Adolescent Fertility and Child Health: The Interaction of Maternal Age, Parity and Birth Intervals in Determining Child Health Outcomes

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Abstract: *Introduction*: Contributing to the Sustainable Development Goals, Global Goals, Global Strategy for Women's, Children's and Adolescents' Health 2016-2030, we clarify the interaction between maternal age, parity and birth intervals to examine the effects on child health.

Methods: We use Demographic and Health Survey data from 33 sub-Saharan African countries, and apply multivariate Poisson and logistic models to first examine the effect of maternal age (15-17, 18-19, 20-24, 25-29, 30-39) on infant mortality and stunting, then modify this relationship by parity and account for the confounding effects of short birth intervals.

Results: We find that poor infant mortality outcomes of children born to teen mothers are driven by higher parity children, not first-born children. While first-born children of teen mothers are at a high risk of stunting, they are likely to survive. Short birth intervals have a negative effect on infant survival and stunting outcomes. But controlling for short birth intervals does not completely offset the effect of young age at birth on child survival outcomes.

Discussion: High parity children of young mothers are at a high risk of infant mortality, driven in part – but not completely – by short birth intervals. Policies aimed at delaying first birth are warranted, but should not overshadow the need to support adolescent mothers at risk of multiple births that are tightly spaced.

Keywords: Maternal age, parity, birth intervals, child health, sub-Saharan Africa.

INTRODUCTION

Childbearing in the teen years is high risk for women in terms of their obstetric health and economic welfare trajectory [1]. For women below age 20, the pelvis may not be fully developed, and folate and iron stores are not as high as in women over age 19 [2, 3]. This puts young women at risk of obstetric complications, compromises a child's survival probability and nutritional health outcomes, and lengthens the recovery period following the pregnancy in terms of building up folate and iron. Furthermore, if a woman has more than one child before the age of 20, the additional children to care for and the potentially short birth intervals compounds the nutritional depletion and adds economic pressure to the young mother and her children.

However, the evidence is mixed as to whether poor child health outcomes for children of teen mothers are driven by the age of the mother, the number of children she has, or the interval between births. In this paper we examine the interacting role of each of these elements to determine the driver of the association between teen motherhood and poor child health outcomes.

A substantial body of literature dedicated to understanding the impact of maternal age on child health outcomes has identified a link between young maternal age (<20 years) and a number of adverse child health outcomes [2, 4-15]. Such adverse health outcomes range from increased risk of preterm birth and infant mortality, to under-nutrition later in childhood. One recent study of birth cohorts from five low- and middle-income countries confirmed an association between young maternal age and increased risk of low birth weight, preterm birth, smallness-for-gestational age, stunting, and wasting in infancy and childhood [16]. Further, an earlier study of survey data from two low-income sub-Saharan African countries found that young maternal age was associated with increased risk of low birth weight and infant and child mortality [11]. Maternal age specifically at first birth has been associated with poor child health outcomes [17].

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E-ISSN: 1929-4247/17

Research investigating the influence of parity on child health outcomes indicates that first born and extremely high parity children are at greatest risk of poor outcomes [18-20].

While there is an association between short birth intervals and child health outcomes [21], issues about the causal direction have been raised, as well the different effects between preceding and proceeding intervals [22, 23].

In examining the effects of fertility on child health outcomes, the three elements of fertility (maternal age, parity, birth interval) have not always been included in the same analysis to help us understand the relative importance of each element. Fall *et al*. [16] examined the relationship between maternal age and child health, adjusting for birth interval, and found that at any parity, the 2-year height-for-age Z-scores increased with maternal age, indicating a decrease in stunting risk with maternal age [16]. In a paper synthesizing early findings in the literature, Haaga explores the mechanisms of maternal age, parity, and birth spacing and the association with infant health outcomes [24]. Haaga found that the association of fertility and child health is stronger with primiparity than with young maternal age, and that the analysis of birth intervals is hampered by endogeneity.

Using the Demographic and Health Surveys, Rutstein and Winter [25] provide a comprehensive analysis of the effects of maternal age, parity and birth spacing on child health outcomes. However, in their analysis, while they control for the three fertility variables in the multivariate analysis, they do not explore the dynamics between the three variables as we do in this paper. In a paper by Fink *et al.* [26] they consider the interaction between young maternal age and short birth intervals, and found the confounding effects of short birth intervals on maternal age on child stunting as we do in this paper. However, we extend the analysis to include infant mortality outcomes to highlight the differences this fertility interaction has on survival compared to nutrition. In a meta-analysis, Kozuki *et al*. [27] find that nulliparious adolescent women have the highest odds of neonatal outcomes – small for gestational age, preterm, and neonatal and infant mortality. In our paper, the reference period is longer that the neonatal era, and thus our results contrast with Kozuki's results, where ours suggest that nulliparious adolescent women are at high risk of stunting in their first born, but infant mortality risk is higher for the primiparous or multiparous adolescent women.

We contribute to these papers that addressed the three elements of fertility in the same analysis first by examining the association of maternal age with child health outcomes, then by considering the moderating effect of parity, and thirdly by accounting for the confounding of birth intervals in the maternal age-child health relationship. We consider infant mortality and childhood stunting outcomes to contrast mortality and morbidity effects.

METHODS

Study Design

We diverge from the existing literature on two major analytic fronts: first, we explicitly include all three fertility variables in the analysis – maternal age, parity, and birth intervals; and second, we consider stunting and infant mortality as the outcome variables (birth weight is the typical outcome).

In our analysis, we treat parity as a moderator in the maternal age to child health relationship. We then further the analysis to include birth intervals as a confounder in this relationship, following that if a young woman has had three children by the age of 19, then birth intervals are more likely to be short, which could have a confounding effect on child health. We consider the preceding birth interval: the number of months between the birth of the older sibling and the birth of the younger sibling (index child). A longer preceding birth interval would enable the mother to recover her nutritional stock following the pregnancy, birth, and breastfeeding of the older sibling. Therefore, we expect that short preceding birth intervals increase the risk of stunting in the index child.

We do not consider the proceeding birth interval, where the older child is the index child and the interval to the younger child. As Haaga noted, this interval is subject to endogeneity. The older child may die, and then the next born comes at a relatively short interval as the breastfeeding period was cut short due to the death of the older child, in which mortality causes the short interval. Or, when the older child's nutrition and care is compromised by the birth of a baby to the extent that the older child dies, in which the short birth interval and arrival of a new baby caused the death of the older sibling.

In this paper, we highlight the modifying effect of parity on maternal age, and hypothesize that the statistical marginal effect of maternal age on stunting and infant mortality is statistically different by parity.

The stratified model, with age as the coefficient of interest and stratified by parity, is empirically equivalent to a fully interactive model of maternal age*parity and X*parity, where X includes all the other independent variables.

In furthering the analysis we add in the birth interval as a control variable, and the sample is a sub-set of the whole sample because in order to measure a birth interval we need at least two births. The initial sample includes women who only have one birth. We add birth interval as a control variable, and not an interaction, as we argue that birth interval is a mediator or confounder in the relationship between maternal age and parity. A mediator is a variable that is an intermediate variable that lies on the causal pathway of maternal age*parity to the child health outcome. This means that we hypothesize that low maternal age and high parity (the interaction of maternal age*parity) implies short birth intervals, and that short birth intervals are associated with poor child health outcomes.

