



USAID
FROM THE AMERICAN PEOPLE

DHS WORKING PAPERS

Initiation of Breastfeeding in Low- and Middle-Income Countries: A Time-to-Event Analysis

Lindsay Mallick
Wenjuan Wang
Shiza Farid
Thomas W. Pullum

2020 No. 163

June 2020

This document was produced for review by the United States Agency for International Development.

DEMOGRAPHIC
AND
HEALTH
SURVEYS

DHS Working Paper No. 163

Initiation of Breastfeeding in Low- and Middle-Income Countries: A Time-to-Event Analysis

Lindsay Mallick^{1,2}
Wenjuan Wang^{2,3*}
Shiza Farid¹
Thomas W. Pullum^{2,3}

ICF
Rockville, Maryland, USA

June 2020

¹Avenir Health
²The DHS Program
³ICF

* This report was prepared while Wenjuan Wang was an employee of ICF.
At the time of publication, Dr. Wang was employed by National Institutes of Health.

Corresponding author: Lindsay Mallick, International Health and Development, ICF, 530 Gaither Road, Suite 500, Rockville, MD 20850, USA; phone: 301-572-0211; fax: 301-407-6501; email: lindsay.mallick@icf.com



BILL & MELINDA
GATES foundation

Acknowledgments: The authors wish to thank Pavani Ram for motivating this paper and both Pavani Ram and Jeniece Alvey for review and feedback on an early version of this paper.

Editor: Diane Stoy

Document Production: Joan Wardell

The DHS Working Papers series is a prepublication series of papers reporting on research in progress that is based on Demographic and Health Surveys (DHS) data. Research for this paper was carried out with support provided by the Bill & Melinda Gates Foundation, Avenir Health through the Track20 project, and the United States Agency for International Development (USAID) through The DHS Program (#720-OAA-18C-00083). The views expressed are those of the authors and do not necessarily reflect the views of Bill & Melinda Gates Foundation, Track20, National Institutes of Health, the Department of Health and Human Services, USAID, or the United States Government.

The DHS Program assists countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. Additional information about The DHS Program can be obtained from ICF, 530 Gaither Road, Suite 500, Rockville, MD 20850 USA; telephone: +1 301-407-6500, fax: +1 301-407-6501, email: info@DHSprogram.com, internet: www.DHSprogram.com.

Recommended citation:

Mallick, Lindsay, Wenjuan Wang, Shiza Farid, and Thomas W. Pullum. 2020. *Initiation of Breastfeeding in Low- and Middle-Income Countries: A Time-to-Event Analysis*. DHS Working Paper No. 163. Rockville, Maryland, USA: ICF.

CONTENTS

TABLES	v
FIGURES	vii
ABSTRACT	ix
ACRONYMS AND ABBREVIATIONS	xi
1 INTRODUCTION.....	1
2 DATA AND METHODS	3
2.1 Data.....	3
2.1 Methods	3
3 RESULTS	7
4 DISCUSSION.....	13
5 CONCLUSION	15
REFERENCES.....	17
APPENDICES.....	21

TABLES

Table 1	Number of most recent live born children in the 2 years before each survey, 2014-2018.....	3
Table 2	Mean and median times to initiation of breastfeeding, among all deliveries, vaginal at home, vaginal at facility, and C-section, among ever-breastfed last born children born in the past 2 years.....	9
Appendix Table 1	Time to initiation of breastfeeding, percent and 95% confidence interval	22
Appendix Table 2	Background characteristics (% and N) of women included in the survival analysis, by country	23
Appendix Table 3a	Hazard ratio (HR) and 95% confidence intervals (CI) according to multivariable Weibull regressions of time to initiation of breastfeeding, Europe and Asia	25
Appendix Table 3b	Hazard ratio (HR) and 95% confidence intervals (CI) according to multivariable Weibull regressions of time to initiation of breastfeeding, sub-Saharan Africa and Haiti.....	27

FIGURES

Figure 1	Percent distribution of children by time to initiation of breastfeeding among most recent live born children in the 2 years before the survey, 2014-2018.....	8
Figure 2	Hazard ratios of time to initiation of breastfeeding for cesarean section and immediate skin-to-skin contact	10
Appendix Figure 1a	Hazard to initiation of breastfeeding by place and mode of delivery, Europe and Asia	29
Appendix Figure 1b	Hazard to initiation of breastfeeding by place and mode of delivery, sub-Saharan Africa and Haiti	30
Appendix Figure 2a	Hazard to initiation of breastfeeding by immediate skin-to-skin contact, Europe and Asia	31
Appendix Figure 2b	Hazard to initiation of breastfeeding by immediate skin-to-skin contact, sub-Saharan Africa and Haiti	32

ABSTRACT

Objective: Early breastfeeding has numerous benefits for both the mother and her baby. Previous research typically analyzes breastfeeding initiation in binary terms (within the first hour or day). There is a need for research on the time to initiation of breastfeeding by hour and quantification of the relationships between initiation and predictive factors.

Methods: With data from 31 countries that had a Demographic and Health Survey since 2015, we describe breastfeeding initiation among women age 15-49 with the most recent birth in the past 2 years. With a subset of 21 countries, we conducted survival analysis with multivariable Weibull regressions to examine factors associated with time to initiation of breastfeeding.

Findings: Babies in most countries began breastfeeding within the first few hours after birth. Mean time to initiation of breastfeeding ranged from 1.7 hours in Burundi to 32 hours in Pakistan and 40 hours in Chad. The median time was 0.5 hours in 24 countries. The mean and median time to initiation was much greater for births delivered by cesarean section compared with births delivered vaginally at home or at health facilities. Weibull regressions, controlling for socioeconomic, demographic, and health-related characteristics of mothers and babies, showed significantly greater delays (reduced hazard ratios) in time to initiation of breastfeeding for cesarean section versus vaginal delivery at facilities and small versus normal birth size. Immediate skin-to-skin contact and higher parity were significantly associated with shorter time to initiation.

Conclusions: Efforts to promote early breastfeeding should encourage skin-to-skin and target cesarean deliveries.

Key words: breastfeeding, early initiation of breastfeeding, Cesarean section, skin-to-skin, survival analysis

ACRONYMS AND ABBREVIATIONS

ANC	antenatal care
CI	confidence interval
DHS	Demographic and Health Surveys
EIBF	early initiation of breastfeeding
HR	hazard ratio

1 INTRODUCTION

Breastfeeding has prodigious benefits for both the mother and baby. Breastfeeding protects infants against infections, supports growth of the child, and protects mothers from postpartum hemorrhage and some types of cancer (Rollins et al. 2016; Victora et al. 2016). Research has shown that breastfeeding, through its protective mechanisms, can avert nearly 1 million deaths of mothers and children each year (Victora et al. 2016).

Early initiation of breastfeeding (EIBF), the initiation of breastfeeding within the first hour after delivery, has benefits for both the mother and newborn. The early initiation triggers the release of hormones which help the mother's uterus contract and prevent hemorrhage (Saxton, Fahy, and Hastie 2014; Saxton et al. 2015). Not only does EIBF provide early milk (colostrum), which has additional protective benefits for the baby, it also encourages future milk production (WHO 2018b). Immediate breastfeeding, in addition to skin-to-skin contact, provides thermal care for the newborn (Lunze and Hamer 2012; WHO Maternal and Newborn Health/Safe Motherhood Unit 1997). Research has also identified a reduced risk of neonatal mortality with EIBF (Debes et al. 2013; Neovita Study Group 2016; Smith et al. 2017). Thus, the World Health Organization (WHO) recommends that breastfeeding should begin within the first hour of birth (WHO 2017). Breastfeeding in the first hour of birth is considered "essential newborn care" (Moxon et al. 2015).

Initiation of breastfeeding can be delayed by individual factors, conditions of the birth (e.g., preterm, low birthweight), cultural influences, or barriers at the health facility, including complications during vaginal and cesarean section (C-section) delivery (Rollins et al. 2016; Takahashi et al. 2017; WHO 2018a). The WHO recommends that breastfeeding begin as soon as possible after C-section deliveries given the importance of early breastfeeding (WHO 2017). With properly trained, supportive health workers, women can be successful in this endeavor. The Baby Friendly Hospital Initiative encourages provider training on breastfeeding (WHO 2017).

To inform these practices, a nuanced understanding of the delay in breastfeeding among C-section delivery is warranted, yet most research to date defines and analyzes breastfeeding initiation in binary terms—within the first hour or the first day. This paper examines the time to initiation of breastfeeding in a more granular way than extant research, while also comparing the timing by delivery characteristics and other factors that may hinder or encourage early breastfeeding.

2 DATA AND METHODS

2.1 Data

Our analysis used data from 31 countries where The Demographic and Health Surveys (DHS) Program has conducted surveys since 2015 to describe breastfeeding initiation. We used a subset of these countries (21) to examine the factors associated with time to initiation of breastfeeding. We examined responses from interviewed women, age 15-49 who had a live birth in the last 2 years, about their most recent live birth. For the most recent birth, women were asked if they ever breastfed and, if so, about the timing of initiation of breastfeeding: *'How long after birth did you first put (NAME) to the breast?'* Women were prompted to respond in either hours after birth or days. All surveys since 2015 that included this question were included in the descriptive analysis. The total number of women analyzed in each country, as well as the percentage of women who gave birth via C-section, is presented in Table 1.

Table 1 Number of most recent live born children in the 2 years before each survey, 2014-2018

Region	Country	C-section % (N)	N All
North Africa, West & Central Asia, Europe	Albania 2017-18	31.7 (328)	1,034
	Armenia 2015-16	21.5 (143)	664
	Egypt 2014	57.4 (3,602)	6,271
	Jordan 2017-18	27.7 (955)	3,452
	Maldives 2016-17	42.8 (460)	1,074
	Tajikistan 2017	5.9 (145)	2,465
	Bangladesh 2014	24.6 (780)	3,166
South & Southeast Asia	Cambodia 2014	8.1 (236)	2,906
	India 2015-16	19.3 (17,838)	92,600
	Indonesia 2017	19.2 (1,260)	6,561
	Myanmar 2015-16	21.2 (350)	1,652
	Nepal 2016	10.1 (198)	1,965
	Pakistan 2017-18	25.8 (998)	3,864
	Philippines 2017	15.5 (572)	3,693
	Timor-Leste 2016	3.5 (97)	2,815
	Angola 2015-16	3.8 (203)	5,298
	Benin 2017-18	4.9 (265)	5,405
Sub-Saharan Africa	Burundi 2016-2017	5.2 (282)	5,368
	Chad 2014-15	1.5 (101)	6,656
	Ethiopia 2016	2.6 (110)	4,244
	Ghana 2014	12.4 (276)	2,234
	Kenya 2014	8.2 (288)	3,496
	Lesotho 2014	10.1 (136)	1,348
	Malawi 2015-16	6.6 (435)	6,579
	Senegal 2016	5.7 (251)	4,410
	South Africa 2016	24.7 (337)	1,364
	Tanzania 2015-16	6.5 (268)	4,106
	Uganda 2016	7.1 (414)	5,797
Latin America & Caribbean	Zimbabwe 2015	6.1 (147)	2,421
	Guatemala 2014-15	29.5 (1,403)	4,756
	Haiti 2016-17	5.7 (136)	2,390

2.1 Methods

Given the response options of hours or days, we used several approaches to explore time to initiation of breastfeeding. First, we examined time to initiation of breastfeeding categorically for all babies. Based on a common distribution of time to initiation across countries, we created seven categories of timing: within the first hour, 1-2 hours, 3-5 hours, 6-23 hours, the day after birth, 2 to 4 days, and 5 days or more, never breastfed, and don't know or missing.

By creating a continuous variable of time to initiation, we examined the mean time to initiation in each country among all women and by mode and place of delivery. To create this continuous variable, we converted responses in days to hours by multiplying by 24. Interviewers are trained to record the time to initiation in completed hours or days. Thus, if a woman reported beginning breastfeeding one hour after birth, she began breastfeeding no sooner than 60 minutes after birth and up to 119 minutes after birth. Although it is unlikely that retrospective self-report of time to initiation is so precise (Stanton et al. 2013), an average for all women beginning within this interval would be likely to fall near 90 minutes. In our analysis, we adjusted for this by adding half an hour to each hour, and a half a day for each day reported. For example, if a woman reported she began breastfeeding immediately, her code was shifted from 0 to 0.5, 1 hour was shifted to 1.5, and 1 day was coded as 36 hours. We calculated the mean and median time to breastfeeding among all women and by mode of delivery among ever-breastfed babies with non-missing responses. We estimated the lower and upper bounds of the 95% confidence interval (CI) of the mean according to a Poisson distribution.

