



The association of maternal age with infant mortality, child anthropometric failure, diarrhoea and anaemia for first births: Evidence from 55 lowand middle-income countries

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The association of maternal age with **DEN** infant mortality, child anthropometric failure, diarrhoea and anaemia for first births: evidence from 55 low- and middle-income countries

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ABSTRACT

Objective: To examine the association between maternal age at first birth and infant mortality, stunting, underweight, wasting, diarrhoea and anaemia in children in low- and middle-income countries.

Design: Cross-sectional analysis of nationally representative household samples. A modified Poisson regression model is used to estimate unadjusted and adjusted RR ratios.

Setting: Low- and middle-income countries.

Population: First births to women aged 12-35 where this birth occurred 12-60 months prior to interview. The sample for analysing infant mortality is comprised of 176 583 children in 55 low- and middle-income countries across 118 Demographic and Health Surveys conducted between 1990 and 2008.

Main outcome measures: Infant mortality in children under 12 months and stunting, underweight. wasting, diarrhoea and anaemia in children under 5 years.

Results: The investigation reveals two salient findings. First, in the sample of women who had their first birth between the ages of 12 and 35, the risk of poor child health outcome is lowest for women who have their first birth between the ages of 27 and 29. Second, the results indicate that both biological and social mechanisms play a role in explaining why children of young mothers have poorer outcomes.

Conclusions: The first-born children of adolescent mothers are the most vulnerable to infant mortality and poor child health outcomes. Additionally, first time mothers up to the age of 27 have a higher risk of having a child who has stunting, diarrhoea and moderate or severe anaemia. Maternal and child health programs should take account of this increased risk even for mothers in their early 20s. Increasing the age at first birth in developing countries may have large benefits in terms of child health.

INTRODUCTION

Progress towards reaching Development Goal 4 focuses on measurable

ARTICLE SUMMARY

Article focus

- The prevalence of nutritional deficiencies underscores the need to understand the basic determinants of poor child health outcomes.
- Young age of the mother at their first birth is one such determinant due to biological and social mechanisms.
- Comparison across low- to middle-income countries enables generalisation of crosssectional associations between the age of the mother and child health outcomes.

Key messages

- Child health outcomes remain poor in many low- to middle-income countries.
- The age of the mother at their first birth is a key correlate of child health outcomes.
- Teen mothers have children with the worst health outcomes and children of mothers who have their first birth in their early 20s are also at risk of poor health outcomes compared to first time mothers in their late 20s.

Strengths and limitations of this study

- One of the strengths of this study is the breadth of countries included in the sample.
- In applying secondary source data, the study is subject to omitted variable and recall bias.

reduction in under-5 mortality. In low- to middle-income countries, this also means "revitalising efforts against... diarrhoea, while bolstering nutrition...". The risk of under-5 mortality and the prevalence of diarrhoeal disease and nutritional deficiencies that manifest themselves in outcomes such as stunting, wasting, underweight and anaemia in young children, underscore the need to understand the basic determinants of these poor child health outcomes. In India alone, 6.0% (95% CI 5.7% to 6.3%) of children die before their 5th birthday. In the same

population, for children under 5, 42.2% are underweight, 47.8% are stunted, 19.7% are wasted and 69.1%are anaemic.² A cross-country study highlights that these prevalence percentages are the norm throughout low- to middle-income countries.³ A report on adolescent girls in low- to middle-income countries by the Center for Global Development⁴ highlights the risk to child health associated with young motherhood. When considering child health, the report draws on intergenerational influences on child health outcomes rather than a cross-sectional observation of children alone. The effect of the age of the mother at first birth on child health outcomes has been explored in several studies in low- to middle-income countries. 5-14 In the case of India, Raj et al^{13} showed that children born to mothers who were married below the age of 18 were at a higher risk of stunting and underweight compared to children of women who had married at age 18 or older. In another study, using the World Fertility Survey, Trussell and Hammerslough¹⁴ also found that the mother's age at first birth was a significant risk factor for infant mortality in Sri Lanka. In low- to middle-income countries, 26.5% of women have their first birth before the age of 18, and 83.1% before age 24.15 Much debate, particularly with regard to US population samples, concerns the social versus physiological influence of young motherhood on child health outcomes. 16-22 Young age can be a proxy for "short stature, low body weight in relation to height, and greater likelihood of inadequate weight gain during pregnancy along with difficulty of delivery". ²³ These physiological factors point to vulnerability to poor child health outcomes. Women in low- to middle-income countries who have children at a young age are also more likely to be, and remain, poor and uneducated.⁴ These social factors also disadvantage young mothers in terms of their child's health outcomes. Analysis that generalises across and within countries, rather than focusing on a sample from a single country, provides standardised analyses and results to assess age as a proxy for physiological immaturity and social disadvantage and its effect on child health outcomes. Earlier work by Hobcraft¹² in 1992 examined the effect of age at first birth on child survival in a number of countries using Demographic and Health Surveys (DHS) available at that time. Given the prevalence of poor child health outcomes in low- to middle-income countries, and not just high infant mortality, studies that extend the monitoring of child health beyond infant mortality provide valuable information regarding health disparities and progress in achieving Millennium Development Goal 4 and its sub-goals relating to child health.

The purpose of the current study is to assess the association between maternal age at first birth and child health outcomes: infant mortality, stunting, underweight, wasting, diarrhoea and anaemia. By controlling for socioeconomic factors, the physiological effect of young motherhood on child health can be separated out from the social disadvantage that young mothers are also

likely to face. The findings could critically inform family planning policies and programs aimed at delaying first birth beyond the teenage years.

METHODS Data source

Information from 118 DHS conducted in 55 countries between 1990 and 2008 provided the data for the analysis in this study. 24 The DHS are nationally representative household sample surveys that measure population, health, socioeconomic and anthropometric indicators, emphasising maternal and child health.²⁵ The DHS are an important data source for studying population health across developing countries due to their extensive coverage, comparability and data quality. 26-28 To ensure standardisation and comparability across diverse sites and times, in conducting the DHS, Macro ICF employs intense interviewer training, standardised measurement tools and techniques, an identical core questionnaire and instrument pretesting.²⁹ Each participating country's report details pretesting and quality assurance measures by survey. 15 The DHS is modular in structure, and in addition to the core questionnaire, a set of country-relevant sections and country-specific variables are included. The DHS provides data with standardised variables across surveys.³⁰

Sampling plan

The DHS involves stratified cluster randomised samples of households.³¹ The sampling frame was stratified by urban and rural status and additionally by country-specific geographic or administrative regions. Within each stratified area, random clusters of households were drawn from a list of all enumeration areas taken from a population census. In the second stage of sampling, all private households within the cluster were listed (institutions excluded) and an average of 25 houses within a cluster were selected by equal probability systematic sampling to be surveyed. Detailed sampling plans are available from survey final reports.¹⁵

Within each sampled household, a household questionnaire was administered and women eligible for a more detailed women's survey were identified. In most surveys all women between the ages of 15 and 49 were interviewed. In a limited number of surveys, the target group is women aged 10–49 or 15–45, or ever-married women. The child anthropometry module was conducted in a selection of the Standard DHS.³² The DHS provides weights for calculating nationally representative statistics.

Study population and sample size

Our sample consists of children born to women who had their first birth 12–60 months before the survey. The lower bound of 12 months is applied so that each child has equal exposure to 1 year of life and we can accurately calculate infant mortality (deaths within the first year of life). Detailed child health measures are only taken for

children up to 60 months of age which establishes our upper bound (the upper bound is 60 months rather than 59 months to conform to the WHO age categories). Only the first birth for each woman is included in our sample; for multiple first births we only use data from the first recorded birth, although we control for this being a part of multiple births. The initial sample is 288 752 children across 72 countries from 181 surveys. Infant mortality status is not available for 5313 of these children, mother's age at their first birth is missing in 1564 and 103563 observations are missing covariates since not all surveys collect data on our covariates of interest, yielding the final sample of 176583 children across 55 countries and 118 surveys for our mortality study. The age of the mother is restricted to 12-35 as only 13 of the mothers had their children below the age of 12 and 1716 had their first birth at 36 or older. Details of the samples for the child health outcomes are given in online supplementary appendix table A1. These samples are smaller because the child anthropometric module was not conducted in a number of surveys. The data comprise 119018 children with stunting, 120246 with wasting, 122680 with underweight, 135121 with diarrhoea and 31 520 with anaemia.

Outcome measures

In this study, we focus on six outcomes: infant mortality, child stunting, underweight, wasting, diarrhoea and moderate to severe anaemia (which is abbreviated to moderate anaemia throughout the paper). All health measures are for children born 12-60 months before the interview. Infant mortality is a measure of whether or not the child survived to age 1 year. The birth history in the DHS individual recode files records the survival status of a woman's (the respondent's) child. A child's death and age at death are reported by the mother. For the measure of infant mortality, we count infants who died within the first year of life (<12 months). We also measure anthropometric failure. First, we calculate a z score given by the child's height minus the median height for that child's age and sex in a reference population. Then we divide the result by the standard deviation of the same age and sex in the WHO reference population of healthy children in developing countries.³³ Stunting is defined as a height z score of less than -2. Similarly, underweight is defined as a z score less than −2 for weight relative to children of the same sex and age in the reference population. Wasting is defined as a z score less than -2 for weight-for-height relative to children of the same sex and age in the reference population. Biologically impossible values are defined by the WHO for height (stunting) as z scores <-6 or >6, for weight (underweight) as <-6 or >5 and for weight-for-height (wasting) as <-5 or >5. Observations with biologically impossible values are dropped from our samples.

The outcome of child diarrhoea was based on the mother's recall of whether their child had had diarrhoea within the 2 weeks prior to interview. Anaemia was

measured by a fingerstick blood test from the child at the time of interview. The first two drops of blood were discarded and the third drop was taken as a sample. The blood drop was analysed using the HemoCue system. Adjustments for altitude were taken into account, and children with a haemoglobin concentration <10 g/dl were considered as having at least moderate anaemia.

Exposure and covariates

In this study we classify the covariates into four different categories: child characteristics, maternal characteristics, paternal characteristics and, finally, household and social factors. The child characteristics are child sex, singleton or multiple births and the age of the child in months. The covariate for the age of the child is not included in the infant mortality model (which depends only on survival to age 1 year) but is included in all other models. Child age in months is categorised into four groups: 12–23, 24–35, 36–47 and 48–60.