What we wanted to highlight was this mediating effect of birth intervals, and that when we think of young women with more than one child we think of short birth intervals as the number of years of exposure in their reproductive years is short (say four years from 15-19) compared to a woman across her entire reproductive years 15-39. In the end, with this model, we can say that age and parity matter for child health outcomes, independent of the effect of short birth intervals on child health, and that short birth intervals may attenuate the direct negative effect of maternal age and parity on child health outcomes, but not completely offset it. That is, maternal age and parity have an effect on child health outcomes independent of the implied short birth intervals of young high parity mothers.

Setting

We use data from the Demographic and Health Surveys (DHS) cross-sectional data that focuses on reproductive and child health. DHS collect information on basic demographic and health indicators with a specific focus on women of reproductive age (15-49 years old) and their children under age five. We appended datasets from 33 sub-Saharan African countries for the latest surveys since 2004 to 2015.

Variables

The outcome variables are infant mortality and stunting. Infant mortality is a binary variable: child died between birth and age 1, or child survived until age 1. Stunting is also a binary variable, defined by the WHO as -2 standard deviations below the median height for age of the reference population. For the infant mortality sample, we restrict to all births that occurred 1-5 years prior to interview so that exposure to the probability of death within the first year of life is uniform across the sample. For stunting, we consider children from 0-59 months of age, as only these children were measured during the data collection.

Data Sources/ Measurement

The key variable of interest is maternal age (15-19, 20-24, 25-29, 30-39), and we stratify by birth order (1^{st} born, 2^{nd} born, 3^{rd} born or higher order). For spacing we consider a sub-sample of women who have had at least two children and another sub-sample who have had at least three children to examine the effects of the preceding birth interval on the younger index child.

We control for child, maternal and household characteristics. The sex of the child (male, female); education attainment of the mother (no schooling or incomplete primary, completed primary or some secondary, complete secondary or some tertiary); employment status of the mother (based on respondents current occupation); marital status of the mother at the time of interview (not married nor in union, married or in union); household head (female, male, or other); household wealth quintile (poorest, poor, medium, rich, richest); location of the household at the time of interview (rural, urban). In the stunting sample we also account for the age in months of the child (0-5, 6-11, 12-23, 24-35, 36-47, 48-59), birth order (first, second, third or higher), number of surviving children to the mother at the time of interview (0, 1, 2 3, and 4 or more). We include country fixed-effects to account for country specific, time invariant, factors.

The unit of analysis in each dataset is the child.

Study Size

In the analysis we consider two analytic datasets derived from the DHS, each with separate eligibility criteria for participants to enter the analytic sample to 1) examine the effect of maternal age on infant mortality, and 2) examine the effect of maternal age on child stunting at time of interview. We refer to the first dataset as the mortality sample and the second dataset as the stunting sample.

We drop twins from the analytic sample, but keep the siblings of twins. In the birth interval analysis, if the

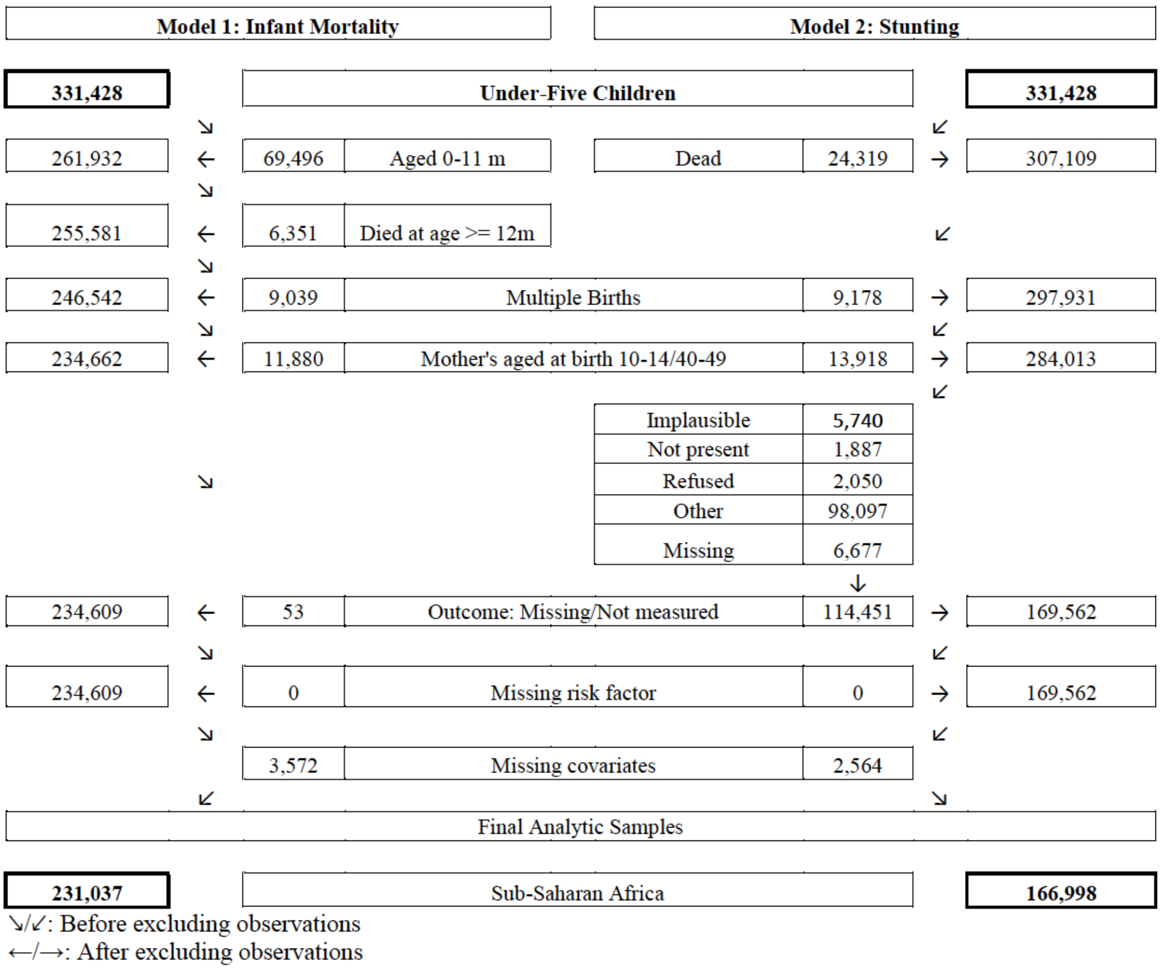

Figure 1: Flow diagram for input data.

sibling is born after older twins, we account for the interval between the younger singleton sibling and the older twins. Details of the sample size are provided in Figure **1**.

Statistical Methods

We consider the frequency and distribution of the characteristics of the two analytic samples and the frequency and distribution of the variables of interest within each sample. We report relative risks from univariate and multivariate regression analyses applying a modified Poisson regression approach for both the mortality and stunting outcomes. Logit regression is a preferred method for binary outcomes when the true model is log-binomial, with low-prevalence outcome, and the model does not fail to converge [28, 29] whereas Poisson estimates with robust standard errors are recommended for high prevalence outcomes [30]. We found nearly identical results after applying both methods, then we report relative risks from the Poisson model because of its better interpretability. The multivariate model is stratified by parity to examine differential associations between maternal age and child health across parity.

We accounted for the cluster survey design of DHS in calculating descriptive statistics, regression estimates and respective statistical precision.

Sensitivity Analyses

We tested the robustness of the analyses by including mother's height as a covariate in the stunting analyses; this reduced the sample, but accounts for maternal nutrition in the pathway between mother and child.