In addition, we conducted multivariable survival analyses to identify the factors associated with time to initiation of breastfeeding. Because skin-to-skin contact is an important factor in breastfeeding initiation (Aghdas, Talat, and Sepideh 2014; Moore and Anderson 2010; Safari et al. 2018; Singh et al. 2017), we analyzed data from the 21 of the 31 recent DHS surveys completed (as of September 2019) that included a question about skin-to-skin contact. Model specification was determined after assessing the proportional hazard assumption based on Schoenfeld residuals which revealed that survival (time to initiation of breastfeeding) between covariate groups did not maintain proportionality over time and that relationships between covariates and the outcome were not consistently linear (Johnson and Shih 2007). Therefore, we selected a parametric model rather than the semi-parametric model (Cox proportional hazard model). We estimated the baseline hazard function and hazard ratios for our covariates for each country using Weibull regression models. Each model was restricted to babies whose breastfeeding began within 4 days after birth. Data were censored at 4 days because, at that point, most women have reached lactogenesis stage II, where the composition of breastmilk has evolved from colostrum to transitional milk (Ballard and Morrow 2013). All analyses excluded babies who died within the first 4 days because these newborns may have faced complications that would inhibit their ability to breastfeed (Neovita Study Group 2016; Takahashi et al. 2017).

The models included socioeconomic, demographic, and health behavior characteristics of the mother and baby. Socioeconomic and demographic characteristics of the mother included place of residence (urban and rural); region; wealth quintile; education (none, primary, secondary or higher); employment (not employed, employed-professional, and employed-manual, agricultural, or other); exposure to mass media (less than once per week and once per week and more); and parity (1, 2, 3, 4+ live births). We also included marital status (currently married, not currently married). Jordan and Pakistan sampled only ever-married women. In the Republic of Maldives, we excluded place of residence because the regions were exclusively either urban or rural. Child characteristics included sex of the child and birth size. Birth size was categorized as small, average, or above average, based on the weight of the child if available or recalled, or the mother's perception in the absence of a reported weight. Health behavior and care-related variables included antenatal care (ANC) visits (<4, 4+); mode and place of delivery (vaginal delivery at home, vaginal delivery in facility, C-section delivery in facility); whether the baby was placed on the chest immediately after birth (had immediate skin-to-skin contact – either no or yes); had a postnatal check within 1 hour for either the

mother or baby (no or yes). The postnatal check was based on the mother's report of whether anyone checked her or the baby's health within the first hour after delivery.

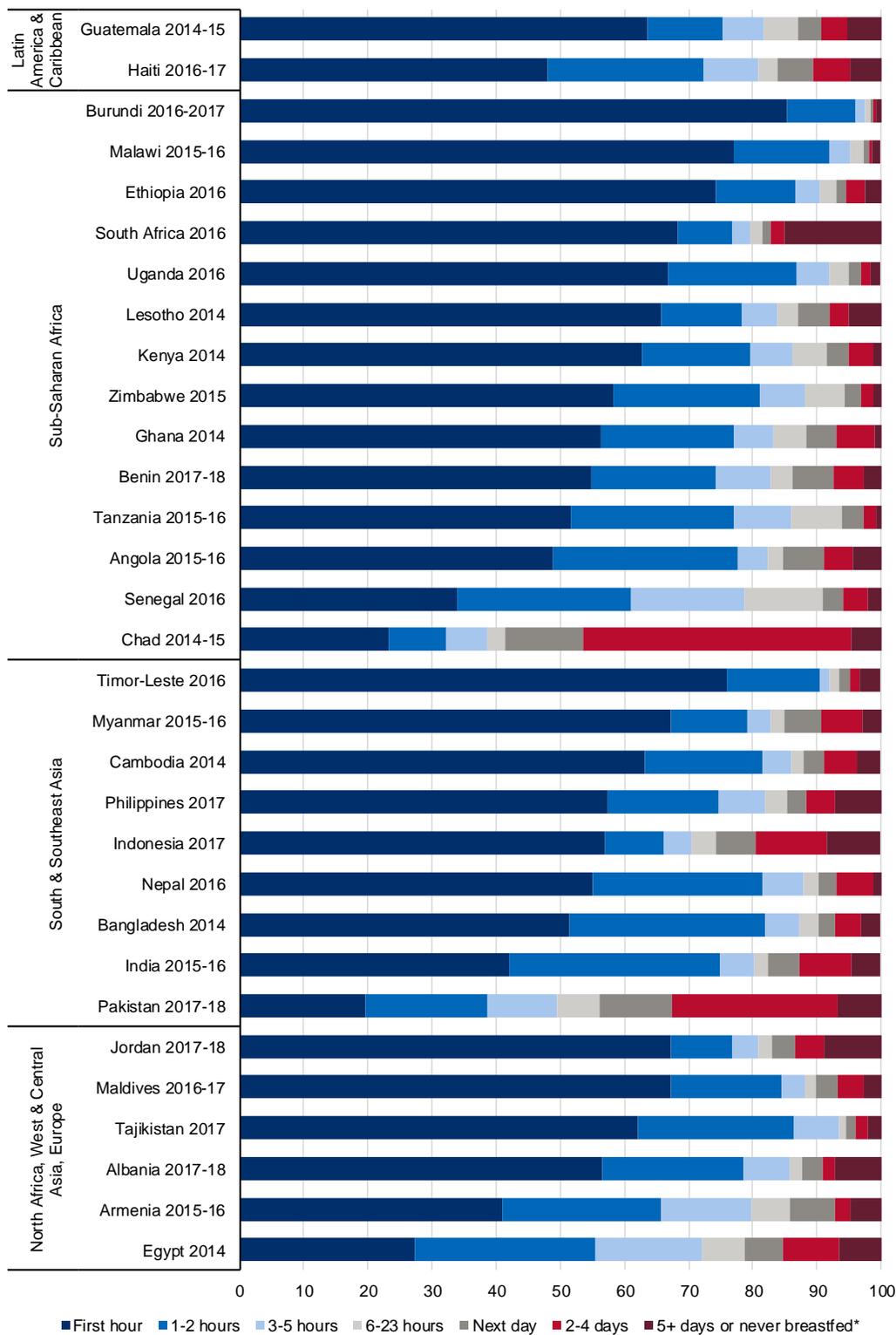
We used Stata version 16.0 for the analysis. All statistical tests adjusted for the complex survey design and applied survey weights.

3 RESULTS

Figure 1 presents the distribution of time to initiation of breastfeeding in 8 categories. In nearly all countries, 80% of babies began breastfeeding in the first day. Very few babies began breastfeeding after 5 days or were never breastfed at all. The exceptions were Chad and Pakistan, where 41% and 56% of babies began breastfeeding in the first day, and South Africa, where 15% of babies began breastfeeding after 5 days or were never breastfed. The majority of babies in most countries began breastfeeding immediately (within the first hour), although there are substantial differences across and within regions. For example, in sub-Saharan Africa, 85% of babies in Burundi began breastfeeding immediately versus 23% in Chad. We found inconsistent practice in South and Southeast Asia, where EIBF ranges from 20% in Pakistan to 76% in Timor-Leste, and in North Africa, West and Central Asia, and Europe, from 27% in Egypt to 67% in Jordan. Appendix Table 2 includes the estimates and 95% CI for each category in each country.

Table 2 shows the mean and median time to initiation of breastfeeding in hours for all babies and by mode of delivery, for each country, and highlighting the disparities in time to initiation of breastfeeding by mode of delivery. For all babies, the mean time ranged from 1.7 hours in Burundi to 40 hours in Chad. The mean time among vaginally-delivered facility births is less than 7 hours in over half of the countries. For C-sections, the mean time was typically greater than 20 hours. The median time to breastfeeding initiation was half an hour after delivery among all births as well as for vaginal deliveries at home and at a health facility. Among C-sections, the mean time to initiation varied from the first half-hour after delivery to 60 hours after delivery, with a median time to initiation of 2.5 hours or more in most countries. A C-section appeared to delay breastfeeding least in the Republic of Maldives and most in Haiti and Senegal. In the region where C-section was most common (West and Central Asia and Europe), breastfeeding was least delayed among C-section births compared with vaginal births, except in Tajikistan where C-section was rare (6%) (see Table 1).

Figure 1 Percent distribution of children by time to initiation of breastfeeding among most recent live born children in the 2 years before the survey, 2014-2018



Note: * Category includes don't know or missing responses.

Table 2 Mean and median times to initiation of breastfeeding, among all deliveries, vaginal at home, vaginal at facility, and C-section, among ever-breastfed last born children born in the past 2 years

Region	Country	All		Vaginal-home		Vaginal-facility		C-section	
		Mean (95% CI)	Med.						
North Africa, West & Central Asia, Europe	Albania 2017-18	5.3 (3.8,7.5)	0.5	1.2 (0.0,165.3)	0.5	3.5 (1.7,7.0)	0.5	9.5 (7.0,12.8)	1.5
	Armenia 2015-16	8.0 (6.5,9.9)	1.5	1.9 (0.0,148.1)	2.5	5.0 (3.9,6.4)	1.5	19.9 (13.9,28.6)	5.5
	Egypt 2014	16.5 (15.2,17.8)	2.5	12.2 (9.8,15.2)	1.5	10.1 (8.7,11.7)	1.5	20.9 (19.1,22.8)	3.5
	Jordan 2017-18	8.6 (7.2,10.2)	0.5	2.5 (0.9,7.0)	0.5	4.7 (3.6,6.2)	0.5	19.6 (16.0,24.1)	0.5
	Maldives 2016-17	10.0 (6.6,15.1)	0.5	12.8 (5.4,30.6)	1.5	9.5 (4.4,20.6)	0.5	10.2 (7.1,14.6)	0.5
	Tajikistan 2017	3.7 (3.0,4.6)	0.5	1.5 (1.0,2.2)	0.5	2.6 (2.1,3.2)	0.5	23.5 (15.2,36.2)	3.5
	Bangladesh 2014	7.4 (6.1,8.8)	0.5	4.7 (3.7,5.9)	0.5	5.1 (3.5,7.3)	0.5	15.4 (11.6,20.5)	1.5
	Cambodia 2014	7.6 (6.6,8.9)	0.5	11.6 (8.3,16.3)	0.5	4.9 (4.0,5.8)	0.5	31.6 (24.3,41.1)	3.5
South & Southeast Asia	India 2015-16	12.7 (12.3,13.1)	1.5	15.9 (15.2,16.7)	1.5	8.8 (8.4,9.3)	1.5	22.4 (21.1,23.7)	1.5
	Indonesia 2017	17.8 (16.6,19.2)	0.5	18.6 (16.0,21.6)	0.5	13.3 (12.0,14.7)	0.5	33.0 (29.5,36.9)	3.5
	Myanmar 2015-16	11.7 (9.8,13.9)	0.5	10.9 (8.6,13.7)	0.5	11.0 (7.4,16.3)	0.5	14.6 (10.6,20.1)	0.5
	Nepal 2016	7.9 (6.5,9.6)	0.5	9.6 (7.3,12.6)	1.5	3.9 (2.9,5.3)	0.5	24.2 (16.6,35.3)	2.5
	Pakistan 2017-18	31.7 (28.9,34.7)	5.5	26.8 (23.3,30.8)	3.5	24.2 (21.2,27.6)	3.5	50.8 (43.6,59.1)	36.0
	Philippines 2017	8.2 (6.8,9.8)	0.5	6.1 (4.2,8.9)	0.5	5.6 (4.5,7.0)	0.5	21.9 (15.9,30.2)	1.5
	Timor-Leste 2016	2.8 (2.3,3.4)	0.5	2.4 (1.8,3.1)	0.5	2.4 (1.8,3.2)	0.5	14.4 (10.0,20.9)	0.5
	Angola 2015-16	8.5 (7.4,9.7)	0.5	8.0 (6.8,9.3)	1.5	7.4 (5.6,9.7)	0.5	26.8 (21.0,34.4)	6.5
Sub-Saharan Africa	Benin 2017-18	9.0 (8.1,9.9)	0.5	8.1 (6.5,10.0)	0.5	8.0 (7.1,9.0)	0.5	28.0 (22.5,34.9)	5.5
	Burundi 2016-2017	1.7 (1.4,2.3)	0.5	1.4 (0.8,2.2)	0.5	1.3 (0.9,1.7)	0.5	10.4 (6.6,16.6)	1.5
	Chad 2014-15	40.4 (38.0,42.9)	36.0	39.9 (37.1,42.9)	36.0	40.4 (37.5,43.6)	36.0	66.4 (52.3,84.3)	60.0
	Ethiopia 2016	5.4 (4.3,6.7)	0.5	4.6 (3.4,6.2)	0.5	5.0 (3.6,7.0)	0.5	28.8 (14.3,58.1)	1.5
	Ghana 2014	11.5 (8.2,16.1)	0.5	9.2 (6.9,12.4)	0.5	8.7 (5.2,14.5)	0.5	30.9 (15.8,60.3)	2.5
	Kenya 2014	8.2 (6.0,11.2)	0.5	12.3 (7.0,21.8)	0.5	4.5 (3.6,5.6)	0.5	16.9 (11.3,25.4)	2.5
	Lesotho 2014	8.7 (6.7,11.2)	0.5	10.3 (6.8,15.7)	0.5	6.4 (4.7,8.7)	0.5	21.7 (10.8,43.6)	3.5
	Malawi 2015-16	2.1 (1.8,2.5)	0.5	2.5 (1.7,3.6)	0.5	1.7 (1.4,2.0)	0.5	7.5 (4.4,12.6)	0.5
	Senegal 2016	9.0 (8.0,10.1)	2.5	6.7 (5.7,7.9)	2.5	6.2 (5.4,7.2)	1.5	53.4 (44.3,64.2)	36.0
	South Africa 2016	4.5 (3.3,6.2)	0.5	15.2 (3.9,59.6)	0.5	3.4 (2.4,4.8)	0.5	6.2 (3.6,10.7)	0.5
	Tanzania 2015-16	5.1 (4.5,5.8)	0.5	6.8 (5.8,8.0)	1.5	3.3 (2.6,4.1)	0.5	11.9 (8.3,16.8)	4.5
	Uganda 2016	4.2 (3.6,5.0)	0.5	4.5 (3.3,6.1)	0.5	3.0 (2.4,3.8)	0.5	15.2 (10.0,23.2)	1.5
Latin America & Caribbean	Zimbabwe 2015	4.6 (3.8,5.6)	0.5	7.7 (5.7,10.4)	1.5	3.0 (2.1,4.1)	0.5	16.0 (12.4,20.6)	3.5
	Guatemala 2014-15	18.5 (15.4,22.1)	0.5	7.1 (5.3,9.5)	0.5	11.1 (8.4,14.6)	0.5	40.9 (32.0,52.2)	3.5
	Haiti 2016-17	11.7 (10.0,13.7)	1.5	8.9 (7.3,10.8)	1.5	10.4 (8.0,13.6)	0.5	52.7 (36.1,77.0)	6.5