The maternal factors that we include in this study are mother's age, her height and her educational attainment. Our exposure of interest is the mother's age at her first birth. The age of the mother at the first birth is a variable reported in the DHS recode manual³⁰ and is calculated from the CMC (century month code) of the date of the first birth and the CMC of the date of the birth of the mother. Age is categorised into 3-year intervals: ages 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32 and 33-35. Online supplementary appendix table A2 shows the effect of the age of the mother at first birth, and age squared, regressed on the child health outcomes. This non-linear, continuous age variable model shows that the poor child health outcomes are minimised at age 29 for the infant mortality outcome. However, a quadratic age variable may not capture all potential heterogeneity in the effect of maternal age on child health outcomes. Furthermore, we use maternal age grouped into 3-year intervals, as opposed to single year age groups, due to the small number of infant deaths occurring for single age groups. Grouping 3 years together provides a sufficient group size to minimise random fluctuations in mortality rates. Not all surveys measure women's height. In our main results, we do not control for height but, since maternal height has been shown to be a predictor of child health,³ we do perform a sensitivity analysis where we see the effect of adding maternal height as a covariate and restrict the sample to observations where the mother's height is available. The height of the mother is in five categories: 100-144 cm, 145-149 cm, 150-154 cm, 155-159 cm and 160-200 cm. Maternal education is classified into three categories: no education or less than completed primary, completed primary, and completed secondary or higher. Paternal covariates are whether the women has a partner or not and, if so, the partner's age and educational level. Partners are typically older than the women and the partner's age is split into six categories: 12-17, 18-23, 24-29, 30-35, 36-41 and 42-59 years. Partner's education follows the same

groupings as coded for the mother's education: no education or less than completed primary, completed primary, and completed secondary or higher.

Household and social factors include the wealth quintile of the household and whether the household is in a rural or an urban location. The wealth quintile is a within-country measure of the wealth of the household relative to other households in that survey based on its ownership of household assets. This measure of wealth, based on Filmer and Pritchett, 34 is a linear index of asset ownership indicators using factor analysis to derive the weights. This measure has been standardised by Measure DHS across most of the DHS and is widely used as a measure of relative wealth within a country. Given we have country fixed effects and year of birth time dummies in the regression analyses, this wealth index is an indicator of how each household's wealth deviates from its own country's mean wealth. We also include indicators for piped water to the house and a flush toilet in the household. In addition to these household measures, we include a cluster level measure: the percentage of living children aged 12-60 months who have received measles vaccination in the cluster. We do not have vaccination data for children who have died and the cluster level measles vaccination percentage allows us to control for neighbourhood health system inputs. The cluster level average may be subject to the ecological fallacy, and we do not claim to measure the causal effect of measles vaccination on vaccinated children. Measles vaccine is administered between 9 and 12 months of age and is likely to have only a limited direct effect on infant mortality (deaths between 0 and 12 months). Rather, we think of vaccine coverage as being a proxy for healthcare provision, although there may also be a herd-immunity effect on younger children due to lower overall prevalence.

Statistical analysis

To measure the RR of a given outcome, we apply a modified Poisson regression following the methodology of Zou.³⁵ We estimate the unadjusted model only controlling for country fixed effects and year of birth time dummies to account for the uneven repeated cross-section. We then estimate the adjusted model and include the covariates. While summary statistics are weighted to take into account the multistage sampling design, the regressions are not weighted.³⁶

RESULTS Summary statistics

Average age at first birth across the 118 DHS is 20.18. This ranges from an average age of 17.65 in Bangladesh in 1996, to an average of 23.02 in Jordan in 2007 (table 1). Across the 118 surveys included in this study, infant mortality is as high as 17.01% of all first-born children in Mali in 1995. In 30 of the 118 surveys, average stunting is 50% or higher and 79 of the 118 surveys have stunting prevalence of 30% or higher.

Madagascar in 1997 has the highest average stunting prevalence with 65.46% of first-born children being classified as stunted according to the WHO standards. Wasting (weight-for-height) is not as prevalent as stunting: 26 of the 118 surveys record an average prevalence of 10% or more. Underweight (weight-for-age) is as high as 50.01% in Niger in 1998. With regard to underweight, 32 of the 118 surveys record a prevalence of 25% or more. An average of 36.91% of first-born children in Niger in 1998 are reported to have had diarrhoea within the 2 weeks prior to the DHS interview, but across the 118 surveys the average is 13.64%. Anaemia was not recorded in all of the surveys, but in the 38 surveys that do record anaemia, average prevalence ranges from a low of 7.99% of first-born children in Egypt in 2000, to 71.55% in Burkina Faso in 2003. The average is 32.6% across the 118 surveys (table 1).

In the infant mortality model (n=176583 children), 23.9% of the women are between the ages of 15 and 17 at their first birth and 35.2% are between the ages of 18 and 20 (table 2). The reference group in the regression analysis is children whose mothers were 27–29 years old at their first birth. This group represents 4.3% of the population with 7648 children. Children of multiple births are rare (0.8%), most women (92.9%) have partners, 60.1% of the children are born in rural areas, 43.6% have piped water to the house (the remainder have to leave the house to collect water) and 30.9% of the children have a flush toilet at the house. Distributions of covariates are similar across the different outcome models (table 2).

In figure 1 we plot the prevalence of the child health outcome against the age of the mother at first birth. The weighted fraction of child health outcomes by age is an extension of the statistics reported in table 2 of child health outcomes by age band. We see that, in general, the prevalence of poor child health outcomes declines with the mother's age to about age 27. The decline in poor child health outcomes with maternal age is particularly obvious for stunting, anaemia and underweight, but is also evident for diarrhoea, infant mortality and wasting.

Older women are more likely to have multiple births, although the event is rare across all age groups. Young mothers are less likely to have a partner: 8.6% of 15-17year-old mothers do not have a partner compared to 5.8% of women in the 27–29-year-old category (table 3). Young mothers have lower education than older mothers: 64.6% of mothers aged 15–17 had incomplete primary or no schooling, whereas 23.1% of women who had their first birth between the ages of 27 and 29 had only incomplete primary or no schooling (table 3). Older mothers tend to be in a higher wealth quintile: 42.9% of women who had their first birth between the ages of 27 and 29 are in the richest quintile, while 11.7% of mothers age 15-17 are in the richest quintile (table 3). Overall, 71.2% of mothers who had their first birth between the ages of 15 and 17 live in rural areas, while 35% of women who had their first birth between