RESULTS

Of the 231,037 children in the mortality sample, 11,804 children died before the age of 12 months (5.2%; 95% CI: 5.1-5.3). Infant mortality rate was highest among children born to mothers aged 15-17 (7.3%; 95% CI: 6.8-7.7), and lowest for children born to

Table 1: Characteristics of the Sample by Infant Mortality and Stunting

Output, risk factors and covariates	Infant Mortality		Stunting	
	N (Weighted %)	Prevalence (95% CI)	N (Weighted %)	Prevalence (95% CI)
Total	11804 (100.0)	5.2 (5.1, 5.3)	61661 (100.0)	37.5 (37.1, 37.9)
Mother's age at birth				
15-17	1259 (10.3)	7.3 (6.8, 7.7)	4716 (7.6)	43.3 (42.1, 44.5)
18-19	1356 (11.4)	6.2 (5.8, 6.6)	5986 (9.7)	39.2 (38.2, 40.2)
20-24	3363 (28.7)	5.1 (4.9, 5.3)	17872 (29.2)	38.0 (37.4, 38.6)
25-29	2601 (22.2)	4.5 (4.3, 4.7)	15873 (25.9)	36.4 (35.8, 37.0)
30-39	3225 (27.3)	5.1 (4.9, 5.3)	17214 (27.7)	36.0 (35.4, 36.6)
Birth order				
1	3133 (26.6)	6.0 (5.8, 6.3)	12622 (20.7)	35.6 (35.0, 36.3)
2	2153 (18.7)	4.9 (4.6, 5.1)	11640 (19.0)	35.7 (35.0, 36.4)
3+	6518 (54.8)	5.0 (4.8, 5.1)	37399 (60.3)	38.8 (38.3, 39.2)
Child sex				
Boy	6534 (55.7)	5.7 (5.6, 5.9)	33020 (53.2)	39.7 (39.2, 40.1)
Girl	5270 (44.3)	4.7 (4.5, 4.8)	28641 (46.8)	35.3 (34.8, 35.8)
Mother's education				
No education	8422 (71.1)	5.6 (5.4, 5.7)	44392 (72.2)	42.3 (41.8, 42.7)
Primary	2877 (24.4)	4.6 (4.4, 4.8)	15149 (24.2)	31.3 (30.7, 31.9)
Secondary or higher	505 (4.5)	3.7 (3.3, 4.2)	2120 (3.6)	19.2 (18.1, 20.3)
Mother's employment status				
Not working	3661 (30.7)	5.1 (4.8, 5.3)	20969 (33.1)	36.3 (35.7, 37.0)
Working	8143 (69.3)	5.3 (5.1, 5.4)	40692 (66.9)	38.1 (37.6, 38.5)
Marital Status				
No cohabitating	1527 (12.4)	5.4 (5.0, 5.7)	6486 (10.1)	35.3 (34.4, 36.2)
Cohabitating	10277 (87.6)	5.2 (5.0, 5.3)	55175 (89.9)	37.7 (37.3, 38.1)
Relationship to HH				
Mother	1314 (11.0)	4.7 (4.4, 5.0)	7476 (12.0)	37.0 (36.1, 37.9)
Husband	8074 (69.7)	5.2 (5.0, 5.3)	44487 (73.4)	38.7 (38.2, 39.1)
Other	2416 (19.3)	5.7 (5.4, 6.0)	9698 (14.6)	32.7 (32.0, 33.5)
Wealth Quintile				
Q1: lowest	3124 (24.6)	5.8 (5.5, 6.0)	18049 (27.1)	45.3 (44.6, 46.0)
Q2	2691 (23.4)	5.6 (5.3, 5.9)	14840 (24.7)	41.8 (41.0, 42.5)
Q3	2361 (20.2)	5.2 (4.9, 5.4)	12410 (21.0)	38.6 (37.9, 39.4)
Q4	2062 (18.3)	4.9 (4.7, 5.2)	9960 (17.0)	33.3 (32.5, 34.1)
Q5: highest	1566 (13.5)	4.3 (4.0, 4.5)	6402 (10.3)	24.1 (23.4, 24.9)
Place of residency				
Urban	2932 (24.2)	4.4 (4.2, 4.6)	13683 (21.1)	27.6 (26.9, 28.3)
Rural	8872 (75.8)	5.5 (5.4, 5.7)	47978 (78.9)	41.4 (41.0, 41.9)

(Table 1). Continued.

Output, risk factors and covariates	Infant Mortality		Stunting	
	N (Weighted %)	Prevalence (95% CI)	N (Weighted %)	Prevalence (95% CI)
Child age (in months)				
0-5			2911 (4.7)	16.8 (16.0, 17.5)
6-11			4037 (6.8)	22.5 (21.7, 23.3)
12-23			13494 (21.9)	39.5 (38.8, 40.2)
24-35			15228 (24.5)	47.1 (46.4, 47.9)
36-47			14206 (23.0)	44.0 (43.3, 44.7)
48-59			11785 (19.2)	39.0 (38.3, 39.8)
No. surviving children				
1			9081 (14.9)	33.7 (32.9, 34.4)
2			13323 (21.9)	36.3 (35.6, 37.0)
3			11990 (19.6)	37.5 (36.8, 38.3)
4+			27267 (43.7)	39.7 (39.1, 40.2)

Table 2: Infant Deaths and Stunted Children by Maternal Age and Parity

Birth Order	Maternal Age	Infant mortality		Stunting	
		N	Dead (%)	N	Stunted (%)
Pooled	15-17	17,484	1259 (7.8)	6,439	4716 (73.2)
	18-19	22,272	1356 (6.5)	9,555	5986 (62.6)
	20-24	67,357	3363 (5.3)	29,920	17872 (59.7)
	25-29	59,121	2601 (4.6)	28,338	15873 (56.0)
	30-39	64,803	3225 (5.2)	31,085	17214 (55.4)
1rst born	15-17	14,266	1025 (7.7)	5,430	3837 (70.7)
	18-19	13,596	850 (6.7)	5,983	3447 (57.6)
	20-24	18,219	938 (5.4)	8,561	4144 (48.4)
	25-29	4,894	234 (5.0)	2,717	945 (34.8)
	30-39	1,377	86 (6.7)	790	249 (31.5)
2nd born	15-17	2,756	193 (7.5)	889	762 (85.7)
	18-19	6,751	370 (5.8)	2,874	1955 (68.0)
	20-24	23,030	1050 (4.8)	10,649	6004 (56.4)
	25-29	9,633	391 (4.2)	5,096	2259 (44.3)
	30-39	3,500	149 (4.4)	1,991	660 (33.1)
3rd born	15-17	462	41 (9.7)	120	117 (97.5)
	18-19	1,925	136 (7.6)	698	584 (83.7)
	20-24	26,108	1375 (5.6)	10,710	7724 (72.1)
	25-29	44,594	1976 (4.6)	20,525	12669 (61.7)
	30-39	59,926	2990 (5.3)	28,304	16305 (57.6)

women ages 25-29 (4.5%; 95% CI: 4.3-4.7). Over half of the children who died were third or higher order births. Infant mortality was significantly higher for boys (5.7%; 95% CI: 5.6-5.9) than girls (4.7%; 95% CI: 4.5-4.8). Of the children who died, 71.1% were born to women with no education. Similarly, there is a clear wealth gradient, with 24.6% of the children who died being from households in the lowest wealth quintile, and 13.5% from households in the highest wealth quintile (Table **1**).

Within parity, 7.7% of first born children of mothers 15-17 years old die, 5.0% to 25-29 year olds die, and 6.7% to 30-39 year olds die. For the third-born children, 9.7% to the 15-17 year old mothers die, 4.6% to the 25-29 year olds die, and 5.3% to the 30-39 year olds die (Table **2**). We also see that the absolute prevalence of stunting decreases with the age of the mother, and that the prevalence of stunting is highest across all age groups for higher parity children (Table **2**).