Note: CI = confidence Interval; Med = median

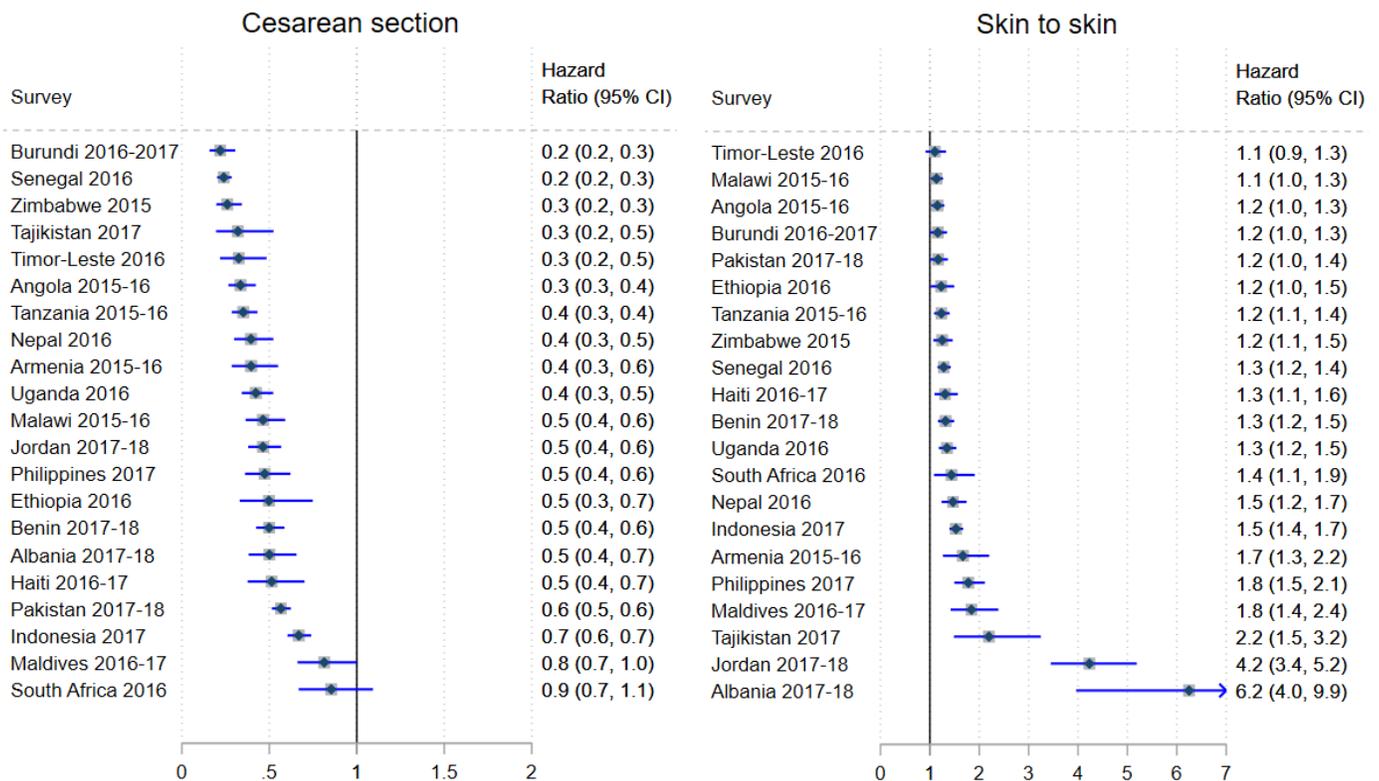
Appendix Table 2 presents the background characteristics of women included in the survival analysis. Skin-to-skin contact was a common practice in most countries in Europe and Asia, except for Pakistan, where only 8% of women had immediate skin-to-skin contact with their baby. The practice of skin-to-skin contact was more varied in sub-Saharan Africa and Haiti, ranging from 13% in Burundi to 76% in Benin. Small size at birth ranged from 4% in Albania to 27% in Haiti and Ethiopia. Exposure to mass media, employment, education, and place of residence also substantially varied across countries. In most countries, a majority of women had 4 or more ANC visits; did not have an early postnatal check for herself or the baby; were delivering their first, second, or third child; and were currently married. The percent of births that are censored (initiated breastfeeding 5 days after birth or later, never breastfed, and cases with don't know or missing information about breastfeeding) are described in Appendix Table 1; between 1% and 8% of births were censored.

Figure 2 shows the hazard ratios (HR) of two variables included in survival analysis: a) C-section compared with vaginal delivery at facilities and b) immediate skin-to-skin contact compared with no immediate skin-to-skin contact, after controlling for covariates of interest. Appendix Figures 1a and 1b show the Kaplan Meier survival curves for place and mode of delivery (including home and facility-based vaginal births and C-section). Appendix Figures 2a and 2b show the Kaplan Meier survival curves for skin-to-skin contact.

Compared with babies born vaginally in a facility, the hazard of time to initiation of breastfeeding is significantly lower among babies born via C-section in all countries except the Maldives and South Africa. Stated differently, babies who were born vaginally had an earlier initiation of breastfeeding compared with babies that were born via C-section in all countries except the Maldives and South Africa. Notably, the hazard of time to initiation of breastfeeding among C-section delivered babies is less than three quarters of the hazard of initiation among babies delivered vaginally at facilities in Burundi and Senegal (HR: 0.2; 95% CI: 0.2-0.3), and approximately 70% less in Angola (95% CI 0.3-0.4), Tajikistan (95% CI: 0.2-0.4), Timor-Leste (95% CI: 0.2-0.5), and Zimbabwe (95% CI: 0.2-0.3). Thus, babies born via C-section in these five countries experienced the most delayed initiation compared to facility-born babies who were delivered vaginally.

Conversely, skin-to-skin contact was significantly associated with an increased hazard, a shorter time to initiation, in all countries except Burundi, Pakistan and Timor-Leste. In most countries, the hazard to initiation was 20% to 80% higher among babies who received immediate skin-to-skin contact compared with babies whose mothers did not report immediate skin-to-skin contact. In Jordan and Albania, the hazard ratios were much higher: four times higher in Jordan (HR 4.1; 95% CI: 3.3-5.1) and eight times higher in Albania (HR 8.1; 95% CI: 5.5-12.6).

Figure 2 Hazard ratios of time to initiation of breastfeeding for cesarean section and immediate skin-to-skin contact



*Note: The reference group for Cesarean section was vaginal deliveries in a facility and the references for immediate skin-to-skin contact was no immediate skin-to-skin.

In 13 countries, small size at birth was associated with a lower hazard to initiation. In nearly all countries, greater parity (2, 3, or 4+) was associated with earlier initiation compared with primiparity. Early postnatal care, a time when a provider has an opportunity to encourage early breastfeeding, generally was not significantly associated with the hazard to initiation, except for Burundi (HR 0.7; 95% CI:0.6-0.9]) and Maldives (HR 0.6; 95% CI: 0.4-0.7). Appendix Table 3 includes the HRs and 95% CIs for the full model for each country.

4 DISCUSSION

Benefits of early initiation of breastfeeding have been well documented. One systematic review has also shown a dose-relationship between the time to breastfeeding initiation and neonatal mortality: later initiation was associated with a greater risk of neonatal death (Smith et al. 2017). Given such evidence, using nationally representative samples from low- and middle-income countries, we assessed time to breastfeeding initiation in 31 countries and its determinants in 21 countries.

Levels of EIBF generally appear higher compared to the estimates by WHO and UNICEF based on data from household surveys conducted 2016 or earlier (WHO and UNICEF 2018). This suggested an increasing trend. However, in one-quarter of all countries studied, nearly half or more of all newborns were not breastfed until after the first hour, which is a delay that reduces the life-saving benefits of breastfeeding (Victora et al. 2016). Even when optimal early initiation cannot be achieved, breastfeeding within 24 hours of birth still protects newborns from a greater risk of neonatal mortality compared to initiating after 24 hours (Smith et al. 2017). Yet in four countries in this analysis, over 20% of babies began breastfeeding after 24 hours of delivery. For example, the median time to initiation in Pakistan was 36 hours. Research has identified a wide range of factors associated with late initiation of breastfeeding in Pakistan including the mother's working status and education, perceived benefit of breastfeeding, and traditional feeding practices (Sharma and Byrne 2016).

As in other studies, our findings demonstrated that C-section significantly delayed breastfeeding in almost all countries. This is concerning because the use of C-section has increased globally, with 30% in the Middle East and North Africa, Eastern Europe, and central Asia, and 44% in Latin America and Caribbean countries (Boerma et al. 2018). Although C-section remains less common in most African countries, it has become more widely experienced by women who live in wealthier households or are more educated (Boerma et al. 2018). Despite the challenges faced by women after surgery, studies have shown that with proper support, it is possible to initiate breastfeeding within the first hour for babies delivered by C-section (Rollins et al. 2016; Stevens et al. 2014; WHO and UNICEF 2018). We also found that immediate skin-to-skin contact between mother and baby is significantly associated with a shorter time to breastfeeding initiation in almost all countries. This is consistent with the findings in other studies, including those that used older DHS surveys and studies with an experimental or quasi-experimental design (Aghdas, Talat, and Sepideh 2014; Moore and Anderson 2010; Safari et al. 2018; Singh et al. 2017). Immediate skin-to-skin contact is believed to be particularly important for newborns born by C-section for early initiation as well as exclusive breastfeeding (Guala et al. 2017; Stevens et al. 2014).