	ia	95% CI	5.92	to 11.49	10.21 to 23.57	13.55	to 23.07										49.74	02.10 01	to 53.26					18.54	to 27.40					C C	00.00	0 /0/ 01				40.19	Continued
	Anaemia	Mean	8.29	107	07.6	17.82											55.57	CZ 81	40.72				!	22.67						, ,	7 1.55					45.37	
	Dea	95% CI	6.20	to 11.63	12.00 to 20.05	7.00	to 13.53	6.43	to 10.23	5.04 to 7.85	4.70	to 7.37	8.24	to 12.03	21.91	to 33.80	11.70	26. / L 01 8 OR	to 10.95	27.25	to 36.50	16.17	to 21.44	19.78	to 24.53 7.96	to 11.58	10.33	to 15.87	10.02	to 15.83	+ 5.54 5.54 5.54	8 78	to 16.45	15.66	to 25.74	13.40	52.12 01
	Diarrhoea	Mean	8.53	U	00.61	9.79		8.13	0	0.30	5.89		9.98		27.46		14.54	0 71	1.	31.69		18.66	!	22.07	9.62		12.85		12.64	0	20.82	12 10	i i	20.23		16.99	
	Underweight	95% CI	0.38	to 2.65	1.30 to 6.41	4.81	to 11.21	45.41	to 52.22	57.31 to 43.51	39.70	to 45.81	37.40	to 44.52	22.44	to 33.45	17.80	10 24.99	to 19.69	7.75	to 14.34	2.47	to 4.73	1.94	to 3.69 1.76	to 3.82	29.51	to 38.78	35.29	to 43.64	29.58 to 27.60	11 94	to 22.96	12.98	to 24.22	10.26	2.7
	Under	Mean	1.02	0	0.07	7.40		48.81	70.07	40.5	42.73		40.91		27.60		21.17	17 51	t.:-	10.60		3.43		2.68	2.60		33.99		39.39	1	33.47	16 73)	17.92		13.57	
	5	95% CI	0.55	to 3.56	1.05 to 5.88	2.31	to 6.61	14.37	to 19.53	o.09 to 12.53	12.29	to 16.87	12.90	to 17.64	10.67	to 20.08	5.53	10 9.40 1 25	4.23 to 6.91	2.47	to 6.96	0.24	to 1.32	0.48	to 1.39 1.48	to 3.96	12.40	to 19.66	10.62	to 16.67	15.29	10 Z 1.00	to 7.86	2.21	to 9.03	4.23	
	Wasting	Mean	1.40	0	0.12	3.93		16.80	0	0.40	14.43		15.12		14.76		7.25	7 73	54.0	4.17		0.56		0.81	2.43		15.69		13.36	1	/6./	4.38)	4.52		6.20	
	ס	95% CI	12.27	to 21.00	11.07 to 25.72	20.80	to 30.45	53.52	to 60.89	59.44 to 59.44	49.58	to 55.60	40.14	to 47.01	32.70	to 45.58	36.75	10 45.31	42.40 to 48.48	25.21	to 35.16	21.38	to 27.35	23.44	to 29.38 7.11	to 10.73	41.34	to 50.46	48.15	to 58.03	44.30	10 32.74 29 95	to 42.33	37.05	to 50.30	31.39	10.7.0
	Stunting	Mean	16.17	7	61.7	25.32		57.25	0 0 1	20.07	52.60		43.55		38.94		40.96	15 13	54.0	29.95		24.24		26.30	8.76		45.86		53.12	, ,	48.54	35 90		43.56		35.95	
s by survey	mortality	95% CI	0.77	to 2.93	0.51 to 4 15	1.73	to 5.55	8.11	to 11.33	o.43 to 11.48	6.49	to 9.35	4.82	to 7.79	6.46	to 10.86	6.49	10 10.48 6.23	to 8.63	2.29	to 4.90	3.42	to 6.00	2.75	to 4.83 1.48	to 3.13	10.06	to 15.44	12.25	to 18.09	7.48 +0.40.0F	4.50	to 9.78	5.29	to 9.91	4.90	16.1 01
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Weighted mean child health outcomes and 95% C	Age at first birth	Mean (SD)	21.04 (3.61)	00 00 10	(21.90 (2.13)	22.54 (3.97)	•	17.65 (3.24)	10,00	16.20 (3.49)	18.04 (3.29)	•	18.48 (3.35)		19.57 (3.02)		20.25 (3.55)	00 49 (3 57)	20.42 (3.37)	20.82 (4.05)		20.85 (4.16)	;	20.48 (4.03)	21.12 (4.53)		19.12 (2.91)		19.21 (3.00)	0000	19.19 (2.87)	18 62 (3 16)	(2::2)	18.87 (3.18)		19.13 (3.45)	
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size Institutional	Table 1 Continued	per	Sample	Age at		-			,			1				
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1996 1030 18.30 (2.99) 12.37 10.37 10.55 4.73 11.55 3.89 11.25 3.89 10.800 2.188 18.25 3.99 2004 733 18.18 (3.09) 14.00 10.186 4.26 3.735 11.23 8.51 3.89 68 29.66 22.88 18.16 8	Rep.	0	0001		1	to 16.41	0	to 54.50	0	to 11.48	C	to 27.62	3	to 33.12		
2004 733 18.18 (3.0a) 14.00 10.86 42.2a 37.35 11.2a 8.51 9.66 26.0a 45.4 34.2 10.7a 10.7a <th< td=""><td>Chad</td><td>066</td><td>030</td><td>18.30 (2.98)</td><td>12.3/</td><td>to 14.70</td><td>20.30</td><td>46.24 to 54.47</td><td>13.08</td><td>to 16.58</td><td>33.95</td><td>30.05 to 38.08</td><td>Z 1.38</td><td>18.25 to 24.89</td><td></td><td></td></th<>	Chad	066	030	18.30 (2.98)	12.3/	to 14.70	20.30	46.24 to 54.47	13.08	to 16.58	33.95	30.05 to 38.08	Z 1.38	18.25 to 24.89		
ia 1995 1405 21.60 (4.43) 15.8 10.238 15.7 10.804 15.7 10.804 15.7 10.804 15.7 10.804 15.7 10.804 15.7 10.804 15.8 10.238 15.8 10.238 15.8 10.238 15.8 10.238 15.8 10.238 15.8 10.230 15.8 10.204 15.8 10.20 15.8 10.204 15.8 10.20	Chad	2004	733	18.18 (3.09)	14.00	10.86	42.26	37.35	11.23	8.51	36.86	29.66	22.83	18.16		
jag 1095 1405 21.60 (443) 158 108 15.73 1388 0.50 4.54 3.42 12.47 10.43 jag 2000 1358 21.22 (4.70) 1.68 10.27 1.53 10.82 10.18 10.18 10.6 0.1 10.71 10.14 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>to 17.85</td><td></td><td>to 47.34</td><td></td><td>to 14.68</td><td></td><td>to 44.69</td><td></td><td>to 28.29</td><td></td><td></td></t<>						to 17.85		to 47.34		to 14.68		to 44.69		to 28.29		
10 1358 11.32 (4.70) 145 1.62 15.34 10.1680 10.168	Colombia	1995	1405	21.60 (4.43)	1.58	1.05	15.73	13.68	0.92	0.50	4.54	3.42	12.44	10.75		
3004 3998 20.70 (4.49) 1.04 0.75 1.28 1.01 0.1 0.1 1.04 1.01	Colombia	0000	1358	21.32 (4.70)	1 85	to 2.38	15.38	to 18.01	0.49	to 1.68	9	to 6.01	12 77	to 14.35		
1996 234 210 (442) 104 0.75 12.36 10.124 0.154 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.144 10.145 10.145 10.146 10.146 10.149 10.149 10.156		2	2	10.17) :	to 2.70	2	to 18.03	2	to 1.09	<u>-</u>	to 4.59	i	to 14.85		
1996 234 21.20 (4.42) 6.84 4.40 4.72 31.36 6.25 19.64 10.36 10.57 10.57 1996 234 21.20 (4.42) 6.84 4.40 4.72 31.56 6.25 10.64 6.25 19.64 10.36 10.75 1997 2005 940 19.66 (3.63) 8.85 6.63	Colombia	2004	3998	20.70 (4.49)	1.04	0.75	12.36	10.92	0.85	0.59	3.15	2.50	14.14	12.63		
Dem. 2007 1180 1986 (3.50) 9.97 7.87 45.30 13.16 (8.54 5.39 10.10.7) Dem. 2007 1180 19.86 (3.50) 9.97 7.87 45.30 13.16 (8.54 5.39 10.10.7) Dem. 2007 1180 19.86 (3.50) 9.97 7.87 45.30 13.16 8.54 5.39 10.13.0 10.10.7 Hep. 2005 940 19.66 (3.63) 8.85 6.89 10.12.55 10.13.0 10.13.		000	200	00 70	0	to 1.44	71 01	to 13.96	0	to 1.24	0	to 3.98	0	to 15.79		
Dem. 2007 1180 19.86 (3.50) 9.97 787 45.30 38.16 8.54 5.39 25.79 21.40 17.11 12.46 45.40	Comoros	066	734	21.20 (4.42)	0.84	4.40 to 10.47	17.74	37.21 to 57.56	10.8	6.25 to 18.05	19.04	12.30 to 29.77	10.81	10.75 to 25.30		
Hep. 2005 940 19.66 (3.63) 8.88 (6.93) 36.58 (3.142) 10.52.6 10.30.61 10.23.00 10.23.00 Hoise 1994 927 18.28 (3.21) 11.63 9.50 45.40 40.31 8.56 6.03 24.23 19.89 17.89 10.23.00 40.19 Hovire 1994 927 18.28 (3.21) 11.83 9.50 45.40 40.31 8.55 6.03 24.23 19.89 17.89 14.34 10.184 <t< td=""><td>Congo, Dem.</td><td>2007</td><td>1180</td><td>19.86 (3.50)</td><td>9.97</td><td>7.87</td><td>45.30</td><td>38.16</td><td>8.54</td><td>5.39</td><td>25.79</td><td>21.49</td><td>17.11</td><td>12.48</td><td>45.44</td><td>38.80</td></t<>	Congo, Dem.	2007	1180	19.86 (3.50)	9.97	7.87	45.30	38.16	8.54	5.39	25.79	21.49	17.11	12.48	45.44	38.80
Hep. 2005 940 19.66 (3.63) 8.85 (6.69) 36.89 31.42 (6.84) 5.64 (3.85) 3.85 (6.93) 12.89 (3.21) 10.75 (3.16)	Rep.					to 12.55		to 52.65		to 13.26		to 30.61		to 23.00		to 52.25
Volice 1994 927 18.28 (3.2.1) 11.63 45.40 40.31 6.55 6.03 24.23 19.89 17.89 18.28 (3.2.1) 11.63 45.40 40.31 6.55 6.03 24.23 19.89 17.89 17.29 10.34 20.92 13.34 Ivoire 1996 1035 20.31 (4.34) 3.42 2.38 3.286 4.53 1.49 17.29 10.34 20.92 13.39 can 1996 1035 20.31 (4.34) 3.42 2.38 8.21 6.30 1.79 10.2 A7 10.21 A 10.21 A can 2002 26.13 3.42 2.38 8.21 1.06 8.25 1.08 2.85 1.85 1.02 A7 10.31 A can 2002 26.23 20.14 (4.29) 2.00 1.38 5.56 1.11 0.66 2.35 1.66 2.35 1.66 1.03 1.03 1.04 can 2002 20.34 20.35 20.34 <t< td=""><td>Congo, Rep.</td><td>2005</td><td>940</td><td>19.66 (3.63)</td><td>8.85</td><td>69.9</td><td>36.58</td><td>31.42</td><td>5.64</td><td>3.85</td><td>12.69</td><td>9.38</td><td>13.49</td><td>10.72</td><td>34.19</td><td>27.82</td></t<>	Congo, Rep.	2005	940	19.66 (3.63)	8.85	69.9	36.58	31.42	5.64	3.85	12.69	9.38	13.49	10.72	34.19	27.82
Worker 1994 927 18.28 (3.21) 11.83 9.50 45.40 40.31 8.55 6.03 24.23 19.89 17.89 14.34 Worker 1998 96 18.50 (3.18) 6.75 2.85 36.39 23.86 4.53 1.49 17.29 10.24 20.22 13 4.34 can 1996 1035 20.31 (4.34) 3.42 2.35 8.21 6.50 1.79 0.88 2.85 1.85 1.03 1.73 10.24 10.31 20.22 13 can 2002 2611 19.99 (4.19) 2.00 1.41 8.13 6.56 1.11 0.68 2.85 1.85 1.85 1.04						to 11.63		to 42.07		to 8.20		to 16.94		to 16.84		to 41.19
Holie 1998 96 18.50 (3.18) 6.75 2.85 3.80 4.50 17.20 17.29 10.29.17 10.22.10 ran 1996 1035 20.31 (4.34) 3.42 2.35 3.23.85 4.53 1.49 17.29 10.24 20.21 10.31.6 can 1996 1035 20.31 (4.34) 3.42 2.35 8.21 6.30 1.79 0.88 2.85 1.85 10.81 8.59 can 2002 2611 19.99 (4.19) 2.00 1.41 8.13 6.56 1.10 0.68 2.85 1.85 1.03 1.04 1.03 1.04 1.03 1.04 1.03 1.04 1.03 1.04 1.05 1.04 1.05 1.04 1.05 1.04 1.05 1.04 1.05 1.05 1.05 1.05 1.05 1.05 1.05 1.06 1.05 1.06 1.06 1.06 1.06 1.06 1.06 1.06 1.06 1.06 1.06	Cote d'Ivoire	1994	927	18.28 (3.21)	11.83	9.50	45.40	40.31	8.55	6.03	24.23	19.89	17.89	14.34		
Mark 1996 1935 20.31 (4.34) 3.42 2.35 30.39 23.885 4.35 1.49 17.29 10.34 20.92 13.39 Can		0	S		1	to 14.63	0	to 50.60		to 12.00	1	to 29.17	0	to 22.10		
can 1996 1035 20.31 (4.34) 3.42 203 8.21 6.30 1.79 0.88 2.85 185 10.81 8.59 10.31 6.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00	Cote d'Ivoire	1998	96	18.50 (3.18)	0.75	2.85	30.39	23.85	4.53	1.49	17.29	10.34	20.92	13.39		
to 4.97 can 2002 2611 19.99 (4.19) 2.00 1.41 8.13 6.56 1.11 0.66 2.35 1.66 13.91 12.04 to 2.84 to 10.04 to 1.86 to 3.31 to 16.02 can 2007 2632 20.14 (4.29) 2.00 1.41 8.13 6.56 1.11 0.66 2.35 1.66 13.91 12.04 to 2.84 to 10.04 to 1.86 to 3.31 to 16.02 can 2007 2632 20.14 (4.29) 2.00 1.48 7.59 6.03 1.40 0.93 2.67 1.68 14.66 12.74 to 2.84 to 9.52 1.08 0.27 1.09 0.58 15.18 9.25 1.08 0.27 1.08 0.27 1.09 0.58 10.23.93 10.428 10.428 10.429 10.429 10.504 10.3401	Dominican	1996	1035	20.31 (4.34)	3.42	0 13.10	200	6.30	1 79	0 12.30	2 85	1 85	10.81	8.59 8.59		
can 2002 2611 19.99 (4.19) 2.00 1.41 8.13 6.56 1.11 0.66 2.35 1.66 13.91 12.04 ic 28a 20.14 (4.29) 2.00 1.38 7.59 6.03 1.40 0.93 2.67 1.68 14.66 12.74 ic 2an 2007 2632 20.14 (4.29) 2.00 1.38 7.59 6.03 1.40 0.93 2.67 1.68 14.66 12.74 ic 2an 2007 164 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 ic 2an 2007 164 18.72 (3.27) 4.92 3.94 3.09 27.95 3.67 2.70 7.48 6.11 13.87 12.04 ic 2an 2007 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 21.9 1.58 2.40 1.82 5.85 4.88 7.99 ic 2an 2008 250 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.03 2.70 7.18 5.75 19.40 17.10 ic 2an 2007 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 21.9 1.58 2.40 1.82 5.85 4.88 7.99 ic 2an 2008 2618 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 ic 2an 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 10.774	Republic	2	2	(10)	1	to 4.97		to 10.65	2	to 3.60	ì	to 4.38	- - -	to 13.51		
tic can 2007 2632 20.14 (4.29) 2.00 1.38 7.59 6.03 1.40 0.93 2.67 1.68 14.66 12.74 to 2.88 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 to 2.89 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 to 6.14 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 Arab 2000 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.09 1.59 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 17.80 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.88 6.05 5.26 4.31 6.63 5.66	Dominican	2002	2611	19.99 (4.19)	2.00	1.41	8.13	6.56	1.11	0.66	2.35	1.66	13.91	12.04		
can 2007 2632 20.14 (4.29) 2.00 1.38 7.59 6.03 1.40 0.93 2.67 1.68 14.66 12.74 ic 10 2.88 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 can 2007 164 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 ic 2007 164 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 ic 10 2.05 2136 21.41 (3.95) 4.92 3.94 30.90 27.95 3.67 2.70 7.48 6.11 13.87 12.04 ic 10 2.00 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.40 1.82 5.85 4.88 7.99 ic 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 ic 2.00 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 ic 2.00 2.00 2.00 1.37 2 10.2.51 10.32.67 10.32.9 10.51 10.37 2 10.57.9 ic 2.00 2.00 2.00 2.00 1.37 2 10.32.9 10.37 2 10.37 2 10.37 2 10.38 10.37 3 10.	Republic					to 2.84		to 10.04		to 1.86		to 3.31		to 16.02		
to 2.88 to 9.52 to 2.10 to 4.20 to 16.82 can 2007 164 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 lic at 0.52 and 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 lic at 0.52 and 0.58 15.18 9.25 and 0.27 4.03 1.85 22.09 15.04 lic at 0.52 and 0.58 15.18 9.25 and 0.58 1.08 0.27 4.03 1.85 22.09 15.04 lic at 0.51 and 0.52 and 0.58 and 0.59 and	Dominican	2007	2632	20.14 (4.29)	2.00	1.38	7.59	6.03	1.40	0.93	2.67	1.68	14.66	12.74		
can 2007 164 18.72 (3.27) 1.99 0.58 15.18 9.25 1.08 0.27 4.03 1.85 22.09 15.04 Arab 1995 2136 21.41 (3.95) 4.92 3.94 30.90 27.95 3.67 2.70 7.48 6.11 13.87 12.04 Arab 2000 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.40 1.82 5.85 4.88 7.99 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2007 164 16.25 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Republic	!				to 2.88		to 9.52		to 2.10		to 4.20	0	to 16.82		
Arab 1995 2136 21.41 (3.95) 4.92 3.94 30.90 27.35 3.67 2.70 7.48 6.11 13.87 12.04 Arab 2000 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.40 1.82 5.85 4.88 7.99 Arab 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Dominican	2007	164	18.72 (3.27)	1.99	0.58	15.18	9.25	1.08	0.27	4.03	1.85	52.09	15.04		
Arab 2000 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.40 1.82 5.85 4.88 7.99 Arab 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2018 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Fovot Arah	1005	2136	21 41 (3 95)	4 92	30.0	20 00	10 23.33 27 95	2.67	0 4.20	7 48	6 11	13 87	12 04		
Arab 2000 2370 21.81 (3.73) 3.20 2.55 21.40 19.35 2.19 1.58 2.40 1.82 5.85 4.88 7.99 Arab 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Rep.	2	3	(2002)	<u>.</u>	to 6.14		to 34.01	5	to 4.97	2	to 9.11	5	to 15.93		
Arab 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2008 2018 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2018 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Egypt, Arab	2000	2370	21.81 (3.73)	3.20	2.55	21.40	19.35	2.19	1.58	2.40	1.82	5.85	4.88	7.99	6.40
Arab 2003 1502 21.45 (3.70) 3.94 3.01 16.87 14.65 4.17 3.03 7.18 5.75 19.40 17.10 Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66	Rep.					to 3.99		to 23.61		to 3.03		to 3.17		to 7.00		to 9.94
Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 to 2005 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 to 7.74	Egypt, Arab	2003	1502	21.45 (3.70)	3.94	3.01	16.87	14.65	4.17	3.03	7.18	5.75	19.40	17.10		
Arab 2005 3226 21.78 (3.69) 2.53 1.99 19.10 17.35 4.15 3.29 3.39 2.72 16.20 14.67 20.08 to 3.29 2.72 16.20 14.67 20.08 to 3.21 to 5.23 to 4.21 to 17.86 to 7.86 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 to 7.74 to 8.73 to 6.39 to 7.74	Rep.					to 5.16		to 19.36		to 5.72		to 8.93		to 21.92		
to 3.21 to 20.97 to 5.23 to 4.21 to 17.86 Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 to 2.51 to 32.67 to 8.73 to 6.39 to 7.74	Egypt, Arab	2002	3226	21.78 (3.69)	2.53	1.99	19.10	17.35	4.15	3.29	3.39	2.72	16.20	14.67	20.08	17.18
Arab 2008 2618 21.91 (3.72) 1.88 1.41 30.29 28.01 7.28 6.05 5.26 4.31 6.63 5.66 to 2.51 to 32.67 to 8.73 to 6.39 to 7.74	Rep.		!			to 3.21		to 20.97		to 5.23		to 4.21		to 17.86		to 23.32
	Egypt, Arab Rep.	2008	2618	21.91 (3.72)	1.88		30.29	28.01 to 32.67	7.28	6.05 to 8.73	5.26	4.31 to 6.39	6.63	5.66 to 7.74		
																Continued