Further exploratory analysis using the infant mortality sample revealed that the correlation between risk factors (age of mother at birth, birth order, and preceding birth interval) and covariates (child age, sex of the child, number of children alive, mother's education, employment status, marital status, relation to household head, wealth quintile, and location) was very low (Table **A2**). In addition, we find that in both pooled and stratified models, male children born to poor uneducated mothers, are more likely to die than male children born to rich educated mothers (Table **A4**).

Comparing across age groups, in the pooled, fully adjusted model, the relative risk of infant mortality is higher for maternal age 15-17 than for the reference

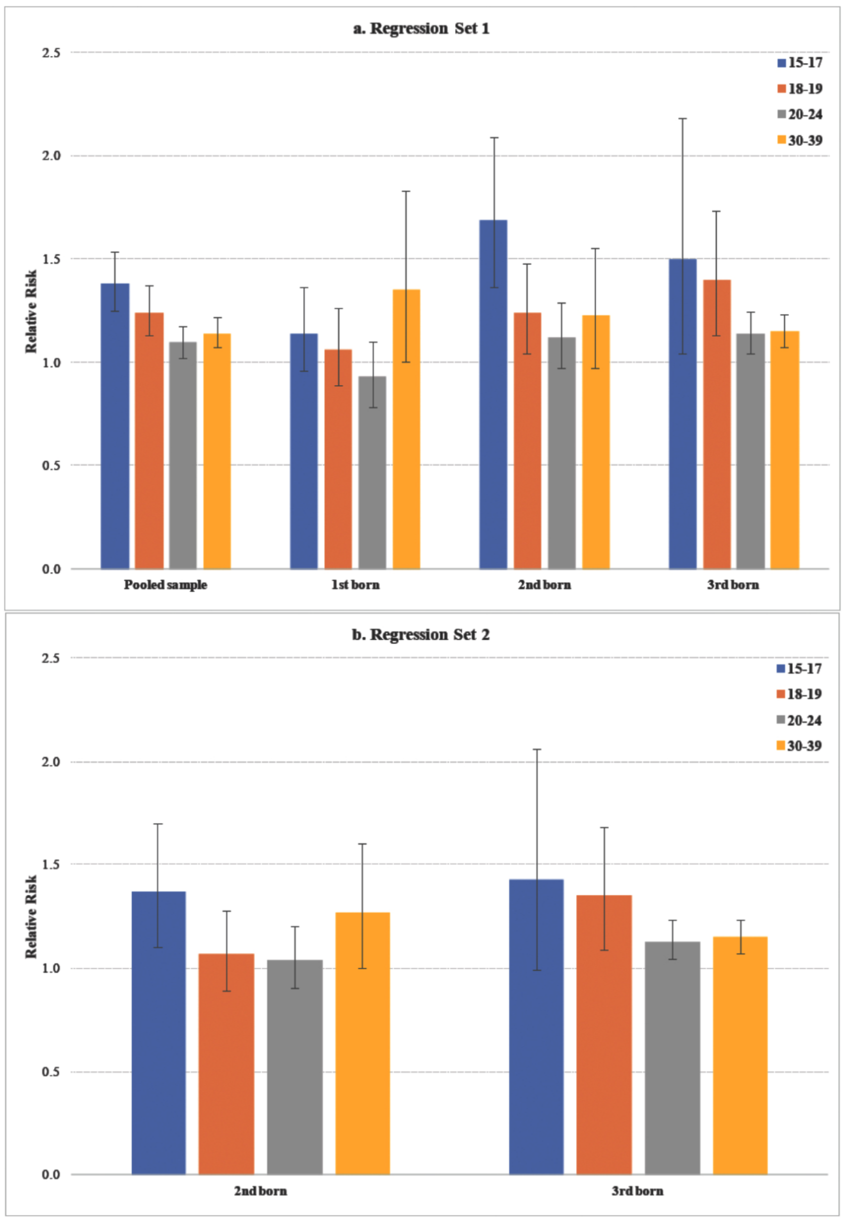

Figure 2: Relative risk of infant mortality by maternal age and (**a**) parity, and (**b**) after controlling for birth interval for second and third born children. Reference group 25-29 year old women.

Source: Based on results from Table **3**.

group (25-29 year olds) (Figure **2a**). For the 15-17 year old mothers, the relative risk is 1.38 (95% CI: 1.25-1.53), and for the 18-19 year olds the relative risk of infant mortality is 1.24 (95% CI: 1.13-1.37) (Table **3**).

We stratify by parity, as we hypothesize that the effect of maternal age on infant mortality is moderated by parity. That is, depending on the birth order the effect of maternal age on infant mortality may differ.

For the first born children, there is no significant difference in the risk of infant mortality across the age-groups. For the second born children, the risk of infant mortality is higher for the 15-17 year old mothers (RR 1.69, 95% CI: 1.36-2.09) compared to the reference age group (25-29 year olds), and slightly higher for the 18-19 year old mothers (1.24, 95% CI 1.04-1.48; Table **3**). Finally, for the third or higher order births, the risk of infant mortality for children born to 15-17and 18-19

Table 3: Relative Risk of Infant Mortalityby Maternal Age and Parity

Maternal age	Infant mortality: RR 95% CI				
	Pooled (Unadjusted)	Pooled (Adjusted)[a]	Birth Order (Adjusted)[a]		
			1st born	2nd born	3rd born +
Regression Set 1					
n	231,037	231,037	52,352	45,670	133,015
15-17	1.60	1.38	1.14	1.69	1.50
	(1.47 - 1.73)	(1.25 - 1.53)	(0.96 - 1.36)	(1.36 - 2.09)	(1.04 - 2.18)
18-19	1.37	1.24	1.06	1.24	1.40
	(1.26 - 1.48)	(1.13 - 1.37)	(0.89 - 1.26)	(1.04 - 1.48)	(1.13 - 1.73)
20-24	1.13	1.10	0.93	1.12	1.14
	(1.06 - 1.21)	(1.02 - 1.17)	(0.78 - 1.10)	(0.97 - 1.29)	(1.04 - 1.24)
25-29	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)
30-39	1.14	1.14	1.35	1.23	1.15
	(1.07 - 1.22)	(1.07 - 1.22)	(1.00 - 1.83)	(0.97 - 1.55)	(1.07 - 1.23)
Regression Set 2					
n				45,670	133,015
15-17				1.37	1.43
				(1.10 - 1.70)	(0.99 - 2.06)
18-19				1.07	1.35
				(0.89 - 1.28)	(1.09 - 1.68)
20-24				1.04	1.13
				(0.90 - 1.20)	(1.04 - 1.23)
25-29				1.00	1.00
				(reference)	(reference)
30-39				1.27	1.15
				(1.00 - 1.60)	(1.07 - 1.23)
Preceding Birth Interval (months between birth of index child and older child)					
0-23				1.91	1.27
				(1.68 - 2.18)	(1.18 - 1.38)
24-35				1.23	1.06
				(1.09 - 1.40)	(0.98 - 1.15)
36+				1.00	1.00
				(reference)	(reference)

[a]Adjusted for maternal (age at birth, education, employment status, marital status), household (head of household, household wealth quintile, location of the household at the time of interview), child characteristics (sex), and country fixed-effects.

year old mothers are RR 1.50 (95% CI: 1.04-2.18) and 1.40 (95% CI 1.13-1.73), respectively (Table **3**) (Figure **2a**).