While EIBF and other breastfeeding practices could be still hampered by social and cultural beliefs or norms, the sizable increase in the coverage of facility delivery in low- and middle-income countries provides opportunities to promote optimal breastfeeding practices through interventions in health facilities. Health facility staff not only need to recognize the benefits of early breastfeeding but also need the skills to assist women with breastfeeding. It is important to have current national guidelines that emphasize the importance of early breastfeeding initiation and essential trainings for healthcare staff. Training for healthcare staff has been associated with improved staff knowledge, attitude, and compliance with the recommended breastfeeding practices, and with increased exclusive breastfeeding in some settings, although not with breastfeeding initiation (Balogun et al. 2017). Other research showed that provider

training on breastfeeding counseling was associated with early initiation of breastfeeding in urban Haiti and Malawi, perhaps through breastfeeding counseling provided during ANC visits (Mallick, Benedict, and Wang 2020). Further research is needed to identify effective interventions that motivate health providers to promote the initiation of early breastfeeding.

This analysis has several limitations. First, self-reporting of the outcome variable is subject to recall bias. Previous research suggests that self-reports of the timing of initiation of breastfeeding (specifically, within one hour) do not meet acceptable validity criteria (Stanton et al. 2013). Although our study attempted to minimize recall bias by restricting the analysis to the most recent birth in the past 2 years, recall bias is still possible. Further, our analysis could not account for all the complications that could interfere with breastfeeding. We controlled for birthweight as a proxy for preterm birth, although other complications could hinder early breastfeeding. For newborns, potential complications include congenital deformities, low Apgar scores, and near-miss cases, in which a pregnant woman comes close to maternal death. For mothers, complications can include eclampsia, anesthesia, blood transfusion, other intensive or surgical care such as hysterectomy, or underlying conditions such as HIV/AIDS (Neovita Study Group 2016; Takahashi et al. 2017).

5 CONCLUSION

Early initiation of breastfeeding remains suboptimal in many countries, although breastfeeding within the first several hours after birth is common in the 31 countries analyzed in this study. Multivariable analysis demonstrated the important role of Cesarean section and immediate skin-to-skin contact in the time to breastfeeding initiation. Interventions that reduce time to initiation of breastfeeding should be encouraged in health care systems given the increase in health facility delivery. Programs and policies should address country-specific practices, including the practice of and the delay in breastfeeding related to Cesarean section.

REFERENCES

- Aghdas, K., K. Talat, and B. Sepideh. 2014. "Effect of Immediate and Continuous Mother–Infant Skin-to-Skin Contact on Breastfeeding Self-Efficacy of Primiparous Women: A Randomised Control Trial." *Women and Birth* 27(1):37-40.
- Ballard, O., and A. L. Morrow. 2013. "Human Milk Composition: Nutrients and Bioactive Factors." *Pediatric Clinics of North America* 60(1):49-74.
- Balogun, O. O., A. Dagvadorj, J. Yourkavitch, K. da Silva Lopes, M. Suto, Y. Takemoto, R. Mori, P. Rayco-Solon, and E. Ota. 2017. "Health Facility Staff Training for Improving Breastfeeding Outcome: A Systematic Review for Step 2 of the Baby-Friendly Hospital Initiative." *Breastfeeding Medicine* 12(9):537-546.
- Boerma, T., C. Ronsmans, D.vY. Melesse, A. J. Barros, F.vC. Barros, L. Juan, A.v-B. Moller, L. Say, A. R. Hosseinpoor, and M. Yi. 2018. "Global Epidemiology of Use of and Disparities in Caesarean Sections." *The Lancet* 392(10155):1341-1348.
- Debes, A. K., A. Kohli, N. Walker, K. Edmond, and L. C. Mullany. 2013. "Time to Initiation of Breastfeeding and Neonatal Mortality and Morbidity: A Systematic Review." *BMC Public Health* 13(Suppl 3):s19.
- Guala, A., L. Boscardini, R. Visentin, P. Angellotti, L. Grugni, M. Barbaglia, E. Chapin, E. Castelli, and E. Finale. 2017. "Skin-to-Skin Contact in Cesarean Birth and Duration of Breastfeeding: A Cohort Study." *The Scientific World Journal* 2017:1940756-1940756.
- Johnson, L. L., and J. H. Shih. 2007. "An Introduction to Survival Analysis." In *Principles and Practice of Clinical Research*, edited by John I. Gallin and Frederick P. Ognibene, 273-282. Burlington, Massachusetts: Academic Press.
- Lunze, K., and D. Hamer. 2012. "Thermal Protection of the Newborn in Resource-Limited Environments." *Journal of Perinatology* 32(5):317.
- Mallick, L., R. K. Benedict, and W. Wang. 2020. "Facility Readiness and Counseling During Antenatal Care and the Relationship with Early Breastfeeding in Haiti and Malawi." *BMC Pregnancy and Childbirth* 20(1):325.
- Moore, E. R., and G. C. Anderson. 2010. "Randomized Controlled Trial of Very Early Mother–Infant Skin-to-Skin Contact and Breastfeeding Status." *Journal of Midwifery & Women's Health* 52(2):116-125.
- Moxon, S. G., H. Ruysen, K. J. Kerber, A. Amouzou, S. Fournier, J. Grove, A.C. Moran, L. M. Vaz, H. Blencowe, and N. Conroy. 2015. "Count Every Newborn; a Measurement Improvement Roadmap for Coverage Data." *BMC Pregnancy and Childbirth* 15(2):S8.

- Neovita Study Group. 2016. "Timing of Initiation, Patterns of Breastfeeding, and Infant Survival: Prospective Analysis of Pooled Data from Three Randomised Trials." *Lancet Global Health* 4(4):e266-75.
- Rollins, N. C., N. Bhandari, N. Hajeebhoy, S. Horton, C. K. Lutter, J. C. Martines, E. G. Piwoz, L. M. Richter, and C. G. Victora. 2016. "Why Invest, and What It Will Take to Improve Breastfeeding Practices?" *Lancet* 387(10017):491-504.
- Safari, K., A. A. Saeed, S. S. Hasan, and L. Moghaddam-Banaem. 2018. "The Effect of Mother and Newborn Early Skin-to-Skin Contact on Initiation of Breastfeeding, Newborn Temperature and Duration of Third Stage of Labor." *International Breastfeeding Journal* 13(1):32.
- Saxton, A., K. Fahy, and C. Hastie. 2014. "Effects of Skin-to-Skin Contact and Breastfeeding at Birth on the Incidence of PPH: A Physiologically Based Theory." *Women and Birth* 27(4):250-253.
- Saxton, A., K. Fahy, M. Rolfe, V. Skinner, and C. Hastie. 2015. "Does Skin-to-Skin Contact and Breast Feeding at Birth Affect the Rate of Primary Postpartum Haemorrhage: Results of a Cohort Study." *Midwifery* 31(11):1,110-1,117.
- Sharma, I.K., and A. Byrne. 2016. "Early Initiation of Breastfeeding: A Systematic Literature Review of Factors and Barriers in South Asia." *International Breastfeeding Journal* 11:17-17.
- Singh, K., S.vM. Khan, L. Carvajal-Aguirre, P. Brodish, A. Amouzou, and A. Moran. 2017. "The Importance of Skin-to-Skin Contact for Early Initiation of Breastfeeding in Nigeria and Bangladesh." *Journal of Global Health* 7(2).
- Smith, E.vR., L. Hurt, R. Chowdhury, B. Sinha, W. Fawzi, K. M. Edmond, et al. 2017. "Delayed Breastfeeding Initiation and Infant Survival: A Systematic Review and Meta-Analysis." *PLOS One* 12(7):e0180722.
- Stanton, C. K., B. Rawlins, M. Drake, M. dos Anjos, D. Cantor, L. Chongo, L. Chavane, M. da Luz Vaz, and J. Ricca. 2013. "Measuring Coverage in Mnch: Testing the Validity of Women's Self-Report of Key Maternal and Newborn Health Interventions During the Peripartum Period in Mozambique." *PLOS One* 8(5):e60694.
- Stevens, J., V. Schmied, E. Burns, and H. Dahlen. 2014. "Immediate or Early Skin-to-Skin Contact after a C Aesarean Section: A Review of the Literature." *Maternal & Child Nutrition* 10(4):456-473.
- Takahashi, K., T. Ganchimeg, E. Ota, J. P. Vogel, J. P. Souza, M. Laopaiboon, C. P. Castro, K. Jayaratne, E. Ortiz-Panoso, and P. Lumbiganon. 2017. "Prevalence of Early Initiation of Breastfeeding and Determinants of Delayed Initiation of Breastfeeding: Secondary Analysis of the Who Global Survey." *Scientific Reports* 7:44868.
- Victora, C. G., R. Bahl, A. J. Barros, G. V. Franca, S. Horton, J. Krusevec, S. Murch, M. J. Sankar, N. Walker, N. C. Rollins, and G. Lancet Breastfeeding Series. 2016. "Breastfeeding in the 21st Century: Epidemiology, Mechanisms, and Lifelong Effect." *Lancet* 387(10017):475-90.

WHO. 2017. *Guideline: Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services*. Geneva, Switzerland: World Health Organization. <https://www.who.int/nutrition/publications/guidelines/breastfeeding-facilities-maternity-newborn/en/>.

WHO. 2018a. *Guideline: Counselling of Women to Improve Breastfeeding Practices*. Geneva: World Health Organization. <https://www.who.int/nutrition/publications/guidelines/counselling-women-improve-bf-practices/en/>.

WHO. 2018b. *Implementation Guidance: Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services—the Revised Baby-Friendly Hospital Initiative*. Geneva: World Health Organization. <http://www.who.int/nutrition/publications/infantfeeding/bfhi-implementation/en/>.

WHO, and UNICEF. 2018. *Reaching Every Newborn National 2020 Milestones: 2018 Progress Report*. Geneva, Switzerland: WHO.

WHO Maternal and Newborn Health/Safe Motherhood Unit. 1997. *Thermal Protection of the Newborn: A Practical Guide*. Geneva, Switzerland: WHO.

APPENDICES

Appendix Table 1 Time to initiation of breastfeeding, percent and 95% confidence interval