Survey Start Autor (Start) Start Autor (Start) Start Autor (Start) Start Autor (Start) Autor	Table 1 Continued	pen														
1,000 1689 20.09 (364) 1137 940 887 617 868 20.09 1137 813 8		Survey	Sample	Age at	_	nortality	Stuntir	ğ	Wastin	ס	Under	veight	Diarrho	Sea	Anaer	lia lia
1,000 1689 20.09 (3.64) 1137 9.40 8.87 6.475 9.29 7.17 31.03 33.21 2.00 18.84 1.25 2.00 18.84 1.25 2.00 18.84 1.25 2.00 18.84 1.25 2.00 18.84 1.25 2.00 18.84 1.25 2.00 18.84 1.25 2.00 1.25 2.00 1.25 2.00 1.25 2.00 1.25 2.00 2.		year	Z	Mean (SD)	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
1993 1906 1956 (363) 7.59 10 1.3.7 10 1.2.5.3 10 1.1.3 10 1.0.3 10 1.1.3 10 1.0.3 10 1.1.3 10 1.0.3 10 1.1.3 10 1.0.3 10 1.0.3 10 1.1.3 10 1.0	Ethiopia	2000	1689	20.09 (3.64)	11.37	9.40	58.70	54.76	9.29	7.17	37.03	33.21	22.00	18.84		
2000 709 18.31 (3.21) 5.00 80.55 1.44 5.00 1.57 5.00 20.03 1.01 (1.6) 10.22 10.03	ciacid+U	3000	1006	10 55 (2 63)	7 50	to 13.70	20 07	to 62.53	00.01	to 11.95	20.00	to 41.03	15 70	to 25.53	0000	77 60
2000 709 18.31 (3.21) 5.10 (3.60) 30.15 (3.57) 2.4.36 (3.57) 2.4.4 (3.51) 2.5.2 (3.5.4) 30.4 (1.75) 4.2.36 (3.57) 30.4 (3.5.4) 4.2.36 (3.5.4	Filliopia	5002	007	(50.5) (5.63)	60.7	5.0/ to 10.08	40.00	to 55.04	00:01	7.47 to 14.26	23.03	to 38.53	67:01	to 20.34	70.07	to 34.88
1983 427 20.45 (3.51) 3.04 1.75 4.28 35.78 10 4.34 10 13.04 1.75 10 24.38 35.78 10 3.04 1.75 10 3.24 1.75 10 3.04 1.75 10 3.24 1.08 10 3.04 1.75 10 3.02 1.75 10 3.04 1.75 10 3.02 1.08	Gabon	2000	709	18.31 (3.21)	5.10	3.60	30.15	25.72	2.40	1.31	7.57	2.60	21.01	17.52		
1993 427 2045 (351) 3.04 175 42.36 35.78 8.70 5.69 20.09 15.52 14.10 10.22 19.89 531 20.72 (3.52) 4.76 3.22 3.32 2.921 2.5 5.46 20.99 17.56 16.21 13.12 10.2						to 7.19		to 34.99		to 4.34		to 10.16		to 24.98		
1996 531 20.72 (3.52) 4.76 3.22 3.32 2.92.1 7.55 5.46 2.09 17.56 16.2 13.12 10.19.16 10.19.	Ghana	1993	427	20.45 (3.51)	3.04	1.75	42.36	35.78	8.70	5.69	20.09	15.52	14.10	10.22		
1903 492 20.22 (3.71) 5.81 4.03 36.27 (3.18) 6.36 4.35 15.51 1.24	Chord Chord	1000	504	20 72 (2 52)	7 7 8	to 5.24	00 00	to 49.22	7 50	to 13.07	00.00	to 25.58	16.01	to 19.15		
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2008 499 21.19 (4.19) 4.51 3.06 3.96 4.47 14.88 11.24 20.50 16.80 ala 1996 1454 19.52 (3.67) 5.38 4.15 50.10 4.56 3.00 2.96 6.80 4.47 14.88 11.34 20.50 16.69 50.40 4.61 0.00 10.10.21 10.44 10.24.92 10.24.92 10.24.92 10.10.21 10.10.41 10.44 10.24.92	Ghana	2003	492	20.92 (3.71)	5.81	4.03	36.27	31.08	6.36	4.35	19.35	15.61	15.96	12.40	52.42	46.87
2006 499 21.19 (4.19) 4.51 3.05 36.08 29.58 6.80 447 14.88 11.24 20.50 16.699 50.44 11.29 14.51 10.683 50.10 45.63 3.90 2.75 16.96 14.31 21.36 18.19 10.24.92 19.99 7.43 18.32 (3.36) 10.82 8.73 37.23 32.89 6.31 4.47 19.86 16.59 2.56 19.45 10.92 2.05 10.82 17.3 19.94 514 21.19 (4.18) 9.24 6.84 33.89 28.47 5.65 3.83 20.68 16.67 23.86 19.70 31.92 19.99 19.90 (3.55) 8.02 1.97 41 552 23.09 19.00 1.28 6.50 1.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.00 1.28 10.04.54 19.04 19.00 1.28 10.04.54 19.04 19.04 19.05 19.05 19.04 19.05 19.04 19.05 19.05 19.04 19.05 1						to 8.31		to 41.79		to 9.21		to 23.73		to 20.29		to 57.91
1995 1454 19.52 (3.67) 5.38 10 6.63 10 41.00 10 10.21 10 19.44 10 24.92 10 6.95 14.54 19.52 (3.67) 5.38 4.15 5.0.10 6.457 10 6.55 10 5.00 10 24.92 10 6.95	Ghana	2008	499	21.19 (4.19)	4.51	3.05	35.08	29.58	08.9	4.47	14.88	11.24	20.50	16.69	50.44	44.47
1999 743 18.32 (3.36) 10.84 20.10	000000	1006	1 1 1 1	10 50 (2 67)	000	to 6.63	0	to 41.00	0	to 10.21	16.06	to 19.44	04.06	to 24.92		to 56.40
1999 743 18.32 (3.36) 10.82 8.73 37.23 32.89 6.31 4.47 19.86 16.59 22.56 19.45 2005 666 18.77 (3.72) 7.40 5.59 4.81 10.883 10.23.58 10.21.53 10.21.53 10.21.53 10.21.53 10.21.53 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.22.36 10.21.54 10.21.54 10.21.53 10.21.54 10.21.54 10.21.53 10.21.54 10.22.36 10.21.53 10.21.54 10.22.36 10.21.53 10.22.36 10.22.3	Gualemaia	CSS-	404 404	19.52 (3.67)	0.30	to 6.95	00.10	to 54.57	0.30	2.75 to 5.52	06:01	to 20.00	05.12	to 24.92		
2005 666 18.7 10.13.35 10.41.79 10.888 10.23.58 10.23.68 10.26.00 1994 514 21.19 (4.18) 9.24 6.84 3.389 28.47 5.65 3.83 20.68 16.57 24.14 17.18 13.55 58.57 1994 514 21.19 (4.18) 9.24 6.84 3.389 28.47 5.65 3.83 20.68 16.57 24.12 19.99 2005 2006 21.99 10.29.26 6.65 3.83 20.68 16.57 24.12 19.99 2005 2300 10.09.20 10.18.66 48.55 46.72 47.90 12.30 1992 12.09 10.29.60 10.19.66 48.55 46.72 46.72 47.90 47.90 47.90 1992 10.196 10.29.60 10.19.47 11.41 39.66 17.36 14.70 14.10 12.30 10.00 10.10.86 7.11 6.86 26.25 6.66 4	Guinea	1999	743	18.32 (3.36)	10.82	8.73	37.23	32.89	6.31	4.47	19.86	16.59	22.56	19.45		
2005 666 18.77 (3.72) 7.40 5.59 4.38 I 37.73 10.06 6.85 26.52 21.40 17.18 13.55 58.57 1994 514 21.19 (4.18) 9.24 6.84 33.89 28.47 5.69 10.45.44 10.97.42 10.97.43 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.44 10.97.84 10.86.64 10.25.36 10.20.82 10.17.10 10.20.82 10.17.10 10.20.82 10.17.10 10.10.72 10.20.82 10.20.82 10.20.82 10.20.82 10.20.82 10.20.82 10.20.82						to 13.35		to 41.79		to 8.83		to 23.58		to 26.00		
1994 514 21.19 (4.18) 9.24 6.84 33.89 28.47 5.65 10 14.54 10 32.36 10 21.53 10 21.53 10 21.53 10 21.53 10 21.53 10 22.30 10 12.39	Guinea	2002	999	18.77 (3.72)	7.40	5.59	43.81	37.73	10.06	6.85	26.52	21.40	17.18	13.55	58.57	52.14
1994 514 21.19 (4.16) 9.24 6.84 33.89 28.47 5.65 3.83 20.68 16.67 24.12 19.99 2005 1000 21.19 (4.44) 5.52 4.09 23.7 19.13 9.22 6.50 16.45 12.85 17.80 13.50 20.90 23.7 19.13 9.22 6.50 16.45 12.85 17.80 13.50 20.90 23.7 19.13 9.22 6.50 16.45 12.85 17.80 13.50 20.90 23.7 19.13 9.22 6.50 16.45 12.85 17.80 13.50 20.90 23.0 12.6 0.80 6.73 5.55 15.76 14.10 12.30 2005 2390 19.70 (3.82) 1.68 1.22 23.09 20.90 1.26 0.80 6.73 5.55 15.76 14.10 12.30 2005 12.919 19.93 (3.55) 8.02 7.44 58.80 56.94 18.02 16.94 18.05 15.25 50.67 15.99 14.77 17.29 19.70 19.91 2005 13.112 21.13 (3.86) 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 17.88 19.20 19.97 10.34 4.79 19.30 11.88 18.53 15.85 18.00 19.47 10.42.0 10.59 19.37 10.42.0 10.42.0 10.42.0 10.59 10.42.0 10.42.0 10.59 10.42.0 10.59 10.42.0 10.59 10.42.0 10.59 10.42.0 10.59 10.42.0 10.59 10.57 17.56 11.77 10.62.9 10.61.1						to 9.74		to 50.09		to 14.54		to 32.36		to 21.53		to 64.73
to 12.39 to 39.78 to 39.78 to 12.39 to 39.78 to 39.78 to 39.78 to 29.00 to 1.29 to 7.41 to 29.00 to 29.00 to 12.90 to 29.30 to 29	Haiti	1994	514	21.19 (4.18)	9.24	6.84	33.89	28.47	2.65	3.83	20.68	16.67	24.12	19.99		
as 2005 1000 21.19 (4.44) 5.52 4.09 23.71 19.13 9.22 6.50 16.45 12.85 17.80 13.50 34.56 as 2005 2390 19.70 (3.82) 1.68 1.22 23.09 20.30 1.26 6.08	:				1	to 12.39		to 39.78	(to 8.26		to 25.36		to 28.80		[
as 2005 2390 19.70 (3.82) 1.68 1.22 23.09 20.90 1.26 0.80 6.73 5.55 15.76 14.10 12.30 10.25.14 10.25.43 10.25.02 10.25.14 10.25.43 10.25.4	Haiti	2002	0001	21.19 (4.44)	29.25	4.09	23.71	19.13	9.22	6.50	16.45	12.85	08.71	13.50	34.56	29.27
48. 2003 2390 19.70 (3.62) 1.00 1.22 23.03 20.30 1.20 0.00 0.00 0.00 0.00 0.00 0.00 0.0		1000	0000	10 70 (0 00)	00	10 7.41		to 29.00	7	10 12.92 0 0	6 70	to 20.82	16 76	21.23.01 4.4.4.0	000	to 40.26
1992 12919 19.33 (3.55) 8.02 7.44 58.80 66.63 to 16.66 48.55 66.37 to 5.037 to 5.95 to 5.95 10 6.595 to 6.6063 to 17.29 to 5.037 to 5.95 10 6.595 to 5.95 10 6.595 10 6.595 10 6.595 10 6.6063 to 17.29 to 43.18 to 6.27 5.71 44.60 43.17 16.28 15.25 38.76 37.35 7.60 6.97 38.38 10 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 38.38 10 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 38.38 10 6.37 10.34 22.17 (3.73) 2.98 2.11 8.55 6.88 1.60 6.94 2.92 2.05 15.63 13.37 10 10.420 10.35 23.02 (3.90) 1.83 0.77 12.20 10.059	riolidulas	5003	7390	19.10 (3.02)	00	1.22	23.03	+0.05.43	07.	0.00 to 1.96	57.5	5.33 to 8 13	07:0	14.10	12.30	10.03
1998 12763 20.12 (3.66) 7.11 6.58 52.52 50.67 15.99 14.77 41.41 39.66 17.38 16.22 2005 13112 21.13 (3.86) 7.11 6.58 52.52 50.67 15.99 14.77 41.41 39.66 17.38 16.22 2005 13112 21.13 (3.86) 6.27 5.71 44.60 43.17 16.25 38.76 37.35 7.60 6.97 38.38 1990 1035 21.22 (3.59) 1.90 1.18 18.53 15.85 3.05 1.97 4.97 3.45 9.21 7.48 1997 1074 22.12 (3.59) 1.90 1.18 18.53 1.58 1.60 0.94 2.92 2.05 15.63 13.37 1997 1074 22.17 12.20 9.05 5.89 3.66 5.23 3.55 16.31 17.29 1995 4.07 22.07 12.20 9.05 5.89 3.66 5.23 <td>India</td> <td>1992</td> <td>12919</td> <td>19.93 (3.55)</td> <td>8.02</td> <td>7.44</td> <td>58.80</td> <td>56.94</td> <td>18.02</td> <td>16.66</td> <td>48.55</td> <td>46.72</td> <td>5.34</td> <td>4.79</td> <td></td> <td>5</td>	India	1992	12919	19.93 (3.55)	8.02	7.44	58.80	56.94	18.02	16.66	48.55	46.72	5.34	4.79		5
1998 12763 20.12 (3.66) 7.11 6.58 52.52 50.67 15.99 14.77 41.41 39.66 17.38 16.22 2005 13112 21.13 (3.86) 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 38.38 1990 1035 21.22 (3.59) 1.90 1.18 18.53 15.85 3.05 1.97 4.97 3.45 9.21 7.48 1997 1074 22.17 (3.73) 2.98 2.11 8.55 6.88 1.60 0.94 2.92 2.05 15.63 13.37 2007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 2007 898 23.02 (3.90) 2.88 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 1995 10 6.21 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 10 6.20 10 6.30 10 6.14 10 10.91 10 10.91						to 8.64		to 60.63		to 19.47		to 50.37		to 5.95		
2005 13112 21.13 (3.86) 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 38.38 to 6.87 1990 1035 21.22 (3.59) 1.90 1.18 18.53 15.85 1.90 1.97 1074 22.17 (3.73) 2.98 2.11 8.55 6.88 1.00 1.95 2.007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 1.95 1.07 1.95 1.95 1.95 1.95 1.95 1.95 1.95 1.95	India	1998	12763	20.12 (3.66)	7.11	6.58	52.52	20.67	15.99	14.77	41.41	39.66	17.38	16.22		
2005 13112 21.13 (3.86) 6.27 5.71 44.60 43.17 16.23 15.25 38.76 37.35 7.60 6.97 38.38 to 46.04 to 47.26 to 40.18 to 8.30 to 6.87 to 46.04 to 17.26 to 40.18 to 8.30 to 3.02 1.97 4.97 3.45 9.21 7.48 to 4.30 1.30 1.30 to 21.55 6.88 1.60 0.94 2.92 2.05 15.63 13.37 to 4.20 to 4.20 to 10.59 to 2.71 to 4.14 to 18.19 to 4.30 to 4.30 to 16.26 5.89 3.66 5.23 3.55 16.98 13.21 12.29 to 4.30 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 to 4.30 1.83 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 6.20 to 6.14 to 10.91 to 25.39	=				I O	to 7.68		to 54.36	0	to 17.29	I	to 43.18	I	to 18.61	(0
1990 1035 21.22 (3.59) 1.90 1.18 18.53 15.85 3.05 1.97 4.97 3.45 9.21 7.48 1997 1074 22.17 (3.73) 2.98 2.11 8.55 6.88 1.60 0.94 2.92 2.05 15.63 13.37 2007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 211 1995 10.50 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 2207 2208 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 2209 2007 2007 2007 2007 2007 2007 2007	India	2005	13112	21.13 (3.86)	6.27	5.71	44.60	43.17	16.23	15.25	38.76	37.35	09.7	6.97	38.38	36.96
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1997 1074 22.17 (3.73) 2.98 2.11 8.55 6.88 1.60 0.94 2.92 2.05 15.63 13.37 2007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 to 4.30 to 4.30 to 16.26 to 9.35 to 7.64 to 21.55 stan 1995 406 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 6.20 to 6.14 to 10.91 to 25.39		2	2	(00:0)	-	40.80	2	to 21.55		to 4.70	è	to 7 11) 1	to 11 29		
to 4.20 to 10.59 to 2.71 to 4.14 to 18.19 2007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 to 4.30 to 16.26 to 9.35 to 7.64 to 21.55 stan 1995 406 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 25.99 to 6.14 to 10.91 to 25.39	Jordan	1997	1074	22.17 (3.73)	2.98	2.11	8.55	6.88	1.60	0.94	2.92	2.05	15.63	13.37		
2007 898 23.02 (3.90) 1.83 0.77 12.20 9.05 5.89 3.66 5.23 3.55 16.98 13.21 12.29 to 4.30 to 4.30 to 4.30 to 16.26 to 9.35 to 7.64 to 21.55 stan 1995 406 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 6.29 to 6.14 to 10.91 to 25.39						to 4.20		to 10.59		to 2.71		to 4.14		to 18.19		
to 4.30 to 16.26 to 9.35 to 7.64 to 21.55 to 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 25.39 to 6.14 to 10.91 to 25.39	Jordan	2007	868	23.02 (3.90)	1.83	0.77	12.20	9.05	5.89	3.66	5.23	3.55	16.98	13.21	12.29	9.25
1995 406 21.93 (3.62) 3.68 2.17 17.89 11.91 2.59 1.07 5.77 2.97 17.56 11.77 to 6.20 to 25.99 to 6.14 to 10.91 to 25.39						to 4.30		to 16.26		to 9.35		to 7.64		to 21.55		to 16.16
	Kazakhstan	1995	406	21.93 (3.62)	3.68	2.17 to 6.20	17.89	11.91 to 25.99	2.59	1.07 to 6.14	2.77	2.97 to 10.91	17.56	11.77 to 25.39		
														2		1000