For the infant mortality outcome, the pooled result of higher risk of infant mortality to teen mothers is driven by the infant mortality risk of higher parity children, not the first born children.

However, to be a teen mother, and have two or more children, may indicate that the birth interval was narrow. The age-effect on poor child health outcomes may be confounded by the short birth interval. Thus we control for the birth interval. We consider the younger child as the index child, and account for the preceding interval – the number of months between the index baby and the next-older sibling. For the second born children, shorter preceding birth intervals have a negative effect on the younger (index) child's survival, (RR 1.91, 95% CI 1.68-2.18). In the same multivariate regression, the mother's young age at birth of the second born has a significant negative effect on survival (RR 1.37, 95% CI 1.10-1.70). When we did not

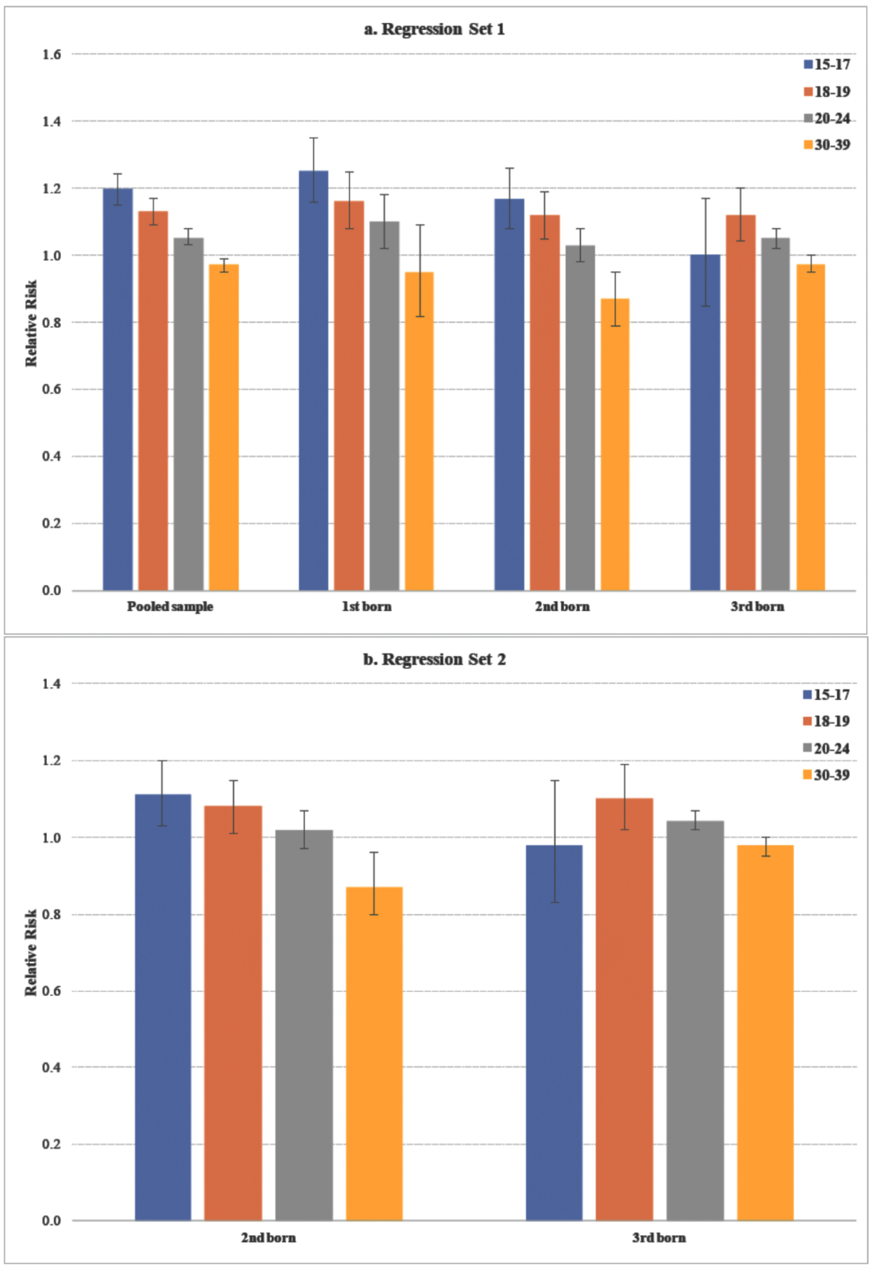

Figure 3: Relative risk of stunting by maternal age and (**a**) parity, and (**b**) after controlling for birth interval for second and third born children.

Source: Based on results from Table **4**.

control for the birth interval, the relative risk of infant mortality to mothers aged 15-17 was RR 1.69 (95% CI 1.36-2.09) (Table **3**). Once we control for the birth interval, the relative risk of infant mortality to young mothers declines, but is still significant, indicating that short birth intervals confound the effect of maternal age on infant mortality. However, young maternal age is still a significant risk factor to child mortality even after controlling for short birth intervals (Figure **2b**).

For stunting, the correlation between risk factors and covariates is only significant for the number of alive children and both age of the mother at birth (Spearman Correlation –SC: 0.519) and birth order (SC: 0.702); and male children born to poor uneducated mothers, have the highest risk of stunting (Table **A5**).

For stunting, in the pooled fully adjusted model, the risk of a poor outcome is highest for young teens (maternal age 15-17) (RR 1.20, 95% CI: 1.15-1.24) relative to the reference age group 25-29. For first born children, the risk of stunting is highest (and significant) for maternal age 15-17 (1.25, 95% CI: 1.16-1.35). For second born children, a higher risk of stunting exists for the children of mothers of maternal age 15-17 (1.17, 95% CI: 1.08-1.26) compared to second born children of 25-29 year old mothers. For third born children, there

Table 4: Relative Risk of Stunting by Maternal Age and Parity

Maternal age	Stunting: RR 95% CI				
	Pooled (Unadjusted)	Pooled (Adjusted)[a]	Birth Order (Adjusted)[a]		
			1st born	2nd born	3rd born +
Regression Set 1					
n	166,998	166,998	36,103	33,139	97,755
15-17	1.19	1.20	1.25	1.17	1.00
	(1.15 - 1.22)	(1.15 - 1.24)	(1.16 - 1.35)	(1.08 - 1.26)	(0.85 - 1.17)
18-19	1.10	1.13	1.16	1.12	1.12
	(1.07 - 1.13)	(1.09 - 1.17)	(1.08 - 1.25)	(1.05 - 1.19)	(1.04 - 1.20)
20-24	1.04	1.05	1.10	1.03	1.05
	(1.02 - 1.06)	(1.03 - 1.08)	(1.02 - 1.18)	(0.98 - 1.08)	(1.02 - 1.08)
25-29	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)
30-39	0.99	0.97	0.95	0.87	0.97
	(0.97 - 1.01)	(0.95 - 0.99)	(0.82 - 1.09)	(0.79 - 0.95)	(0.95 - 1.00)
Regression Set 2					
n				33,139	97,756
15-17				1.11	0.98
				(1.03 - 1.20)	(0.83 - 1.15)
18-19				1.08	1.10
				(1.01 - 1.15)	(1.02 - 1.19)
20-24				1.02	1.04
				(0.97 - 1.07)	(1.02 - 1.07)
25-29				1.00	1.00
				(reference)	(reference)
30-39				0.87	0.98
				(0.80 - 0.96)	(0.95 - 1.00)
Preceding Birth Interval (months between birth of index child and older child)					
0-23				1.16	1.07
				(1.10 - 1.22)	(1.04 - 1.10)
24-35				1.06	1.05
				(1.02 - 1.11)	(1.02 - 1.07)
36+				1.00	1.00
				(reference)	(reference)

[a]Adjusted for maternal (age at birth, education, employment status, marital status, number of surviving children at the time of the interview), household (head of household, household wealth quintile, location of the household at the time of interview), child characteristics (sex, age in months), and country fixed-effects.

is no difference across the age groups in stunting risk (Table **4**).