Region	Country	First hour	1-2 hours	3-5 hours	6-23 hours	Next day	2-4 days	5+ days, never breastfed, missing
North Africa, West & Central Asia, Europe	Albania 2017-18	56.6 (51.9,61.2)	21.9 (18.2,26.2)	7.3 (5.6,9.4)	1.8 (1.1,3.0)	3.3 (1.9,5.7)	2.0 (1.2,3.2)	7.1 (5.3,9.4)
	Armenia 2015-16	41.0 (36.7,45.5)	24.6 (21.2,28.4)	14.2 (11.3,17.7)	6.0 (4.1,8.6)	7.1 (5.2,9.5)	2.2 (1.3,3.6)	4.9 (3.4,7.1)
	Egypt 2014	27.2 (25.7,28.8)	28.2 (26.9,29.6)	16.7 (15.6,17.9)	6.7 (6.0,7.5)	6.0 (5.2,6.8)	8.7 (7.8,9.6)	6.5 (5.8,7.3)
	Jordan 2017-18	67.3 (64.7,69.8)	9.4 (7.9,11.2)	4.1 (3.3,5.0)	2.2 (1.5,3.0)	3.7 (2.9,4.6)	4.3 (3.4,5.4)	9.1 (7.9,10.6)
	Maldives 2016-17	67.2 (63.1,71.0)	17.3 (14.3,20.6)	3.7 (2.3,5.9)	1.6 (0.8,2.9)	3.4 (2.1,5.4)	4.1 (2.5,6.6)	2.8 (1.7,4.6)
	Tajikistan 2017	62.0 (58.4,65.4)	24.3 (22.0,26.8)	7.1 (5.2,9.5)	1.1 (0.7,1.7)	1.5 (1.1,2.1)	2.0 (1.5,2.8)	2.0 (1.4,2.7)
	Bangladesh 2014	51.4 (48.7,54.1)	30.5 (28.0,33.0)	5.4 (4.5,6.6)	2.9 (2.3,3.7)	2.6 (2.1,3.4)	4.1 (3.4,5.1)	3.0 (2.4,3.8)
	Cambodia 2014	63.2 (60.7,65.7)	18.4 (16.7,20.3)	4.3 (3.4,5.5)	2.1 (1.5,3.0)	3.1 (2.3,4.2)	5.1 (4.1,6.2)	3.7 (2.9,4.6)
	India 2015-16	42.0 (41.5,42.6)	32.8 (32.3,33.3)	5.5 (5.3,5.7)	2.1 (2.0,2.3)	4.9 (4.7,5.1)	8.1 (7.8,8.4)	4.5 (4.3,4.8)
South & Southeast Asia	Indonesia 2017	57.0 (55.4,58.7)	9.2 (8.4,10.1)	4.1 (3.6,4.8)	4.0 (3.4,4.6)	6.2 (5.6,7.0)	11.0 (10.1,12.0)	8.4 (7.6,9.3)
	Myanmar 2015-16	67.3 (64.2,70.3)	11.9 (10.1,13.9)	3.6 (2.7,4.8)	2.2 (1.5,3.0)	5.7 (4.5,7.3)	6.3 (5.1,7.8)	3.0 (2.2,4.1)
	Nepal 2016	55.1 (52.1,58.1)	26.3 (23.9,28.8)	6.5 (5.4,7.9)	2.3 (1.8,3.1)	2.8 (2.0,3.8)	5.7 (4.3,7.4)	1.3 (0.8,2.0)
	Pakistan 2017-18	19.7 (17.5,22.1)	19.0 (17.1,21.0)	10.7 (9.2,12.2)	6.7 (5.7,8.0)	11.3 (9.8,12.9)	25.8 (23.2,28.6)	6.9 (5.7,8.3)
	Philippines 2017	57.3 (54.7,59.8)	17.4 (15.6,19.3)	7.3 (6.0,8.9)	3.4 (2.7,4.3)	2.9 (2.3,3.7)	4.6 (3.2,6.4)	7.2 (6.1,8.5)
	Timor-Leste 2016	75.9 (73.3,78.4)	14.6 (12.7,16.8)	1.5 (1.1,2.2)	1.4 (0.9,2.0)	1.8 (1.2,2.7)	1.4 (1.0,2.1)	3.3 (2.5,4.3)
	Angola 2015-16	48.9 (46.3,51.6)	28.8 (26.6,31.0)	4.6 (3.8,5.6)	2.3 (1.8,2.9)	6.6 (5.5,7.8)	4.3 (3.6,5.0)	4.6 (3.9,5.4)
	Benin 2017-18	54.8 (52.8,56.7)	19.5 (18.0,21.2)	8.4 (7.5,9.3)	3.4 (2.9,4.0)	6.6 (5.8,7.5)	4.5 (3.9,5.3)	2.8 (2.4,3.3)
	Burundi 2016-2017	85.4 (84.2,86.6)	10.6 (9.6,11.7)	1.4 (1.1,1.8)	0.9 (0.7,1.3)	0.5 (0.3,0.7)	0.5 (0.3,0.7)	0.7 (0.5,1.0)
Sub-Saharan Africa	Chad 2014-15	23.2 (21.0,25.6)	9.0 (7.9,10.2)	6.5 (5.7,7.5)	2.7 (2.2,3.3)	12.1 (10.9,13.4)	41.8 (39.4,44.1)	4.7 (4.0,5.6)
	Ethiopia 2016	74.2 (71.8,76.4)	12.5 (10.9,14.2)	3.7 (2.9,4.7)	2.7 (2.1,3.4)	1.4 (1.0,1.9)	3.1 (2.3,4.2)	2.5 (1.9,3.4)
	Ghana 2014	56.3 (53.3,59.2)	20.7 (18.4,23.2)	6.1 (5.0,7.5)	5.3 (4.2,6.7)	4.6 (3.6,5.8)	5.9 (4.9,7.2)	1.1 (0.7,1.8)
	Kenya 2014	62.7 (60.5,64.9)	16.9 (15.3,18.6)	6.5 (5.5,7.6)	5.4 (4.5,6.5)	3.5 (2.7,4.5)	3.7 (2.9,4.7)	1.4 (0.9,2.0)
	Lesotho 2014	65.7 (62.5,68.7)	12.5 (10.4,14.9)	5.6 (4.3,7.1)	3.3 (2.4,4.5)	4.8 (3.7,6.3)	3.1 (2.2,4.3)	5.1 (3.8,7.0)
	Malawi 2015-16	77.1 (75.7,78.5)	14.9 (13.7,16.1)	3.2 (2.7,3.8)	2.1 (1.7,2.7)	0.8 (0.6,1.2)	0.5 (0.3,0.8)	1.3 (1.0,1.7)
	Senegal 2016	33.8 (31.8,35.8)	27.3 (25.6,29.1)	17.6 (16.1,19.1)	12.1 (10.7,13.6)	3.3 (2.7,4.1)	3.9 (3.1,4.9)	2.1 (1.6,2.6)
	South Africa 2016	68.3 (65.1,71.4)	8.5 (6.8,10.6)	2.8 (1.9,4.0)	1.8 (1.2,2.7)	1.4 (0.9,2.1)	2.1 (1.2,3.6)	15.1 (12.9,17.7)
	Tanzania 2015-16	51.7 (49.3,54.0)	25.3 (23.6,27.1)	9.0 (8.0,10.2)	7.8 (6.8,9.0)	3.4 (2.7,4.3)	2.0 (1.6,2.6)	0.8 (0.5,1.2)
	Uganda 2016	66.8 (65.2,68.5)	20.0 (18.7,21.4)	5.2 (4.5,5.9)	2.9 (2.5,3.4)	1.9 (1.6,2.4)	1.6 (1.3,2.0)	1.5 (1.2,2.0)
	Zimbabwe 2015	58.3 (55.3,61.2)	22.7 (20.6,25.0)	7.2 (6.1,8.5)	6.1 (5.0,7.4)	2.6 (1.8,3.7)	1.8 (1.2,2.5)	1.3 (0.9,1.9)
	Latin America & Caribbean	Guatemala 2014-15	63.5 (61.6,65.4)	11.9 (10.7,13.2)	6.3 (5.5,7.1)	5.3 (4.5,6.1)	3.6 (3.0,4.2)	4.2 (3.6,4.9)
Haiti 2016-17	47.9 (45.4,50.5)	24.4 (22.1,26.8)	8.5 (7.2,10.0)	3.0 (2.2,3.9)	5.7 (4.7,7.0)	5.6 (4.5,6.9)	5.0 (3.8,6.4)	

Appendix Table 2 Background characteristics (% and N) of women included in the survival analysis, by country

	Europe and Asia																			
	Albania 2017-18		Armenia 2015-16		Jordan 2017-18		Maldives 2016-17		Tajikistan 2017		Indonesia 2017		Nepal 2016		Pakistan 2017-18		Philippines 2017		Timor-Leste 2016	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Place and mode of delivery																				
Home, vaginal	1.1	11	0.7	4	1.0	33	4.9	51	10.5	253	16.8	1,009	35.9	697	29.7	1,067	17.0	581	49.2	1,340
Facility, vaginal	68.1	654	79.7	503	73.4	2,302	52.0	543	83.8	2,025	65.2	3,920	54.6	1,059	45.7	1,644	68.3	2,339	47.3	1,289
Facility, C-section	30.8	296	19.6	124	25.6	802	43.1	450	5.7	138	18.0	1,081	9.5	185	24.7	887	14.8	507	3.5	94
Immediate skin-to-skin																				
No	17.9	172	20.4	129	26.5	830	34.3	358	11.0	265	39.3	2,363	37.0	718	91.7	3,299	24.7	846	36.9	1,003
Yes	82.1	788	79.6	503	73.5	2,306	65.7	686	89.0	2,151	60.7	3,648	63.0	1,222	8.3	300	75.3	2,582	63.1	1,719
PNC in first hour after birth																				
No	56.5	543	68.7	434	81.8	2,567	57.7	602	82.3	1,988	88.9	5,345	76.5	1,483	55.5	1,998	73.5	2,520	96.6	2,629
Yes	43.5	418	31.3	197	18.2	570	42.3	442	17.7	428	11.1	665	23.5	457	44.5	1,601	26.5	908	3.4	94
Number of ANC visits																				
0-3 visits	20.2	194	3.0	19	7.2	226	17.2	180	34.5	832	9.6	576	28.6	555	48.2	1,734	13.9	478	23.0	625
4 or more	79.8	767	97.0	613	92.8	2,910	82.8	864	65.5	1,584	90.4	5,435	71.4	1,385	51.8	1,865	86.1	2,950	77.0	2,097
Size at birth																				
Normal	90.5	870	92.9	586	80.9	2,538	83.7	874	88.2	2,131	90.5	5,437	79.8	1,548	71.3	2,566	85.8	2,940	81.8	2,226
Small or very small	4.0	38	4.7	30	16.0	502	13.1	136	6.9	166	5.9	353	13.7	266	23.2	835	11.1	382	9.4	256
Large or very large	5.5	53	2.5	16	3.1	96	3.2	34	4.9	119	3.7	221	6.5	126	5.5	197	3.1	106	8.8	241
Sex of child																				
Male	49.7	477	51.0	322	51.8	1,626	49.2	513	51.5	1,243	51.3	3,084	53.6	1,041	49.7	1,789	51.9	1,778	51.3	1,397
Female	50.3	483	49.0	309	48.2	1,510	50.8	531	48.5	1,173	48.7	2,927	46.4	899	50.3	1,810	48.1	1,650	48.7	1,326
Parity																				
1	37.8	363	41.5	262	24.1	756	36.6	382	27.1	654	32.3	1,944	40.2	781	22.9	825	30.1	1,030	25.0	679
2-3	57.4	552	54.9	347	40.9	1,284	53.5	559	54.4	1,314	55.0	3,304	44.5	863	40.1	1,443	46.6	1,596	36.3	988
4+	4.8	46	3.5	22	35.0	1,096	9.9	103	18.6	448	12.7	763	15.3	297	37.0	1,331	23.4	801	38.8	1,056
Marital status																				
Not married ¹	1.2	11	1.2	8	0.7	23	1.8	18	2.0	49	1.8	111	0.3	5	0.9	34	7.3	250	2.1	56
Married	98.8	950	98.8	624	99.3	3,114	98.2	1,026	98.0	2,367	98.2	5,900	99.7	1,935	99.1	3,565	92.7	3,177	97.9	2,666
Exposed to TV, radio, or newspaper																				
Less than once a week	9.5	91	8.1	51	19.9	625	6.7	70	14.8	358	14.8	889	46.1	894	51.5	1,854	19.0	652	59.9	1,631
At least once a week	90.5	870	91.9	580	80.1	2,511	93.3	974	85.2	2,058	85.2	5,122	53.9	1,046	48.5	1,745	81.0	2,776	40.1	1,092
Employment																				
Not employed	67.8	652	77.0	486	88.7	2,781	59.3	619	85.7	2,070	56.1	3,374	46.5	903	84.2	3,030	60.5	2,075	66.1	1,800
Employed	32.2	309	23.0	146	11.3	356	40.7	425	14.3	346	43.9	2,636	53.5	1,037	15.8	568	39.5	1,353	33.9	923
Education																				
None or primary	44.8	430	5.1	32	7.3	228	15.6	163	7.8	188	24.1	1,447	48.4	938	63.7	2,293	17.1	587	39.7	1,082
Secondary or higher	55.2	531	94.9	599	92.7	2,909	84.4	881	92.2	2,228	75.9	4,563	51.6	1,002	36.3	1,306	82.9	2,841	60.3	1,640
Wealth																				
First	21.7	208	17.5	111	25.6	804	18.7	196	17.8	430	20.3	1,222	21.2	411	22.1	794	27.2	932	19.7	537
Second	19.1	183	21.5	136	24.4	766	22.1	231	20.1	486	20.4	1,225	21.0	408	19.2	692	22.0	753	20.1	547
Middle	19.9	191	18.2	115	23.7	744	21.5	224	23.3	563	19.8	1,192	22.9	444	22.0	790	20.2	692	20.7	562
Fourth	21.5	207	18.5	117	16.3	510	17.7	185	22.5	545	20.4	1,226	20.6	399	18.5	665	16.7	571	20.6	560
Highest	17.8	171	24.3	153	10.0	313	20.0	208	16.2	392	19.1	1,145	14.3	278	18.3	659	14.0	480	19.0	516
Place of residence																				
Urban	57.3	551	58.3	368	88.2	2,765	37.0	386	19.4	468	48.2	2,896	53.6	1,041	32.9	1,185	44.0	1,507	27.3	744
Rural	42.7	410	41.7	264	11.8	371	63.0	658	80.6	1,948	51.8	3,115	46.4	900	67.1	2,413	56.0	1,921	72.7	1,979
Total		961		631		3,137		1,044		2,416		6,011		1,940		3,599		3,428		2,723

Continued...