	Table 1 Continued	pen														
1999 399 21.99 (369) 448 269 1266 815 2.66 0.674 3.6 1.23 7.49 13.22 1.49 1.29 1.20 (3.69) 448 2.69 1.26 (8.15 2.66 0.674 3.6 1.24 13.22 1.29 (3.69) 448 2.69 1.26 (8.15 2.66 0.674 3.6 1.24 1.23 1.24 13.22 1.24 1.25 1.25 1.24 1.25		Survey	Sample	Age at first birth	Infant I	mortality	Stuntir) Bu	Wastin	D	Under	veight	Diarrho)ea	Anaem	lia l
start 1999		year	z	Mean (SD)	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
1998 667 1922 (3.20) 39 27.7 35.0 19.18 10 6.15 10 19.4 11.53 19.9	Kazakhstan	1999	395	21.99 (3.69)	4.48	2.69	12.66	8.15	2.56	0.97	3.86	1.53	17.49	13.32		
1996 866 1922 (3.20) 3.59 2.71 38.01 3.54 5.84 5.94 3.97 4.11 11.55 18.01 3.59 2.71 38.01 3.54 5.84 3.87 4.91 1.41 19.05 (3.44) 5.64 4.29 3.5.34 3.5.4 3.87 4.91 1.41 19.05 (3.44) 5.64 4.29 3.5.34 3.5.4 3.87 4.91 1.41 19.05 (3.44) 5.64 4.29 3.5.34 3.5.4 3.87 4.91 1.41 19.05 (3.44) 5.05 3.22 3.24 3.67 4.30 1.0	<u>`</u>		1		i C	to 7.38	0	to 19.15	C C	to 6.54	;	to 9.42	1	to 22.63		
2008 1114 19.95 (3.43) 5.61 4.29 37.70 5.42 3.87 14.99 12.43 16.13 16.13 16.13 16.13 16.13 16.14 16.15 <t< td=""><td>Kenya</td><td>1998</td><td>/98</td><td>19.92 (3.20)</td><td>3.95</td><td>2.71 to 5.71</td><td>38.01</td><td>33.54 to 42.69</td><td>5.98</td><td>3.97 to 8.90</td><td>14.11</td><td>11.53 to 17.14</td><td>18./3</td><td>14.95 to 23.21</td><td></td><td></td></t<>	Kenya	1998	/98	19.92 (3.20)	3.95	2.71 to 5.71	38.01	33.54 to 42.69	5.98	3.97 to 8.90	14.11	11.53 to 17.14	18./3	14.95 to 23.21		
2006 1059 197 38.4 10 7.54 10 7.54 10 7.54 10 7.57 10 17.67 10 19.00 1997 388 20 97 (3.14) 5.05 3.243 2.43 2.64 1.75 10 1.264 1.01 1.264 10 1.00 10 1.00 2004 749 1981 (3.24) 6.05 3.44 1.04 3.64 1.05 3.24 2.04 1.05 3.00 1.05 1.05 3.00 1.05 1.05 3.00 1.05 1.05 3.00 1.05 3.00 1.05 3.00 1.05 3.00	Kenya	2003	1114	19.95 (3.43)	5.61	4.29	35.33	31.70	5.42	3.87	14.99	12.43	16.14	13.63		
2008 1059 1991 (3.60) 4.75 3.44 3.07.8 5.44 367 14.39 13.6 13.5 10.08 1997 388 20.97 (3.14) 5.05 3.22 3.24 24.30 2.02 0.73 6.77 351 19.01 19.08 19.01 19.01 19.08 19.01 19.01 19.02 <td></td> <td></td> <td></td> <td></td> <td></td> <td>to 7.30</td> <td></td> <td>to 39.14</td> <td></td> <td>to 7.54</td> <td></td> <td>to 17.97</td> <td></td> <td>to 19.00</td> <td></td> <td></td>						to 7.30		to 39.14		to 7.54		to 17.97		to 19.00		
1997 388 20.97 (3.14) 5.05 32.24 32.43 54.430 10.743 10.7	Kenya	2008	1059	19.91 (3.60)	4.75	3.34	35.46	30.78	5.24	3.67	14.39	11.36	13.55	10.69		
1997 1997 1998 (3.52) 1712 1998 (3.52) 1712 (3.44) 1814 (3.24) 1814 (3	Kyrowy	1007	888	20 07 (3 14)	ת ה	to 6.71	20 /3	to 40.43	000	to 7.41	27.	to 18.06	10.38	to 17.02		
1900 1910	Republic	1661	999	(41.6) (6.07)	0.00	5.22 to 7.83	54.45	to 41.77	20.2	to 5.49	2.5	5.51 to 12.64	9.30	to 26.20		
Secari 1997 915 19.22 (3.94) 10.61 6.548 4.056 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 4.068 5.65 5.06 5.05	Lesotho	2004	749	19.81 (3.24)	6.82	5.09	48.43	41.99	2.81	1.50	16.97	13.00	13.53	9.92	28.47	22.99
1997 915 19.22 (3.94) 10.61 8.51 65.46 60.10 7.12 5.03 7.12 5.03 10.31.3 17.16 10.25.50 10.31.3 17.16 10.25.50 10.31.3 17.16 10.25.50 10.31.3 17.16 10.25.50 10.31.3 17.16 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.25.50 10.31.3 10.31.3 10.25.50 10.31.3 10.31.3 10.25.50 10.31.3 1						to 9.09		to 54.93		to 5.18		to 21.84		to 18.19		to 34.65
secar 1997 915 1922 (3.94) 106 1 9.63 10 50.35 10 8.32 34.37 29.41 25.50 10 25.50 sscar 2003 951 19.22 (3.94) 106 1 3.44 10 70.45 1.2 50.33 34.37 29.41 29.95 25.50 sscar 2003 951 20.19 (4.40) 5.36 3.70 65.18 50.85 12.83 37.42 22.05 7.33 53.11 34.48 sscar 2008 1887 19.11 (3.82) 4.78 4.72 40.11 10.00 <t< td=""><td>Liberia</td><td>2006</td><td>940</td><td>19.38 (3.52)</td><td>7.12</td><td>5.23</td><td>45.57</td><td>40.86</td><td>5.85</td><td>4.08</td><td>25.72</td><td>20.96</td><td>21.03</td><td>17.16</td><td></td><td></td></t<>	Liberia	2006	940	19.38 (3.52)	7.12	5.23	45.57	40.86	5.85	4.08	25.72	20.96	21.03	17.16		
secar 2003 951 20.10 (4.40) 5.36 37.0 5.01 (0.00) 37.7 2.3.7 2.3.2 (5.3.2) 7.33 5.31 34.8 secar 2008 1887 19.11 (3.82) 4.78 5.06 (3.82) 1.2.83 9.76 37.42 32.05 7.33 5.31 34.8 secar 2008 1887 19.11 (3.82) 4.78 44.72 40.13 10.10.05 10.00 10.0		1007	015	10 22 (3 04)	10.61	to 9.63	8E 18	to 50.35	7 10	to 8.32	76 76	to 31.13	20.05	to 25.50		
sscar 2003 951 20.19 (4.40) 5.36 3.70 56.18 50.85 12.89 9.76 37.42 32.05 7.33 5.31 34.48 sscar 2008 1887 19.11 (3.82) 4.78 4.72 40.11 1 10.16.70 10.43.13 10.10.05 10.40.11 10.10.05 10.10.05 10.40.11 10.10.05 10.40.11 10.10.05 10.10.05 10.10.12	Madayascai	1881	C 6	19.52 (3.34)	0.01	to 13.14	04.50	to 70.45	7.1	to 10.00	75.45	to 39.70	29.93	to 34.81		
sscar 2008 1887 19.11 (3.82) 4.78 44.72 40.11 1.0 49.42 10.0105 10.0105 10.005 10.013 10.013 10.002 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.42 10.049.43 10.049.42 10.049.43 </td <td>Madagascar</td> <td>2003</td> <td>951</td> <td>20.19 (4.40)</td> <td>5.36</td> <td>3.70</td> <td>56.18</td> <td>50.85</td> <td>12.83</td> <td>9.76</td> <td>37.42</td> <td>32.05</td> <td>7.33</td> <td>5.31</td> <td>34.48</td> <td>26.54</td>	Madagascar	2003	951	20.19 (4.40)	5.36	3.70	56.18	50.85	12.83	9.76	37.42	32.05	7.33	5.31	34.48	26.54
192 184 194						to 7.69		to 61.36		to 16.70		to 43.13		to 10.05		to 43.39
1992 564 18.84 (2.98) 17.00 10.6.02 10.49.42 10.98 17.00 10.6.02 10.49.42 10.49.42 17.00 10.6.03 10.20.98 10.0.98 10.0.98 10.0.99	Madagascar	2008	1887	19.11 (3.82)	4.78	3.78	44.72	40.11					9.11	96.9	14.62	11.89
1992 564 18.84 (2.36) 17.00 13.65 64.28 58.09 6.08 3.88 22.30 17.09 11.15 8.10 2000 2121 18.95 (2.61) 13.71 12.13 62.66 59.07 4.79 3.64 22.42 19.99 16.49 14.48 2004 1872 18.80 (2.53) 8.53 7.15 58.00 54.61 5.87 4.55 18.31 15.91 21.50 18.90 1995 1042 18.48 (3.32) 17.01 14.74 48.29 42.85 20.05 18.84 18.55 (3.43) 14.71 42.24 38.58 14.98 17.04 15.06 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 17.04 17.24 10.37.8 10.34.9 10.75.9 10.34.9 10.75.0 19.20.9 10.49.9 10.75.0			i I		1	to 6.02		to 49.42	(0	0	1	,	to 11.84		to 17.85
2000 2121 18.95 (2.61) 13.71 12.0.98 10.70.03 4.0.941 10.27.37 10.15.17 10.15.46 10.70.03 4.0.941 10.27.37 10.15.17 10.15.46 10.65.66 10.65.05 4.0.57 4.0.55 10.25.05 10.15.17 10.15.14 10.15.14 10.15.14 10.15.14 10.15.14 10.15.14 10.15.14 10.15.14 10.25.04 10.25.04 10.15.14<	Malawi	1992	264	18.84 (2.98)	17.00	13.63	64.28	58.09	80.9	3.88	22.30	17.79	11.15	8.10		
2004 1872 18.80 (2.53) 8.53 7.15 62.00 54.61 5.87 4.55 18.31 15.91 21.50 18.93 14.75 10.18.30 10.18.31 15.91 20.00 10.18.30 10.18	MO.	0000	50.50	10 05 (2 64)	10 71	10 20.98	99 09	to 70.03	7 70	10 9.41	07 00	10 27.57	16.40	/L'CL 01		
2004 1872 18.80 (2.53) 8.53 7.15 58.00 54.61 5.87 7.55 18.31 15.91 21.50 18.90 39.83 1995 1042 18.48 (3.32) 17.01 14.74 48.29 42.85 23.45 19.14 39.96 34.73 25.17 20.64 2001 1595 18.70 (3.44) 15.56 13.36 45.95 42.17 12.23 9.96 33.63 30.07 19.06 15.93 63.91 2006 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 12.97 33.23 28.23 14.47 12.11 62.99 2006 1844 18.55 (3.43) 14.17 14.24 38.58 14.98 12.97 33.23 28.23 14.47 12.11 62.99 2006 1844 18.55 (3.43) 14.17 14.24 38.58 14.98 12.97 33.23 28.23 14.47 12.11 62.99 0 22	Ivialawi	2000	1717	10.33 (2.01)	- 7.0	to 15.46	02.00	59.57 to 65.66	t.;	5.04 to 6.27	24.77	19.39 to 25.05	9.01	14.46 to 18.71		
1995 1042 18.48 (3.32) 17.01 14.74 48.29 42.85 23.45 19.14 39.96 34.73 25.17 20.64 2001 1595 18.70 (3.44) 15.56 13.36 45.95 42.17 12.23 9.96 34.73 28.23 14.77 17.74 42.24 38.58 14.98 12.97 17.24 10.34.40 2002 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 12.97 31.23 28.23 14.47 12.11 62.99 coo 2003 1276 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 coo 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.73 coo 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.73 coo 2003 1276 22.57 (4.54) 3.96 2.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 7.30 5.72 coo 2003 1276 22.57 (4.54) 3.96 2.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 coo 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 coo 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 coo 2003 1276 22.57 (4.54) 3.96 20.21 10.35 50.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69	Malawi	2004	1872	18.80 (2.53)	8.53	7.15	58.00	54.61	5.87	4.55	18.31	15.91	21.50	18.90	39.83	34.10
1995 1042 18.48 (3.32) 17.01 14.74 48.29 42.85 23.45 19.14 39.96 34.73 25.17 20.64 2001 1595 18.70 (3.44) 15.56 13.36 45.95 42.17 12.23 9.96 33.63 30.07 19.06 15.93 63.91 2001 1595 18.70 (3.44) 15.56 13.36 45.95 42.17 12.23 9.96 33.63 30.07 19.06 15.93 63.91 2006 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 12.97 31.23 28.23 14.47 12.11 62.99 cco 1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 cco 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 ambique 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 co 2013 12.00 12.00 12.00 12.00 12.00 10.01 10.0						to 10.15		to 61.31		to 7.55		to 20.98		to 24.34		to 45.84
to 19.55 to 53.77 to 28.41 to 45.43 to 30.32 2001 1595 18.70 (3.44) 15.56 13.36 45.95 42.17 12.23 9.96 33.63 30.07 19.06 15.93 63.91 2006 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 12.97 31.23 28.23 14.47 12.11 62.99 1004a 2005 630 22.18 (3.56) 0.93 0.40 8.89 6.70 5.19 3.59 3.22 1.95 7.01 5.26 to 14.30 0.20 20.03 12.76 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 ambique 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69	Mali	1995	1042	18.48 (3.32)	17.01	14.74	48.29	42.85	23.45	19.14	39.96	34.73	25.17	20.64		
2006 1844 18.55 (3.43) 14.17 11.74 42.24 38.59 42.77 10.14.94 to 14.94 to 22.64 10.20.2 10.20.	MO II	1000	100	10 70 (3 44)	и Т	to 19.55	76.06	to 53.77	1000	to 28.41	00 00	to 45.43	90.01	to 30.32	000	EG 77
2006 1844 18.55 (3.43) 14.17 11.74 42.24 38.58 14.98 12.97 31.23 28.23 14.47 12.11 62.99 lova 2005 630 22.18 (3.56) 0.93 0.40 8.89 6.70 5.19 3.59 3.22 1.95 7.01 5.28 9.04 lova 2005 630 22.18 (3.56) 0.93 0.40 8.89 6.70 5.19 3.59 3.22 1.95 7.01 5.28 9.04 loca 1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 loca 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 loca 20.33 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69	IVIDII	- 007	CBC -	10.10 (3.44)	0	to 18 04	5.00	to 49.77	C2.21	5.30 to 14 94	50.55	to 37.38	9.00	to 22 64	6.50	50.77 to 70.49
lova 2005 630 22.18 (3.56) 0.93 0.40 8.89 6.70 5.19 3.59 3.22 1.95 7.01 5.28 9.04 occo 1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 occo 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 ambique 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69	Mali	2006	1844	18.55 (3.43)	14.17	11.74	42.24	38.58	14.98	12.97	31.23	28.23	14.47	12.11	65.99	57.58
2005 630 22.18 (3.56) 0.93 0.40 8.89 6.70 5.19 3.59 3.22 1.95 7.01 5.28 9.04 1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 1005 1005 1005 1005 1005 1005 1005 100						to 17.01		to 45.99		to 17.24		to 34.40		to 17.20		to 68.08
1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 1997 1997 10.26 10.63.83 10.15.20 10.38.36 10.32.59	Moldova	2005	630	22.18 (3.56)	0.93	0.40	8.89	0.70	5.19	3.59	3.22	1.95	7.01	5.28	9.04	6.38
1992 788 22.21 (4.38) 6.22 4.55 23.49 20.13 1.94 1.10 4.29 2.86 6.20 4.48 10 8.45 to 27.23 to 3.41 to 6.39 to 8.53 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 10 20.26 to 63.83 to 15.20 to 38.36 to 32.59						to 2.15		to 11.70		to 7.44		to 5.26		to 9.26		to 12.66
to 8.45 to 27.23 to 3.41 to 6.39 to 8.53 2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 5.72 to 5.21 to 22.64 to 10.70 to 10.15 to 9.26 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 to 20.26 to 63.83 to 15.20 to 38.36 to 32.59	Morocco	1992	788	22.21 (4.38)	6.22	4.55	23.49	20.13	1.94	1.10	4.29	2.86	6.20	4.48		
2003 1276 22.57 (4.54) 3.96 3.00 19.72 17.10 8.67 7.00 8.32 6.80 7.30 9.72 to 5.21 to 22.64 to 10.70 to 10.15 to 9.26 1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 to 20.26 to 63.83 to 15.20 to 38.36 to 32.59		000	7	1	0	to 8.45	1	to 27.23	0	to 3.41	0	to 6.39	1	to 8.53		
1997 938 18.80 (3.27) 14.62 10.35 56.14 48.14 9.74 6.09 28.54 20.40 22.39 14.69 to 32.59 to 32.59	Morocco	2003	12/0	22.57 (4.54)	3.90	3.00 to 5.21	19.72	17.10	8.67	7.00 to 10.70	8.32	6.80 to 10.15). US. /	5.72 to 9.86		
	Mozambique	1997	938	18.80 (3.27)	14.62	10.35 to 20.26	56.14	48.14 to 63.83	9.74	6.09 to 15.20	28.54	20.40 to 38.36	22.39	14.69 to 32.59		
																Continued