The higher risk of stunted children born to teen mothers is driven by the first born, and to a lesser extent the second born, but not the third (or higher) parity children.

The results in Table **4**, regression set 2, show that once we control for birth intervals, for the second born children, the young maternal age is still significant (RR 1.11, 95% CI 1.03-1.20). Even after controlling for the shorter birth intervals (RR 1.16, 95% CI 1.10-1.22), children born to young mothers (15-17 year olds) are at a higher risk of stunting than children born to older mothers.

For a limited sub-sample we included maternal height as a confounder in the effect of fertility on child stunting outcomes. We found that the inclusion of this control variable did not change the main result that first born children of teen mothers are at the highest risk for stunting (Table **A2**).

DISCUSSION

In this paper we bring clarity to the fertility and child health association, disentangling maternal age, parity, and birth interval in the sub-Saharan African context. We found that 1) the risk of infant mortality is highest for high parity young mothers; 2) the risk of stunting is highest for nulliparous young mothers; 3) short birth intervals have a negative effect on infant mortality and stunting outcomes; 4) short birth intervals do not completely offset the negative effect of young maternal age on infant mortality and stunting.

The conclusion that infant mortality is higher for high parity/young mothers than nulliparous young mothers is consistent with previous studies [4, 16, 24].

We also considered the influence of maternal age and parity on stunting outcomes and found that first born children to young mothers are at the highest risk of stunting. This result is consistent with previous research [17].

When we compare the infant mortality results and the stunting results, we see that although first born children to teen mothers do not have a statistically higher risk of mortality, they do have a higher risk of stunting. Higher order children born to teen mothers have a statistically higher risk of infant mortality but not a statistically higher risk of stunting. Thus first born children to teen mothers do not die, but they are stunted. Higher order children born to teen mothers are more likely to die, but those who survive are not stunted.

Because we emphasize the poor infant mortality outcome for higher order children born to teen mothers, it could be argued that this is due to confounding of short birth spacing. To have two children before the age of 20 could imply short birth intervals.

We found that short birth intervals confound the effect of young maternal age on infant mortality outcomes, but even after controlling for birth intervals, young maternal age still has a negative effect on infant mortality and stunting for the higher parity children.

The findings in this paper lead to important policy recommendations, particularly for developing effective policies to improve adolescent sexual and reproductive health and avert poor child health outcomes to teen mothers in sub-Saharan Africa. First-born children to teen mothers may survive, but they are at a high risk of stunting. Thus post-partum support for teen mothers for effective breastfeeding and child nutrition would help these mothers and children. The issue of high parity for young women under age 20 is confounded by short spacing (parity 2), and thus helping young mothers space their births will improve child survival outcomes. For adolescent sexual and reproductive health, bringing an emphasis to birth intervals – and not just timing of the first birth – is important for young mothers. For adolescents, there is often a policy emphasis on staying in school and delaying first birth, and while this is important, it should not overshadow the need for effective support for higher parity teen mothers and their children.

LIMITATIONS

Given that DHS data are self-reported, recall bias may be a factor in the collection of variables such as the age of infant or child mortality, the length of birth intervals (due to not knowing the exact month of conception), and the potential exclusion of pregnancies that were miscarried, aborted, or stillborn, particularly because of the lower probability of reporting a birth when the child dies in infancy or childhood.

INTERPRETATION

When analyzing the role of the three fertility variables-maternal age, parity and birth intervals-caution must be taken when interpreting the results and comparing these results to other publications. The way that the variables are treated in the analysis-exposure variables, modifiers, mediators or confounders--as well as the different categories created for age groups, or high parity, or different reference groups, can affect the interpretation of the results and extend to differences in the conclusions to policy recommendations.

ACKNOWLEDGEMENTS

This research work is supported by the William and Flora Hewlett Foundation (2014-9962) and NWO/WOTRO (W 08.560.002). The content is solely the responsibility of the authors and does not necessarily represent the official views of these organizations.

Data for this project were accessed using the Stanford Center for Population Health Sciences Data Core. The PHS Data Core is supported by a National Institutes of Health National Center for Advancing Translational Science Clinical and Translational Science Award (UL1 TR001085) and from Internal Stanford funding. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

APPENDIX

Table A1: Frequency, Weighted Percentage, and Prevalence (95% CI) of Infant Mortality and Stunting by Country

Variable	Mother's age at birth					
	Model 1: infant mortality			Model 2: stunting		
	N	Deaths (Weighted %)	Prev. (95% CI)	N	Stunted (Weighted %)	Prev. (95% CI)
Benin (2011)	9171	306 (2.5)	3.3 (2.9, 3.7)	8928	4306 (6.7)	48.2 (46.7, 49.8)
Burkina Faso (2010)	10434	600 (5.1)	5.8 (5.2, 6.3)	6034	2052 (3.4)	34.5 (33.0, 36.1)
Burundi (2010)	5596	295 (2.7)	5.7 (4.9, 6.4)	3176	1754 (3.0)	57.9 (55.6, 60.1)
Cameroon (2011)	7990	444 (4.0)	6.0 (5.3, 6.7)	4621	1459 (2.4)	31.8 (30.1, 33.5)
Chad (2004)	3961	362 (3.5)	10.0 (8.4, 11.6)	4259	1771 (3.1)	43.6 (41.5, 45.7)
Comoros (2012)	2147	59 (0.6)	3.0 (2.1, 3.9)	2248	626 (1.1)	29.4 (27.1, 31.7)
Congo, Democratic Republic (2013)	13010	678 (5.5)	5.1 (4.6, 5.6)	7460	3230 (4.9)	41.8 (39.9, 43.7)
Congo, Republic (2011)	6362	211 (1.5)	3.1 (2.5, 3.7)	4025	1054 (1.3)	22.6 (20.6, 24.5)
Cote d'Ivoire (2011)	5332	318 (2.5)	5.9 (4.9, 6.8)	2938	858 (1.3)	28.6 (26.3, 30.9)
Ethiopia (2010)	8334	439 (3.8)	5.3 (4.6, 6)	8988	3792 (6.7)	44.1 (42.2, 46.0)
Gabon (2012)	4146	131 (0.9)	3.2 (2.5, 3.9)	3096	738 (0.7)	16.4 (13.9, 18.9)
Ghana (2008)	2025	111 (0.8)	5.0 (4.0, 6.0)	2174	605 (0.9)	27.7 (25.3, 30.1)
Guinea (2012)	4820	289 (2.4)	6.0 (5.1, 6.8)	2872	838 (1.4)	29.7 (27.5, 31.9)
Kenya (2008)	4351	205 (1.7)	4.7 (3.7, 5.7)	4839	1654 (2.7)	35.3 (33.0, 37.6)
Lesotho (2009)	2778	216 (1.8)	8.5 (7.2, 9.8)	1541	601 (0.8)	37.0 (34.1, 39.9)
Liberia (2013)	5249	254 (1.7)	4.5 (3.7, 5.3)	2940	884 (1.2)	29.0 (26.6, 31.4)
Madagascar (2008)	8915	387 (3.3)	4.3 (3.7, 4.8)	4843	2279 (3.9)	49.1 (46.9, 51.3)
Malawi (2010)	14225	776 (6.7)	5.7 (5.2, 6.2)	4343	1979 (3.2)	46.5 (44.5, 48.6)
Mali (2012)	6246	333 (2.8)	5.3 (4.6, 6.1)	3449	1281 (2.1)	37.6 (35.3, 39.9)
Mozambique (2011)	7790	431 (3.9)	5.7 (5.1, 6.3)	8701	3398 (6.3)	42.7 (41.0, 44.4)
Namibia (2013)	7201	238 (1.8)	3.1 (2.5, 3.7)	3343	737 (1.0)	20.7 (18.3, 23.0)
Niger (2012)	8789	383 (3.5)	4.6 (4.0, 5.2)	4561	1875 (3.3)	42.3 (40.4, 44.3)
Nigeria (2013)	21689	1341 (11.4)	6.2 (5.7, 6.6)	23196	8249 (13.5)	36.0 (34.7, 37.3)
Rwanda (2010)	6617	305 (2.6)	4.7 (4.1, 5.2)	3737	1598 (2.6)	43.1 (41.1, 45.0)
Sao Tome and Principe (2008)	1336	40 (0.3)	2.7 (1.8, 3.7)	1373	392 (0.6)	29.7 (26.6, 32.9)
Senegal (2010)	8724	361 (2.6)	3.8 (3.3, 4.4)	3490	1037 (1.5)	27.7 (25.5, 29.8)
Sierra Leone (2013)	8162	645 (5.9)	8.4 (7.6, 9.2)	3912	1444 (2.3)	36.8 (34.6, 38.9)
Swaziland (2006)	1995	159 (1.3)	8.0 (6.7, 9.2)	1917	515 (0.9)	27.6 (25.2, 29.9)
Tanzania (2009)	5755	269 (2.3)	4.7 (4.0, 5.4)	6349	2482 (4.3)	40.8 (39.1, 42.5)
Togo (2013)	4905	202 (1.6)	4.0 (3.4, 4.6)	2910	808 (1.2)	26.3 (24.3, 28.3)
Uganda (2011)	5588	266 (2.4)	5.0 (4.3, 5.7)	1941	616 (1.0)	32.9 (30.2, 35.5)
Zambia (2013)	9650	372 (3.2)	4.0 (3.5, 4.5)	10546	4135 (6.6)	39.5 (38.2, 40.8)
Zimbabwe (2010)	7744	378 (3.3)	5.1 (4.4, 5.9)	8248	2614 (4.1)	31.3 (29.7, 32.9)