Appendix Table 2—Continued

	sub-Saharan Africa and Haiti																					
	Angola 2015-16		Benin 2017-18		Burundi 2016-2017		Ethiopia 2016		Malawi 2015-16		Senegal 2016		South Africa 2016		Tanzania 2015-16		Uganda 2016		Zimbabwe 2015		Haiti 2016-17	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Place and mode of delivery																						
Home, vaginal	52.1	2,632	14.8	780	14.6	779	63.9	2,641	7.0	453	19.9	860	3.9	45	35.1	1,429	23.5	1,340	18.9	451	63.0	1,430
Facility, vaginal	44.0	2,224	80.3	4,221	80.3	4,278	33.7	1,394	86.5	5,615	74.9	3,234	72.9	844	58.6	2,386	69.5	3,966	75.2	1,797	32.4	736
Facility, C-section	3.9	199	4.8	253	5.1	274	2.4	101	6.5	425	5.2	224	23.3	269	6.4	259	7.1	403	6.0	142	4.6	104
Immediate skin-to-skin																						
No	53.2	2,691	23.7	1,245	86.7	4,622	72.0	2,977	34.4	2,236	47.8	2,066	34.1	395	66.0	2,690	25.7	1,465	49.4	1,180	70.2	1,595
Yes	46.8	2,364	76.3	4,008	13.3	708	28.0	1,159	65.6	4,256	52.2	2,253	65.9	763	34.0	1,384	74.3	4,243	50.6	1,210	29.8	676
PNC in first hour after birth																						
No	95.5	4,826	73.4	3,856	78.7	4,195	95.4	3,944	77.3	5,022	44.3	1,914	46.6	540	90.3	3,679	78.7	4,492	67.0	1,602	85.1	1,932
Yes	4.5	230	26.6	1,398	21.3	1,135	4.6	192	22.7	1,471	55.7	2,404	53.4	618	9.7	395	21.3	1,216	33.0	788	14.9	339
Number of ANC visits																						
0-3 visits	38.9	1,968	49.3	2,591	48.2	2,570	66.4	2,748	51.6	3,353	44.4	1,916	24.6	285	51.9	2,115	39.5	2,252	26.3	629	37.1	843
4 or more	61.1	3,088	50.7	2,663	51.8	2,760	33.6	1,388	48.4	3,139	55.6	2,403	75.4	873	48.1	1,959	60.5	3,456	73.7	1,761	62.9	1,428
Size at birth																						
Normal	74.6	3,769	77.2	4,058	80.4	4,285	48.3	1,998	76.5	4,967	71.0	3,066	78.3	907	82.3	3,355	73.6	4,203	81.9	1,958	58.5	1,329
Small or very small	10.1	509	12.2	643	11.3	604	27.4	1,132	12.0	781	18.1	780	16.5	191	9.1	370	12.5	714	9.8	235	26.7	605
Large or very large	15.4	778	10.5	553	8.3	441	24.3	1,005	11.5	745	11.0	473	5.2	60	8.6	349	13.9	791	8.3	197	14.8	337
Sex of child																						
Male	49.6	2,509	50.0	2,629	50.6	2,697	48.0	1,986	50.6	3,286	50.5	2,182	51.7	598	50.9	2,074	51.1	2,915	50.4	1,204	49.1	1,115
Female	50.4	2,547	50.0	2,625	49.4	2,633	52.0	2,150	49.4	3,206	49.5	2,137	48.3	560	49.1	2,000	48.9	2,793	49.6	1,186	50.9	1,156
Parity																						
1	20.8	1,051	21.8	1,147	17.3	921	20.5	847	27.5	1,787	24.6	1,061	34.8	403	27.1	1,105	22.4	1,279	26.5	634	28.9	656
2-3	35.4	1,789	35.9	1,885	34.5	1,839	30.5	1,262	36.3	2,357	34.6	1,493	51.6	597	34.3	1,397	34.8	1,986	44.8	1,071	40.1	911
4+	43.8	2,216	42.3	2,222	48.2	2,570	49.0	2,027	36.2	2,348	40.9	1,765	13.6	158	38.6	1,573	42.8	2,443	28.7	685	31.0	704
Marital status																						
Not married ¹	25.4	1,282	5.8	303	8.9	475	4.4	182	16.3	1,061	6.3	272	57.0	660	18.4	750	15.8	902	13.4	320	13.9	317
Married	74.6	3,773	94.2	4,950	91.1	4,855	95.6	3,954	83.7	5,431	93.7	4,047	43.0	498	81.6	3,324	84.2	4,806	86.6	2,071	86.1	1,954
Exposed to TV, radio, or newspaper																						
Less than once a week	58.2	2,941	60.1	3,155	72.7	3,876	80.6	3,334	65.9	4,281	28.3	1,221	20.8	240	52.9	2,156	37.8	2,160	50.2	1,201	66.4	1,508
At least once a week	41.8	2,115	39.9	2,099	27.3	1,455	19.4	802	34.1	2,212	71.7	3,098	79.2	918	47.1	1,918	62.2	3,548	49.8	1,189	33.6	763
Employment																						
Not employed	28.9	1,460	20.1	1,057	7.0	373	58.2	2,406	31.8	2,065	44.0	1,899	70.7	819	19.2	782	18.7	1,066	53.7	1,284	40.9	928
Employed	71.1	3,596	79.9	4,197	93.0	4,957	41.8	1,730	68.2	4,428	56.0	2,420	29.3	339	80.8	3,292	81.3	4,642	46.3	1,106	59.1	1,343
Education																						
None or primary	66.5	3,362	81.8	4,295	88.0	4,693	91.2	3,773	78.7	5,109	81.3	3,509	9.7	112	83.1	3,384	70.4	4,017	33.2	793	57.7	1,311
Secondary or higher	33.5	1,693	18.2	958	12.0	638	8.8	363	21.3	1,383	18.7	810	90.3	1,046	16.9	691	29.6	1,690	66.8	1,597	42.3	960
Wealth																						
First	21.8	1,100	21.0	1,102	22.1	1,176	23.2	961	25.4	1,651	24.5	1,060	23.5	272	24.6	1,003	22.4	1,281	24.8	593	26.5	602
Second	23.3	1,178	20.7	1,090	22.1	1,179	22.2	920	22.6	1,469	22.3	963	23.6	273	20.9	853	21.3	1,215	20.5	490	22.7	516
Middle	21.8	1,103	20.7	1,086	20.6	1,099	20.8	859	19.3	1,254	20.6	888	20.0	232	18.6	758	19.1	1,089	18.2	434	21.7	493
Fourth	18.0	909	20.0	1,048	18.9	1,008	18.3	758	16.9	1,097	17.2	744	18.7	216	19.0	776	17.6	1,005	22.5	538	15.8	358
Highest	15.2	766	17.6	927	16.3	869	15.4	638	15.7	1,022	15.4	664	14.2	164	16.8	684	19.6	1,119	14.0	335	13.3	302
Place of residence																						
Urban	60.8	3,075	38.2	2,009	9.0	478	11.8	489	13.7	886	36.0	1,554	63.2	731	27.4	1,115	21.2	1,207	27.9	666	32.9	746
Rural	39.2	1,980	61.8	3,245	91.0	4,852	88.2	3,647	86.3	5,606	64.0	2,765	36.8	427	72.6	2,959	78.8	4,501	72.1	1,724	67.1	1,525
Total		5,056		5,254		5,330		4,136		6,492		4,319		1,158		4,074		5,708		2,390		2,271

¹Sample of women is ever-married only in Jordan and Pakistan.

Appendix Table 3a Hazard ratio (HR) and 95% confidence intervals (CI) according to multivariable Weibull regressions of time to initiation of breastfeeding, Europe and Asia

	Albania 2017-18		Armenia 2015-16		Jordan 2017-18		Maldives 2016-17		Tajikistan 2017	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Place and mode of delivery (ref = Facility, vaginal)										
Home, vaginal	1.6**	1.2, 2.1	1.8*	1.0, 3.3	0.8	0.5, 1.2	0.7	0.3, 1.3	1.4**	1.1, 1.7
Facility, C-section	0.5***	0.4, 0.7	0.4***	0.3, 0.6	0.5***	0.4, 0.6	0.8	0.7, 1.0	0.3***	0.2, 0.5
Immediate skin-to-skin (ref = no)										
Yes	6.2***	4.0, 9.9	1.7***	1.3, 2.2	4.2***	3.4, 5.2	1.8***	1.4, 2.4	2.2***	1.5, 3.2
PNC in first hour after birth (ref = no)										
Yes	1.2	0.9, 1.6	0.9	0.7, 1.2	0.8*	0.6, 1.0	0.6***	0.4, 0.7	1.2	0.9, 1.5
Number of ANC visits (ref = 4 or more)										
0-3 visits ¹	1.0	0.8, 1.3	1.2	0.8, 1.8	1.2	0.9, 1.5	0.8	0.6, 1.1	1.1	1.0, 1.3
Size at birth (ref = normal)										
Small or very small	0.8	0.5, 1.3	0.4*	0.2, 0.9	1.2*	1.0, 1.4	0.5***	0.4, 0.6	0.5***	0.3, 0.7
Large or very large	1.6***	1.2, 2.0	0.9	0.5, 1.7	0.6	0.2, 1.3	0.6	0.3, 1.2	1.1	0.9, 1.3
Sex of child (ref = male)										
Female	1.1	0.9, 1.3	1.2	0.9, 1.4	0.9	0.8, 1.1	1.2	0.9, 1.5	1.0	0.9, 1.2
Parity (ref = 1)										
2-3	1.0	0.8, 1.2	1.3*	1.0, 1.5	1.0	0.8, 1.1	1.5**	1.2, 2.0	1.5***	1.2, 1.8
4+	0.9	0.6, 1.3	1.9*	1.1, 3.3	0.9	0.8, 1.1	1.5	1.0, 2.2	1.6***	1.3, 2.0
Marital status										
Not married ¹	1.5**	1.1, 2.1	2.4*	1.1, 5.2	0.9	0.4, 1.8	0.5*	0.2, 1.0	1.0	0.7, 1.7
Exposed to TV, radio, or newspaper (ref = < once per week)										
At least once a week	1.4	1.0, 2.0	1.6*	1.1, 2.4	1.1	1.0, 1.3	1.0	0.7, 1.3	1.1	0.9, 1.4
Employment (ref = not employed)										
Employed	0.9	0.8, 1.1	1.0	0.7, 1.3	0.8	0.6, 1.1	0.9	0.7, 1.1	1.1	0.9, 1.3
Education (ref = none or primary)										
Secondary or higher	0.9	0.7, 1.1	1.1	0.6, 2.1	0.9	0.7, 1.1	1.1	0.8, 1.6	1.0	0.8, 1.3
Wealth (ref = Lowest)										
Second	0.8	0.6, 1.2	0.9	0.6, 1.3	0.9	0.8, 1.2	0.8*	0.6, 1.0	0.9	0.7, 1.2
Middle	1.0	0.7, 1.5	0.8	0.6, 1.2	0.9	0.8, 1.2	1.1	0.9, 1.4	1.0	0.8, 1.2
Fourth	1.1	0.8, 1.6	1.3	0.8, 2.1	1.2	0.9, 1.5	1.3*	1.0, 1.7	0.9	0.7, 1.2
Highest	1.5*	1.1, 2.2	1.4	0.9, 2.3	1.4*	1.0, 1.9	0.9	0.5, 1.5	0.9	0.7, 1.2
Place of residence (ref = urban)										
Rural	1.0	0.8, 1.2	1.4*	1.1, 1.9	0.9	0.7, 1.2	na		1.1	0.8, 1.4

Continued...