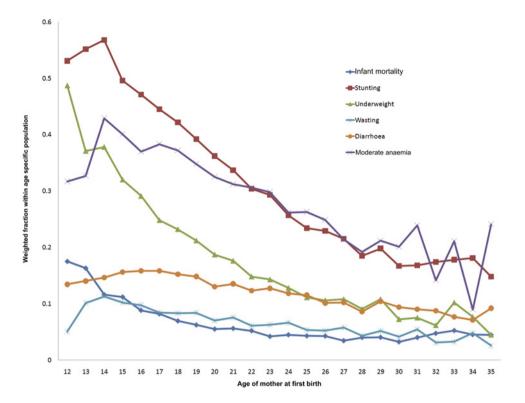
S Wozambique 2 Namibia 1	Curvey	Sample	Age at												
enbi		Size	first birth	Infant r	mortality	Stunting	g	Wasting	5	Under	Underweight	Diarrhoea)ea	Anaemia	<u>a</u>
ique		N	Mean (SD)	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
	2003	1679	18.73 (3.26)	11.68	9.88	51.77	47.94	4.75	3.40	21.41	18.50	14.41	12.22		
		İ	;		to 13.75		to 55.58		to 6.60		to 24.65		to 16.91		
	1992	762	20.32 (3.71)	5.10	3.75	38.83	34.12 to 72.76	8.02	5.73	21.24	17.21	16.28	12.91		
Namibia	2000	830	20.44 (3.83)	3.05	1.95	27.82	23.92	8.74	6.18	18.69	14.28	12.63	9,55		
					to 4.72		to 32.10		to 12.22		to 24.08		to 16.53		
Namibia 2	2006	1123	20.76 (4.00)	3.31	2.44	28.69	24.81	5.96	4.41	17.92	14.58	16.00	12.96		
	[!	to 4.50		to 32.90		to 8.02		to 21.84		to 19.59		
Nicaragua 1	1997	1633	19.06 (3.64)	3.75	2.86	25.74	23.01	2.18	1.39	8.07	6.33	12.33	10.57		
Nicaragua 2	2001	1663	19.26 (3.75)	2.43	1.78	20.84	18.42	1.59	0.88	5.03	3.84	12.33	10.48		
)					to 3.30		to 23.48		to 2.85		to 6.56		to 14.45		
Niger	1998	871	18.16 (3.15)	16.42	13.68	56.49	50.91	24.52	19.95	50.01	44.60	36.91	31.70		
		0		í.	to 19.58	0	to 61.91	į	to 29.75	Ĺ	to 55.42	1	to 42.44	0	0
Niger	5006	922	18.64 (3.42)	9.45	7.42	60.64	55.35	9.47	6.85	45.40	40.09 to E0.04	18.74	14.93	59.43	53.08
Nigeria	1990	1023	19.80 (3.88)	7.65	5.64	55.63	51.25	13.60	8.01	38.01	32.01	10.97	8.23		00.49
					to 10.30		to 59.92		to 22.17		to 44.40		to 14.47		
Nigeria	2003	820	19.82 (3.89)	10.00	7.71	46.78	40.28	9.13	09.9	31.67	26.27	16.72	13.26		
					to 12.87		to 53.39		to 12.50		to 37.61		to 20.87		
Nigeria	2008	3952	20.29 (4.24)	8.17	7.26	39.08	36.76	12.00	10.61	24.74	22.65	10.41	9.20		
		į		[to 9.19	(to 41.46		to 13.53		to 26.96	:	to 11.77		
Pakistan 1	1990	874	20.81 (3.88)	9.97	7.64	53.38	47.78	11.52	7.41	33.03	27.96	7.11	4.90		
		Č	77 77	C	to 12.90	7	10 58.89	2	to 17.49	7	to 38.54	5	10.21 to 10.21		
raraguay	066	080	(4.21)	3.03	2.02 to 4.69	12.8/	10.24	ე. გა	10.07 15.75	 	10.98 10.98	4.95 5	3.27 to 7.35		
Peru 1	1991	1747	21.13 (4.22)	2.50	1.87	30.63	27.83	1.21	0.73	6.08	4.88	7.93	6.57		
					to 3.35		to 33.57		to 1.99		to 7.56		to 9.55		
Peru 1	1996	3505	20.96 (4.15)	3.05	2.45	22.42	20.35	0.79	0.51	3.17	2.59	15.06	13.51		
					to 3.80		to 24.65		to 1.22		to 3.88		to 16.75		
Peru	2000	3151	21.02 (4.33)	2.21	1.70	24.09	21.85	0.68	0.41	3.20	2.50	13.78	12.30	24.96	20.76
		i i		!	to 2.87	0	to 26.48	i	to 1.13	0	to 4.08	1	to 15.41	1	to 29.70
Peru	2003	5826	21.14 (4.44)	1.57	1.11	20.19	17.77	0.71	0.35	2.24	1.70	13.72	11.85	17.32	15.22
		1	5	0	to 2.24		to 22.84	3	to 1.43	1	to 2.94	L	to 15.82		to 19.64
Hwanda	1885	/4Z	21.54 (3.57)	0.00	8.07 to 12.48	28.42	53.98	Z.9.	1.75 40 7 83	<u>-</u>	15.79	15.52	12.01		
Chacke	0000	1200	01 37 (3 30)	10.62	8 96	50 00	10 02.73	707	273	17.16	17.207	15 03	12.40		
		604	(20.04)	20.0	to 12.54	36.36	to 56.70	t 4.0	to 7.30) -	to 20.52	5.5	to 18.84		
Rwanda 2	2005	926	21.54 (3.29)	8.06	6.31	54.14	49.11	5.69	3.72	21.00	17.07	16.34	12.97	35.70	30.54
					to 10.25		to 59.09		to 8.59		to 25.56		to 20.38		to 41.20

