterilization	4.4	0.2	4.1	4.9	4.4	0.2	4.1	4.9	4.4	0.2	4.1	4.9	4.4	0.2	4.0	4.8	4.4	0.2	4.1	4.9	4.1	0.2	3.7	4.4
Periodic Abstinence	9.7	0.3	9.2	10.3	10.8	0.3	10.2	11.3	9.7	0.3	9.2	10.3	11.1	0.3	10.5	11.6	9.7	0.3	9.2	10.3	10.8	0.3	10.3	11.4
Withdrawal	4.3	0.2	3.9	4.7	4.6	0.2	4.2	5.1	4.3	0.2	3.9	4.7	4.6	0.2	4.2	5.0	4.3	0.2	3.9	4.7	4.1	0.2	3.8	4.5
Implant	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1
LAM	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.1
Other Traditional Methods	0.6	0.1	0.5	0.8	0.6	0.1	0.5	0.8	0.6	0.1	0.5	0.8	0.8	0.1	0.7	1.0	0.6	0.1	0.5	0.8	0.8	0.1	0.7	1.0
Other Modern Methods	0.2	0.1	0.2	0.4	0.3	0.1	0.2	0.5	0.2	0.1	0.2	0.4	0.2	0.1	0.2	0.4	0.2	0.1	0.2	0.4	0.2	0.1	0.1	0.4
Missing/Unknown if Using Any Method, Including Missing	49.1	0.5	48.2	50.0	51.1	0.5	50.1	52.2	49.1	0.5	48.2	50.0	51.8	0.5	50.8	52.9	49.1	0.5	48.2	50.0	52.6	0.5	51.6	53.5
Any Method, Excluding Missing					51.1	0.5	50.1	52.2					51.8	0.5	50.8	52.9					52.6	0.5	51.6	53.5
Any Modern Method	34.4	0.5	33.4	35.3	35.1	0.5	34.1	36.1	34.4	0.5	33.4	35.3	35.3	0.5	34.4	36.3	34.4	0.5	33.4	35.3	36.8	0.5	35.8	37.8
Any Traditional Method	14.7	0.4	14.0	15.4	16.0	0.4	15.3	16.7	14.7	0.4	14.0	15.4	16.5	0.4	15.7	17.2	14.7	0.4	14.0	15.4	15.8	0.4	15.1	16.5
N	21,057				19,389				21,057				18,825				21,057				19,557			

	Current-status data from 2010				Calendar data from 2011				Current-status data from 2010				Calendar data from 2012				Current-status data from 2011				Calendar data from 2012			
	Women ages 15-43 at time of survey				Women ages 15-43 in August 2010				Women ages 15-43 at time of survey				Women ages 15-43 in August 2010				Women ages 15-43 at time of survey				Women ages 15-43 in August 2011			
	%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI		%	SE	CI	
Not using	50.2	0.5	49.2	51.1	47.8	0.5	46.8	48.8	50.2	0.5	49.2	51.1	46.7	0.5	45.7	47.7	49.3	0.5	48.2	50.4	47.2	0.5	46.2	48.3
Pill	6.2	0.2	5.7	6.7	5.9	0.3	5.4	6.4	6.2	0.2	5.7	6.7	6.8	0.3	6.3	7.3	6.1	0.2	5.6	6.6	6.9	0.3	6.4	7.4
IUD	2.0	0.2	1.7	2.3	2.1	0.1	1.8	2.4	2.0	0.2	1.7	2.3	2.3	0.2	1.9	2.6	1.7	0.1	1.4	2.0	2.0	0.2	1.7	2.4
Injections	12.5	0.3	11.9	13.2	13.2	0.4	12.5	13.9	12.5	0.3	11.9	13.2	14.2	0.4	13.5	15.0	12.9	0.4	12.2	13.6	13.8	0.4	13.2	14.5
Male Condom	9.2	0.3	8.6	9.9	10.3	0.4	9.6	11.0	9.2	0.3	8.6	9.9	9.8	0.3	9.2	10.5	9.9	0.3	9.3	10.6	10.1	0.4	9.4	10.8
Sterilization	4.1	0.2	3.8	4.6	4.3	0.2	3.9	4.7	4.1	0.2	3.8	4.6	3.9	0.2	3.5	4.2	4.3	0.2	3.9	4.7	3.7	0.2	3.3	4.1
Periodic Abstinence	10.0	0.3	9.5	10.5	10.7	0.3	10.2	11.3	10.0	0.3	9.5	10.5	10.7	0.3	10.2	11.3	10.0	0.3	9.4	10.5	10.5	0.3	9.9	11.1
Withdrawal	4.8	0.2	4.4	5.2	4.6	0.2	4.3	5.1	4.8	0.2	4.4	5.2	4.5	0.2	4.1	4.9	4.7	0.2	4.3	5.1	4.5	0.2	4.1	4.9
Implant	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2
LAM	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2
Other Traditional Methods	0.6	0.1	0.4	0.7	0.7	0.1	0.6	0.8	0.6	0.1	0.4	0.7	0.7	0.1	0.5	0.8	0.6	0.1	0.5	0.8	0.7	0.1	0.6	0.9
Other Modern Methods	0.2	0.1	0.2	0.4	0.4	0.1	0.3	0.5	0.2	0.1	0.2	0.4	0.3	0.1	0.2	0.5	0.4	0.1	0.3	0.5	0.4	0.1	0.3	0.5
Missing/Unknown if Using Any Method, Including Missing	49.8	0.5	48.9	50.8	52.2	0.5	51.2	53.2	49.8	0.5	48.9	50.8	53.3	0.5	52.3	54.3	50.7	0.5	49.6	51.8	52.8	0.5	51.7	53.8
Any Method, Excluding Missing					52.2	0.5	51.2	53.2					53.3	0.5	52.3	54.3					52.8	0.5	51.7	53.8
Any Modern Method	34.4	0.5	33.4	35.4	36.2	0.5	35.2	37.1	34.4	0.5	33.4	35.4	37.3	0.5	36.3	38.4	35.3	0.5	34.3	36.4	37.0	0.5	36.0	38.1
Any Traditional Method	15.3	0.3	14.7	16.0	16.1	0.3	15.4	16.7	15.3	0.3	14.7	16.0	15.8	0.3	15.2	16.5	15.3	0.4	14.6	16.0	15.7	0.4	15.0	16.4
N	19,818				19,179				19,818				19,864				19,484				20,260			