Appendix Table 3a—Continued

	Indonesia 2017		Nepal 2016		Pakistan 2017-18		Philippines 2017		Timor-Leste 2016	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Place and mode of delivery (ref = Facility, vaginal)										
Home, vaginal	1.0	0.8, 1.1	0.8*	0.6, 1.0	0.9	0.8, 1.0	1.0	0.8, 1.2	1.0	0.9, 1.2
Facility, C-section	0.7***	0.6, 0.7	0.4***	0.3, 0.5	0.6***	0.5, 0.6	0.5***	0.4, 0.6	0.3***	0.2, 0.5
Immediate skin-to-skin (ref = no)										
Yes	1.5***	1.4, 1.7	1.5***	1.2, 1.7	1.2	1.0, 1.4	1.8***	1.5, 2.1	1.1	0.9, 1.3
PNC in first hour after birth (ref = no)										
Yes	1.0	0.8, 1.1	1.2	1.0, 1.4	1.0	0.9, 1.1	1.1	1.0, 1.3	1.1	0.7, 1.7
Number of ANC visits (ref = 4 or more)										
0-3 visits ¹	1.0	0.9, 1.2	0.9	0.8, 1.0	0.9**	0.8, 0.9	1.0	0.9, 1.2	0.9	0.8, 1.1
Size at birth (ref = normal)										
Small or very small	0.9	0.7, 1.0	0.8	0.7, 1.0	0.8***	0.7, 0.9	0.8*	0.7, 1.0	0.8	0.6, 1.1
Large or very large	0.9	0.7, 1.1	1.1	0.8, 1.5	1.2	1.0, 1.4	0.8	0.6, 1.1	0.8	0.6, 1.1
Sex of child (ref = male)										
Female	1.0	0.9, 1.1	1.0	0.9, 1.2	0.9	0.9, 1.0	1.0	0.9, 1.1	1.0	0.9, 1.2
Parity (ref = 1)										
2-3	1.2***	1.1, 1.3	1.4***	1.2, 1.6	1.2**	1.0, 1.3	1.4**	1.1, 1.6	1.7***	1.4, 2.1
4+	1.2**	1.1, 1.4	1.4**	1.1, 1.7	1.3***	1.2, 1.4	1.4***	1.2, 1.8	1.7***	1.4, 2.1
Marital status										
Not married ¹	1.1	0.8, 1.4	1.0	0.6, 1.7	0.9	0.7, 1.3	1.1	0.8, 1.3	0.8	0.5, 1.4
Exposed to TV, radio, or newspaper (ref = < once per week)										
At least once a week	0.9*	0.8, 1.0	1.0	0.9, 1.2	1.1*	1.0, 1.2	0.9	0.8, 1.1	1.0	0.8, 1.2
Employment (ref = not employed)										
Employed	1.0	0.9, 1.1	1.1	0.9, 1.3	0.9	0.8, 1.0	0.9	0.8, 1.1	1.0	0.8, 1.1
Education (ref = none or primary)										
Secondary or higher	1.1*	1.0, 1.3	1.3***	1.1, 1.6	1.0	0.9, 1.1	0.9	0.7, 1.0	1.0	0.9, 1.2
Wealth (ref = Lowest)										
Second	1.0	0.9, 1.1	0.8	0.6, 1.0	1.1	1.0, 1.3	1.0	0.9, 1.2	1.5***	1.2, 1.8
Middle	0.9	0.8, 1.1	0.7*	0.6, 1.0	1.1	1.0, 1.3	0.9	0.7, 1.1	1.3*	1.1, 1.6
Fourth	0.8*	0.7, 1.0	0.7**	0.5, 0.9	1.1	0.9, 1.4	0.6***	0.5, 0.8	1.2	0.9, 1.6
Highest	1.0	0.8, 1.1	0.7*	0.6, 1.0	1.2	0.9, 1.5	0.8	0.6, 1.1	1.4*	1.0, 1.9
Place of residence (ref = urban)										
Rural	1.0	0.9, 1.1	0.8*	0.7, 1.0	1.0	0.9, 1.1	1.0	0.9, 1.2	0.9	0.7, 1.2

¹Sample of women is ever-married only in Jordan and Pakistan; *p<0.05, **p<0.01, ***p<0.001.
na = Not available

Appendix Table 3b Hazard ratio (HR) and 95% confidence intervals (CI) according to multivariable Weibull regressions of time to initiation of breastfeeding, sub-Saharan Africa and Haiti

	Angola 2015-16		Benin 2017-18		Burundi 2016-2017		Ethiopia 2016		Malawi 2015-16	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Place and mode of delivery (ref = Facility, vaginal)										
Home, vaginal	0.9	0.8, 1.1	1.0	0.9, 1.2	0.9	0.7, 1.0	0.9	0.8, 1.1	0.7**	0.5, 0.9
Facility, C-section	0.3***	0.3, 0.4	0.5***	0.4, 0.6	0.2***	0.2, 0.3	0.5***	0.3, 0.7	0.5***	0.4, 0.6
Immediate skin-to-skin (ref = no)										
Yes	1.2*	1.0, 1.3	1.3***	1.2, 1.5	1.2	1.0, 1.3	1.2*	1.0, 1.5	1.1*	1.0, 1.3
PNC in first hour after birth (ref = no)										
Yes	1.1	0.9, 1.4	1.0	0.9, 1.1	0.7***	0.6, 0.9	0.8	0.6, 1.2	1.0	0.9, 1.2
Number of ANC visits (ref = 4 or more)										
0-3 visits ¹	1.0	0.9, 1.1	1.1	1.0, 1.2	0.9	0.8, 1.0	1.0	0.8, 1.1	0.9	0.8, 1.1
Size at birth (ref = normal)										
Small or very small	1.0	0.8, 1.1	0.9	0.8, 1.1	0.7**	0.5, 0.9	0.8*	0.7, 1.0	0.9	0.8, 1.1
Large or very large	1.1	0.9, 1.3	1.0	0.9, 1.2	1.1	0.9, 1.3	0.9	0.8, 1.1	1.1	0.9, 1.2
Sex of child (ref = male)										
Female	1.0	0.9, 1.1	1.0	0.9, 1.1	1.1	0.9, 1.2	1.1*	1.0, 1.3	1.0	0.9, 1.1
Parity (ref = 1)										
2-3	1.2	1.0, 1.3	1.2***	1.1, 1.3	1.3**	1.1, 1.5	1.6***	1.3, 2.0	1.4***	1.2, 1.6
4+	1.2*	1.0, 1.4	1.2**	1.1, 1.3	1.1	0.9, 1.4	1.5***	1.2, 1.8	1.5***	1.3, 1.7
Marital status										
Not married	1.1	0.9, 1.2	0.9	0.8, 1.1	1.0	0.8, 1.2	1.0	0.7, 1.3	1.0	0.9, 1.2
Exposed to TV, radio, or newspaper (ref = < once per week)										
At least once a week	0.9	0.8, 1.0	0.9	0.9, 1.0	1.0	0.8, 1.1	0.9	0.7, 1.1	0.9	0.8, 1.1
Employment (ref = not employed)										
Employed	1.0	0.8, 1.1	1.0	0.9, 1.1	1.4**	1.1, 1.8	0.9	0.7, 1.0	1.0	0.9, 1.1
Education (ref = none or primary)										
Secondary or higher	0.9	0.8, 1.0	1.0	0.9, 1.1	0.9	0.7, 1.1	0.8	0.6, 1.1	0.9	0.8, 1.1
Wealth (ref = Lowest)										
Second	0.9	0.8, 1.1	1.1	0.9, 1.2	0.9	0.8, 1.1	1.1	0.9, 1.5	1.1	0.9, 1.3
Middle	1.0	0.8, 1.2	1.1	0.9, 1.2	0.8	0.7, 1.0	1.1	0.9, 1.4	1.0	0.8, 1.3
Fourth	0.9	0.7, 1.1	1.0	0.9, 1.2	0.9	0.8, 1.1	1.0	0.8, 1.3	1.1	0.9, 1.3
Highest	1.0	0.8, 1.3	1.0	0.8, 1.2	1.1	0.9, 1.4	1.1	0.8, 1.4	1.1	0.9, 1.4
Place of residence (ref = urban)										
Rural	0.9	0.8, 1.1	1.0	0.9, 1.2	1.6*	1.0, 2.4	0.9	0.6, 1.2	1.3*	1.0, 1.6

Continued...