Table A2: Spearman Correlation between Risk Factors and Covariates

	Infant Mortality			Stunting		
	Age of mother at birth	Birth order	Preceding birth interval	Age of mother at birth	Birth order	Preceding birth interval
Child age				-0.003	0.017	-0.029
Sex of the child	0.002	0.003	-0.002	-0.001	0.004	-0.006
Number of children alive				0.519	0.702	-0.152
Mother's education	0.015	-0.149	0.121	0.010	-0.158	0.124
Employment status	0.091	0.058	-0.001	0.093	0.061	-0.010
Marital status	0.017	0.078	-0.072	0.017	0.075	-0.066
Relation to household head	-0.141	-0.109	-0.011	-0.143	-0.113	-0.009
Wealth quintile	0.028	-0.090	0.078	0.033	-0.092	0.075
Location	-0.020	0.087	-0.074	-0.020	0.088	-0.063

Table A3: Adjusted Relative Risk (95% CI) of Stunting by Age of the Mother at Birth: Sensitivity to Mother's Height

Stunting: RR (95% CI)				
Age of mother at birth	Pooled	Stratified by parity		
		1st born	2nd born	3rd or higher order
15-17	1.17	1.23	1.13	0.97
	(1.13 - 1.22)	(1.14 - 1.32)	(1.05 - 1.22)	(0.83 - 1.13)
18-19	1.11	1.14	1.10	1.09
	(1.07 - 1.15)	(1.06 - 1.23)	(1.03 - 1.17)	(1.02 - 1.18)
20-24	1.04	1.09	1.02	1.04
	(1.02 - 1.07)	(1.02 - 1.17)	(0.98 - 1.08)	(1.01 - 1.07)
25-29	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)
30-39	0.97	0.94	0.87	0.98
	(0.95 - 0.99)	(0.82 - 1.09)	(0.79 - 0.95)	(0.96 - 1.00)

[a]Adjusted for maternal (age at birth, education, employment status, marital status, number of surviving children at the time of the interview), household (head of household, household wealth quintile, location of the household at the time of interview), child characteristics (sex, age in months), and country fixed-effects.

Table A4: Relative Risk of Infant Mortality by Maternal Age and Parity[a]

Covariates and Risk Factors	Pooled	Birth Order: Regression Set 1			Birth Order: Regression Set 2	
		1st born	2nd born	3rd born +	2nd born	3rd born +
Risk Factors						
Age of mother at birth						
	1.38	1.14	1.69	1.50	1.37	1.43
15-17	(1.25 - 1.53)	(0.96 - 1.36)	(1.36 - 2.09)	(1.04 - 2.18)	(1.10 - 1.70)	(0.99 - 2.06)
	1.24	1.06	1.24	1.40	1.07	1.35
18-19	(1.13 - 1.37)	(0.89 - 1.26)	(1.04 - 1.48)	(1.13 - 1.73)	(0.89 - 1.28)	(1.09 - 1.68)
	1.10	0.93	1.12	1.14	1.04	1.13
20-24	(1.02 - 1.17)	(0.78 - 1.10)	(0.97 - 1.29)	(1.04 - 1.24)	(0.90 - 1.20)	(1.04 - 1.23)

(Table A4). Continued.

25-29	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)
30-39	1.14	1.35	1.23	1.15	1.27	1.15
	(1.07 - 1.22)	(1.00 - 1.83)	(0.97 - 1.55)	(1.07 - 1.23)	(1.00 - 1.60)	(1.07 - 1.23)
Birth order						
1rst born	1.00					
	(reference)					
2nd born	0.86					
	(0.80 - 0.93)					
3rd born	0.88					
	(0.81 - 0.95)					
Preceding Birth Interval (months)						
0-23					1.91	1.27
					(1.68 - 2.18)	(1.18 - 1.38)
24-35					1.23	1.06
					(1.09 - 1.40)	(0.98 - 1.15)
36+					1.00	1.00
					(reference)	(reference)
Covariates						
Sex of the child						
Female	0.81	0.80	0.78	0.82	0.78	0.82
	(0.77 - 0.84)	(0.74 - 0.87)	(0.71 - 0.87)	(0.77 - 0.87)	(0.71 - 0.87)	(0.77 - 0.87)
Male	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)
Mother's education						
No education	1.41	1.60	1.36	1.31	1.41	1.29
	(1.23 - 1.61)	(1.29 - 1.99)	(1.05 - 1.77)	(1.05 - 1.63)	(1.08 - 1.84)	(1.04 - 1.61)
Primary	1.21	1.31	1.20	1.14	1.25	1.15
	(1.06 - 1.38)	(1.06 - 1.62)	(0.93 - 1.56)	(0.92 - 1.43)	(0.96 - 1.63)	(0.92 - 1.43)
Secondary or higher	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)
Employment status						
Not working	0.98	0.93	1.00	1.01	0.98	1.00
	(0.93 - 1.03)	(0.84 - 1.02)	(0.89 - 1.12)	(0.93 - 1.09)	(0.88 - 1.10)	(0.93 - 1.08)
Marital status						
Not married nor in union	1.04	0.97	1.14	1.10	1.19	1.11
	(0.95 - 1.13)	(0.84 - 1.11)	(0.95 - 1.37)	(0.97 - 1.26)	(0.99 - 1.42)	(0.97 - 1.26)
Married or in Union	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)
Relation to household head						
Wife	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)

(Table A4). Continued.