Appendix Table 41: Comparison of failure rate estimates between this and previous studies

Method	12-month pooled failure rate (95% CI), Current Study	Median 12-month failure rate* (95% CI)		12-month typical-use failure rate* estimated from U.S. data (95% CI) (Trussell 2011)
		(Polis et al., 2016) study†	(Ali et al., 2012) study	
Implant	0.4 (0.2–0.6)	0.6 (0.0–2.4)	na	0.05 (Implanon) ‡
IUD	1.2 (1.1–1.4)	1.4 (0.0–2.4)	1.1	0.8 (0.4–1.2) (ParaGard)§
Injectable	2 (1.9–2.1)	1.7 (0.6–2.9)	1.5	6 (Depo-Provera)**
Pill	6.6 (6.4–6.7)	5.5 (3.5–7.3)	5.6	9 (COC, POP)**
Male condom	8.6 (8.3–9.0)	5.4 (2.3–8.7)	7.6	18**
Withdrawal	17.8 (17.5–18.2)	13.4 (9.1–17.1)	15.3	22**
Periodic abstinence	19.4 (18.9–19.9)	13.9 (9.2–19.3)	17.4	24**, ***

*Number of failures per 100 episodes of use. †Median CIs are calculated as a median of all CIs. ‡No clinical study has reported an Implanon failure, but pregnancies during its use have been reported; thus typical-use (and perfect-use) failure rates for this implant were arbitrarily set at 0.05; 95% CIs were not provided. (Hatcher 2011)§Estimate derived from 1979 study of 3,536 women using the TCu 380A IUD. (Sivin and Stern 1979)95% CI calculated from one-year gross cumulative pregnancy rate per 100 women accepting the TCu 380A IUD (0.8) and the associated standard error (0.2) provided in Table 8 of the study by Sivin and Stern.[28] **Weighted averages of estimates derived from the 1995 and 2002 National Surveys of Family Growth, corrected for abortion underreporting; 95% CIs were not provided. (Hatcher 2011)*** The overwhelming majority of women using fertility awareness-based methods (FABMs) in the NSFG are believed to be using calendar rhythm, although this could also include women using newer FABM methods such as Standard Days, TwoDay, Ovulation, or Symptothermal.

Notes: Data from sources other than the current study are replicated from Polis et al. 2016. CI=confidence interval (when available). na=not available (method was not assessed). COC=combined oral contraceptive pill. POP=progestin-only pill.