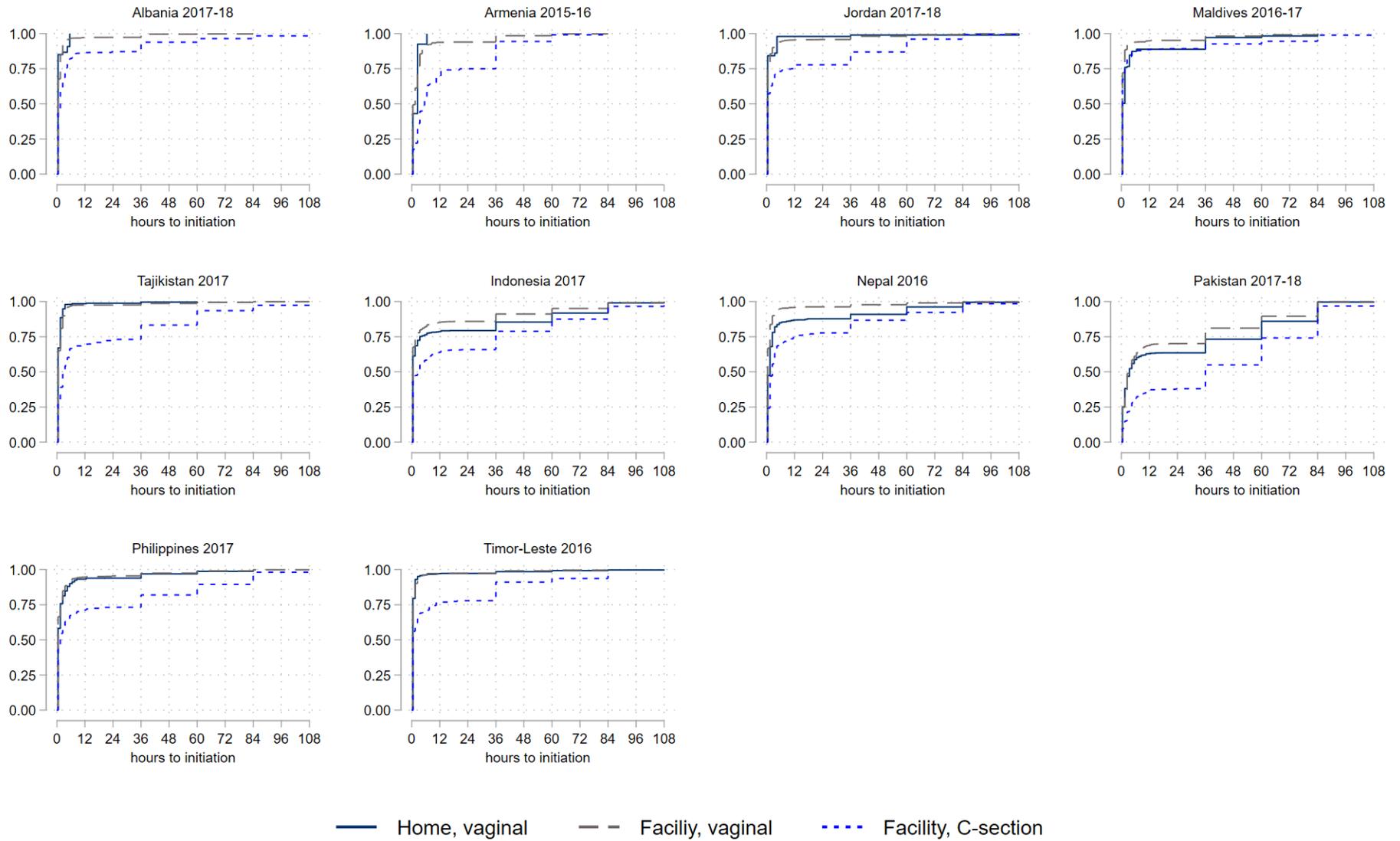
Appendix Table 3b—Continued

	Senegal 2016		South Africa 2016		Tanzania 2015-16		Uganda 2016		Zimbabwe 2015		Haiti 2016-17	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Place and mode of delivery (ref = Facility, vaginal)												
Home, vaginal	0.8**	0.7, 1.0	1.2	0.9, 1.7	0.7***	0.6, 0.8	1.0	0.9, 1.1	0.5***	0.4, 0.7	1.1	0.9, 1.3
Facility, C-section	0.2***	0.2, 0.3	0.9	0.7, 1.1	0.4***	0.3, 0.4	0.4***	0.3, 0.5	0.3***	0.2, 0.3	0.5***	0.4, 0.7
Immediate skin-to-skin (ref = no)												
Yes	1.3***	1.2, 1.4	1.4*	1.1, 1.9	1.2**	1.1, 1.4	1.3***	1.2, 1.5	1.2**	1.1, 1.5	1.3**	1.1, 1.6
PNC in first hour after birth (ref = no)												
Yes	1.0	0.9, 1.1	1.1	0.9, 1.4	0.9	0.7, 1.1	1.0	0.9, 1.2	1.1	1.0, 1.3	1.1	0.9, 1.4
Number of ANC visits (ref = 4 or more)												
0-3 visits ¹	0.9	0.9, 1.0	0.9	0.7, 1.2	0.9	0.8, 1.0	1.0	0.9, 1.0	0.8*	0.7, 1.0	1.0	0.8, 1.1
Size at birth (ref = normal)												
Small or very small	0.9*	0.7, 1.0	0.9	0.7, 1.3	0.8*	0.7, 1.0	0.8**	0.7, 0.9	0.7***	0.6, 0.8	0.9*	0.7, 1.0
Large or very large	1.0	0.8, 1.1	1.1	0.8, 1.5	0.9	0.8, 1.1	0.9*	0.7, 1.0	0.9	0.7, 1.2	0.9	0.8, 1.1
Sex of child (ref = male)												
Female	1.0	0.9, 1.1	1.0	0.9, 1.3	1.1	1.0, 1.2	1.0	0.9, 1.1	1.2**	1.1, 1.4	1.1	0.9, 1.2
Parity (ref = 1)												
2-3	1.4***	1.2, 1.6	1.3	1.0, 1.7	1.2**	1.0, 1.4	1.4***	1.2, 1.6	1.5***	1.3, 1.8	1.2*	1.0, 1.4
4+	1.5***	1.3, 1.7	1.4*	1.0, 1.8	1.1	0.9, 1.3	1.4***	1.2, 1.6	1.5***	1.2, 1.8	1.1	0.9, 1.3
Marital status												
Not married ¹	0.8	0.7, 1.1	1.2	1.0, 1.5	1.0	0.8, 1.1	1.0	0.9, 1.2	1.0	0.8, 1.2	0.9	0.8, 1.1
Exposed to TV, radio, or newspaper (ref = < once per week)												
At least once a week	1.1	0.9, 1.2	0.7*	0.6, 0.9	1.1*	1.0, 1.3	1.0	0.9, 1.1	1.2	1.0, 1.4	1.1	1.0, 1.2
Employment (ref = not employed)												
Employed	1.0	0.9, 1.1	0.9	0.8, 1.2	1.0	0.8, 1.1	1.0	0.9, 1.2	1.0	0.9, 1.2	1.1*	1.0, 1.3
Education (ref = none or primary)												
Secondary or higher	1.1	0.9, 1.2	0.9	0.8, 1.1	1.0	0.8, 1.2	1.1	1.0, 1.3	0.9	0.8, 1.0	0.9	0.8, 1.0
Wealth (ref = Lowest)												
Second	1.0	0.9, 1.2	1.0	0.7, 1.3	1.1	0.9, 1.2	1.1	0.9, 1.2	1.0	0.8, 1.2	0.8*	0.7, 1.0
Middle	1.0	0.9, 1.2	1.1	0.8, 1.4	1.0	0.9, 1.2	1.1	0.9, 1.2	1.2	0.9, 1.5	0.8*	0.6, 1.0
Fourth	1.0	0.8, 1.2	1.0	0.7, 1.4	0.9	0.7, 1.1	1.1	0.9, 1.3	1.1	0.8, 1.4	0.8	0.6, 1.0
Highest	0.9	0.7, 1.2	0.8	0.5, 1.3	0.9	0.7, 1.2	1.2*	1.0, 1.4	1.0	0.7, 1.4	0.8	0.6, 1.0
Place of residence (ref = urban)												
Rural	1.1	1.0, 1.2	0.9	0.7, 1.2	0.8*	0.7, 1.0	1.1	0.9, 1.3	1.2	1.0, 1.5	0.9	0.7, 1.1

Note: *p<0.05, **p<0.01, ***p<0.001

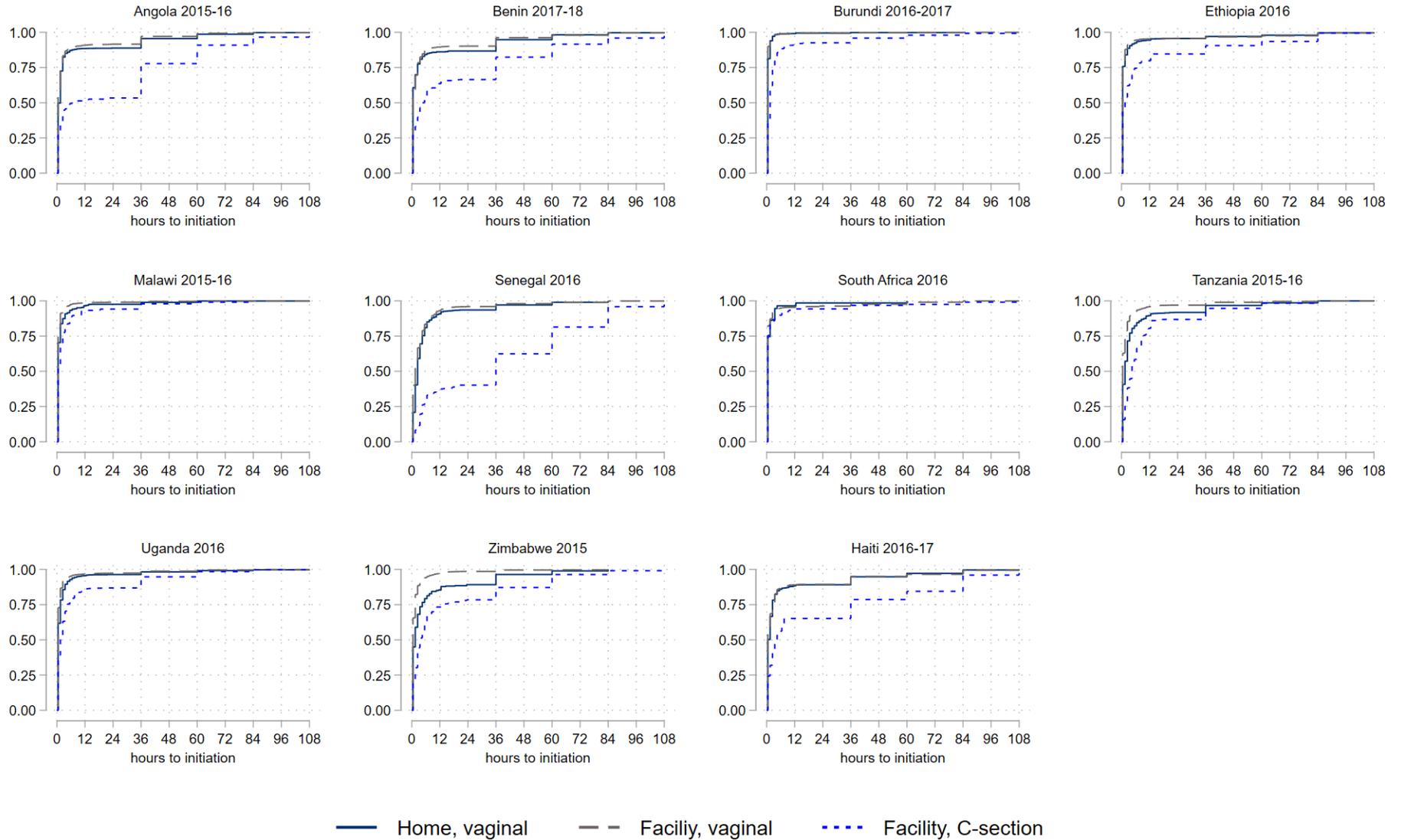
Appendix Figure 1a Hazard to initiation of breastfeeding by place and mode of delivery, Europe and Asia

Europe and Asia



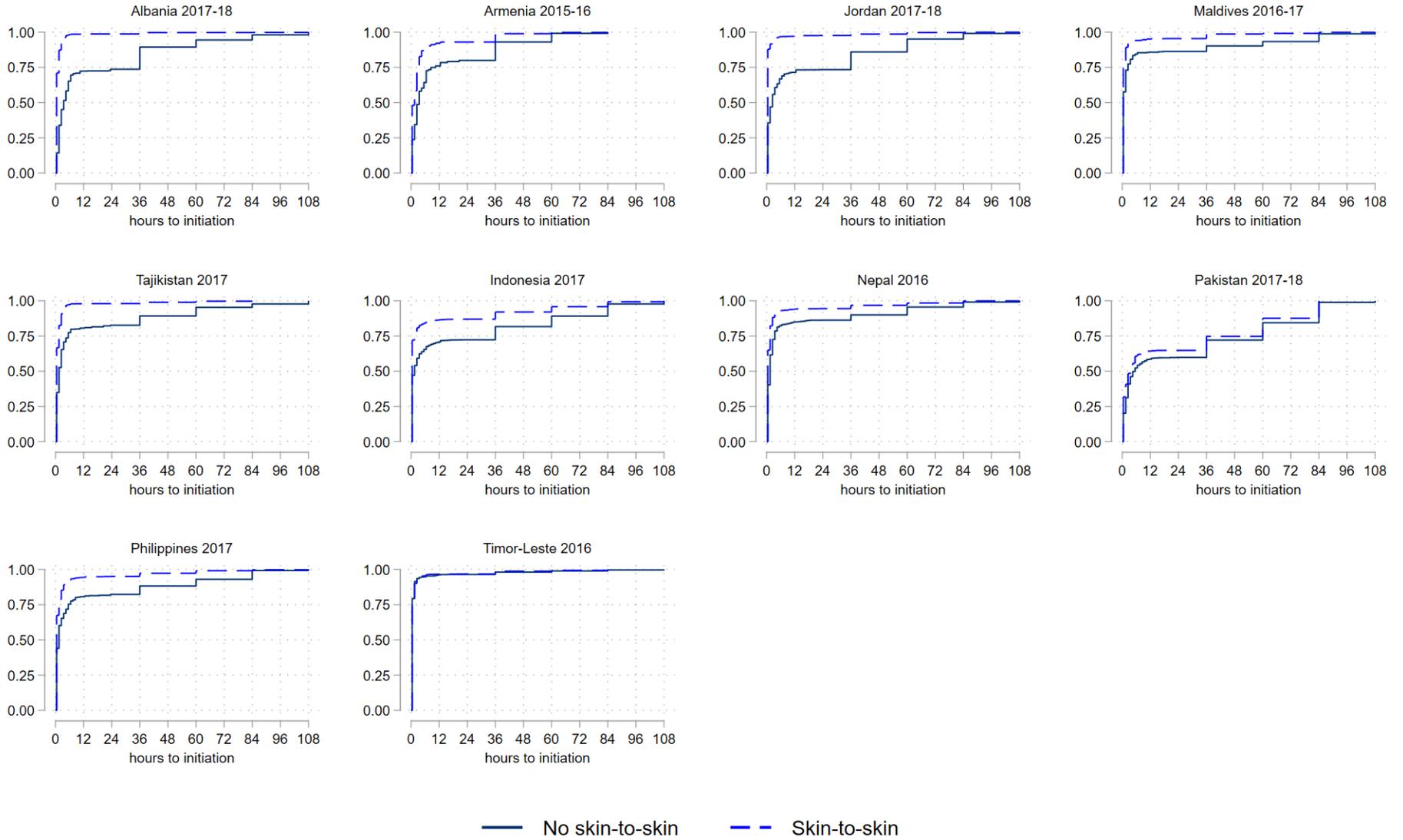
Appendix Figure 1b Hazard to initiation of breastfeeding by place and mode of delivery, sub-Saharan Africa and Haiti

sub-Saharan Africa and Haiti



Appendix Figure 2a Hazard to initiation of breastfeeding by immediate skin-to-skin contact, Europe and Asia

Europe and Asia



sub-Saharan Africa and Haiti