Table 1 Continued	per														
	Survey	Sample	Age at first birth	Infant n	mortality	Stunting	5	Wasting		Underweight	veight	Diarrhoea)ea	Anaemia	<u>a.</u>
	year	z	Mean (SD)	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Senegal	2005	1260	20.01 (3.91)	7.09	5.61	20.13	15.29	7.46	5.05	13.98	10.29	21.26	16.65	61.98	55.64
·		0		(to 8.93	(to 26.04		to 10.88		to 18.71	i I	to 26.74	0	to 67.94
Sierra Leone	2008	993	19.85 (4.03)	8.06	6.08 to 10.61	38.25	31.56 to 45.41	11.82	8.30 to 16.57	22.17	16.99 to 28.30	7.80	5.15	46.22	39.35
Swaziland	2006	620	19.48 (3.35)	7.95	5.95	28.69	24.65	1.54	0.72	3.87	2.40	17.15	13.71	21.93	18.07
					to 10.55		to 33.10		to 3.29		to 6.16		to 21.23		to 26.34
Tanzania	1996	1058	19.31 (2.81)	9.38	7.62	26.50	52.22	8.52	6.43	26.25	23.01	13.45	11.13		
ŀ		Ç		0	to 11.50	1	to 60.69	0	to 11.20	0	to 29.77	0	to 16.17		
l anzania	1888	4 Σ	18.50 (2.84)	9.80	3.92 to 22.69	57.16	33.20 to 78.17	6.31	1.43 to 23.83	26.88	13.03 to 47.41	9.32	3.45 to 22.82		
Tanzania	2004	1405	19.58 (3.26)	7.40	5.98	50.22	45.93	3.24	2.22	18.11	15.72	11.54	9.57	43.42	39.87
					to 9.12		to 54.51		to 4.69		to 20.77		to 13.85		to 47.05
Togo	1998	801	20.30 (3.60)	8.27	6.47 to 10.53	34.67	29.09 to 40.70	12.53	9.28 to 16.70	25.71	21.19 to 30.81	30.18	25.94 to 34.79		
Turkey	1993	949	21.16 (3.44)	4.73	3.47	17.98	15.20	1.76	1.00	6.15	4.49	14.42	12.09		
					to 6.42		to 21.15		to 3.09		to 8.37		to 17.12		
Turkey	1998	929	21.59 (3.89)	3.06	2.05	18.36	15.46	1.62	0.88	5.70	4.12	27.06	23.87		
					to 4.55		to 21.67		to 2.99		to 7.85		to 30.51		
Uganda	1995	1067	18.71 (2.98)	11.14	9.18	52.06	46.60	5.41	3.49	23.09	19.11	25.44	22.03		
					to 13.47		to 57.47		to 8.29		to 27.61		to 29.17	:	
Uganda	2000	1035	18.81 (2.98)	10.56	8.68	49.28	45.02	3.10	1.94	14.86	11.93	16.99	13.93	41.11	36.08
Uganda	2006	711	19.26 (2.82)	7.63	5.55	42.30	36.02	6.65	3.81	15.90	11.62	26.83	21.31	41.20	34.42
)					to 10.39		to 48.83		to 11.35		to 21.39		to 33.17		to 48.33
Uzbekistan	1996	229	20.89 (2.71)	3.80	2.51	35.89	29.30	7.84	4.63	7.63	4.98	6.73	4.11		
:					to 5.71	((to 43.06		to 13.00		to 11.53		to 10.84		
Zambia	986	188	18.80 (2.81)	13.46	11.48	27.98	54.05	4.49	3.18 00 9 0t	L5.13	18.40	24.12	71.12 to 57.94		
Zambia	2001	1161	18.59 (2.68)	10.47	8.82	58.17	54.17	5.27	3.70	22.43	19.83	23.77	20.83		
					to 12.38		to 62.06		to 7.44		to 25.27		to 26.98		
Zambia	2007	972	19.21 (3.12)	7.44	5.85	51.39	47.22	4.36	3.03	15.44	12.74	15.66	12.98		
					to 9.42		to 55.54		to 6.24		to 18.59		to 18.78		
Zimbabwe	1994	719	19.53 (3.01)	5.81	4.22	31.46	25.99	7.39	4.77	14.70	10.79	25.59	20.64		
Zimhahwa	2002	1961	19 87 (3 19)	7 70	10 / .95	32.26	30.00	6 30	10 11.27 177	10 57	10.49	12.65	11 40	20 68	25 99
Zilloadwe	200	- 03	(61.0)		to 7.35	5	to 36.69	20.0	to 8.33	10:3	to 14.98	5	to 16.26	20.03	to 33.65
Total	2000	176 583	20.18 (3.87)	6.49	6.35	36.20	35.81	7.53	7.32	19.78	19.43	13.64	13.40	32.60	31.87
					to 6.64		to 36.60		to 7.74		to 20.13		to 13.8/		to 33.34