Husband	1.04 (0.96 - 1.13)	1.18 (0.99 - 1.41)	1.06 (0.88 - 1.27)	1.02 (0.92 - 1.14)	1.04 (0.87 - 1.26)	1.02 (0.91 - 1.14)
Other	1.15 (1.04 - 1.26)	1.17 (0.97 - 1.41)	1.22 (0.99 - 1.51)	1.22 (1.07 - 1.39)	1.20 (0.97 - 1.48)	1.21 (1.07 - 1.38)
Wealth Quintile						
Q1	1.21 (1.10 - 1.33)	1.13 (0.94 - 1.35)	1.14 (0.92 - 1.41)	1.27 (1.10 - 1.46)	1.11 (0.90 - 1.38)	1.25 (1.09 - 1.44)
Q2	1.18 (1.07 - 1.30)	1.21 (1.02 - 1.43)	1.05 (0.85 - 1.30)	1.23 (1.06 - 1.41)	1.03 (0.84 - 1.28)	1.21 (1.05 - 1.40)
Q3	1.11 (1.01 - 1.22)	1.10 (0.93 - 1.30)	1.10 (0.90 - 1.33)	1.13 (0.99 - 1.29)	1.09 (0.90 - 1.33)	1.12 (0.98 - 1.28)
Q4	1.09 (1.00 - 1.19)	1.08 (0.93 - 1.26)	1.00 (0.82 - 1.21)	1.15 (1.01 - 1.30)	1.00 (0.82 - 1.21)	1.14 (1.01 - 1.30)
Q5	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Location						
Rural	1.03 (0.96 - 1.10)	1.05 (0.92 - 1.19)	1.03 (0.89 - 1.19)	1.02 (0.92 - 1.12)	1.03 (0.89 - 1.19)	1.01 (0.92 - 1.12)
Urban	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)

[a]Models further adjusted for country fixed-effects.

Table A5: Relative Risk of Child Stunting by Maternal Age and Parity[a]

Covariates and Risk Factors	Pooled	Birth Order: Regression Set 1			Birth Order: Regression Set 2	
		1st born	2nd born	3rd born +	2nd born	3rd born +
Risk Factors						
Age of mother at birth						
15-17	1.20 (1.15 - 1.24)	1.25 (1.16 - 1.35)	1.17 (1.08 - 1.26)	1.00 (0.85 - 1.17)	1.11 (1.03 - 1.20)	0.98 (0.83 - 1.15)
18-19	1.13 (1.09 - 1.17)	1.16 (1.08 - 1.25)	1.12 (1.05 - 1.19)	1.12 (1.04 - 1.20)	1.08 (1.01 - 1.15)	1.10 (1.02 - 1.19)
20-24	1.05 (1.03 - 1.08)	1.10 (1.02 - 1.18)	1.03 (0.98 - 1.08)	1.05 (1.02 - 1.08)	1.02 (0.97 - 1.07)	1.04 (1.02 - 1.07)
25-29	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
30-39	0.97 (0.95 - 0.99)	0.95 (0.82 - 1.09)	0.87 (0.79 - 0.95)	0.97 (0.95 - 1.00)	0.87 (0.80 - 0.96)	0.98 (0.95 - 1.00)
Birth order						
1rst born	1.00 (reference)					
2nd born	1.06 (1.02 - 1.09)					

(Table A5). Continued.

3rd born	1.13 (1.09 - 1.18)					
Preceding Birth Interval (months)						
0-23					1.16 (1.10 - 1.22)	1.07 (1.04 - 1.10)
24-35					1.06 (1.02 - 1.11)	1.05 (1.02 - 1.07)
36+					1.00 (reference)	1.00 (reference)
Covariates						
Sex of the child						
Female	0.89 (0.87 - 0.90)	0.86 (0.84 - 0.89)	0.87 (0.84 - 0.90)	0.90 (0.88 - 0.91)	0.87 (0.84 - 0.90)	0.90 (0.88 - 0.91)
Male	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Mother's education						
No education	1.54 (1.45 - 1.64)	1.50 (1.36 - 1.65)	1.44 (1.29 - 1.60)	1.63 (1.48 - 1.80)	1.46 (1.31 - 1.62)	1.63 (1.48 - 1.80)
Primary	1.36 (1.28 - 1.44)	1.29 (1.18 - 1.41)	1.26 (1.14 - 1.40)	1.45 (1.31 - 1.59)	1.27 (1.15 - 1.41)	1.45 (1.32 - 1.60)
Secondary or higher	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Employment status						
Not working	1.02 (1.00 - 1.04)	1.02 (0.98 - 1.05)	1.02 (0.98 - 1.07)	1.02 (0.99 - 1.04)	1.02 (0.98 - 1.06)	1.02 (0.99 - 1.04)
Marital status						
Not married nor in union	1.03 (1.00 - 1.07)	1.11 (1.05 - 1.17)	1.02 (0.95 - 1.09)	0.99 (0.95 - 1.04)	1.03 (0.95 - 1.10)	1.00 (0.95 - 1.04)
Married or in Union	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Relation to husehold head						
Wife	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Husband	1.00 (0.98 - 1.03)	1.05 (0.98 - 1.12)	1.05 (0.98 - 1.12)	0.97 (0.94 - 1.00)	1.05 (0.98 - 1.12)	0.97 (0.94 - 1.00)
Other	1.01 (0.97 - 1.04)	0.98 (0.92 - 1.05)	1.04 (0.96 - 1.12)	1.02 (0.97 - 1.07)	1.03 (0.96 - 1.11)	1.02 (0.97 - 1.07)
Wealth Quintile						
Q1	1.57 (1.51 - 1.64)	1.55 (1.43 - 1.68)	1.69 (1.55 - 1.84)	1.53 (1.45 - 1.61)	1.68 (1.54 - 1.83)	1.53 (1.45 - 1.61)
Q2	1.46 (1.40 - 1.53)	1.51 (1.39 - 1.63)	1.52 (1.40 - 1.66)	1.42 (1.35 - 1.50)	1.52 (1.39 - 1.65)	1.42 (1.35 - 1.49)

(Table A5). Continued.

Q3	1.38	1.38	1.43	1.36	1.43	1.36
	(1.33 - 1.44)	(1.28 - 1.49)	(1.32 - 1.56)	(1.29 - 1.43)	(1.32 - 1.55)	(1.29 - 1.43)
Q4	1.25	1.27	1.30	1.22	1.30	1.21
	(1.20 - 1.30)	(1.18 - 1.37)	(1.21 - 1.41)	(1.16 - 1.28)	(1.20 - 1.41)	(1.15 - 1.28)
Q5	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)
Location						
Rural	1.06	1.06	1.01	1.09	1.01	1.09
	(1.03 - 1.10)	(1.01 - 1.12)	(0.95 - 1.07)	(1.05 - 1.13)	(0.95 - 1.07)	(1.05 - 1.13)
Urban	1.00	1.00	1.00	1.00	1.00	1.00
	(reference)	(reference)	(reference)	(reference)	(reference)	(reference)

[a]Models further adjusted for country fixed-effects.

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Received on 30-01-2017 Accepted on 28-02-2017 Published on 16-03-2017

https://doi.org/10.6000/1929-4247.2017.06.01.2