	Infant mortality	ality	Stunting		Underweight	,t	Wasting		Diarrhoea		Moderate anaemia	naemia
	n=176583		n=119018		n=122680		n=120246		n=135121		n=31520	
	Population	Weighted fraction	Population	Weighted fraction	Population	Weighted fraction	Population	Weighted fraction	Population	Weighted fraction	Population	Weighted fraction
band in years	Age band in years of the mother	at first birth										
12-14	4497	0.026	2301	0.020	2443	0.020	2379	0.020	2851	0.021	514	0.016
15-17	42233	0.239	25 882	0.219	26839	0.220	26 335	0.220	30 01 1	0.222	6531	0.203
18–20	62 091	0.352	41 492	0.351	42 868	0.352	42 054	0.352	47 425	0.351	11 753	0.366
21–23	37 757	0.214	26 427	0.224	27 127	0.223	26 594	0.223	29 927	0.222	7563	0.236
24–26	17 383	0.099	12 669	0.107	12936	0.106	12 690	0.106	14258	0.106	3355	0.105
27–29	7648	0.043	5722	0.048	5883	0.048	5771	0.048	6480	0.048	1481	0.046
30-32	3377	0.019	2566	0.022	2616	0.022	2547	0.021	2884	0.021	650	0.020
33-35	1399	0.008	1075	600.0	1085	600.0	1075	600.0	1203	600.0	249	0.008
Sex of child												
Male	90302	0.512	59 709	0.505	61867	0.508	60 577	0.507	68 50 1	0.507	16438	0.512
Female	86083	0.488	58 424	0.495	59 929	0.492	58 867	0.493	66 539	0.493	15658	0.488
Type of birth												
Singleton	174947	0.992	117235	0.992	120853	0.992	118515	0.992	134 004	0.992	31850	0.992
Twin	1438	0.008	868	0.008	944	0.008	930	0.008	1036	0.008	247	0.008
Age of child in months	nths											
48–60	44 542	0.253	24 472	0.207	24 780	0.203	24 353	0.204	27 013	0.200	7552	0.235
36-47	42 793	0.243	26908	0.228	27 694	0.227	27 210	0.228	31 330	0.232	7867	0.245
24-35	43 082	0.244	31 485	0.267	32 603	0.268	31 950	0.267	36 595	0.271	7961	0.248
12–23	45968	0.261	35268	0.299	36718	0.301	35 932	0.301	40 101	0.297	8717	0.272
ational level o	Educational level of the mother at time of interview	it time of inte	arview									
Secondary	36 152	0.205	27 729	0.235	28308	0.232	27 757	0.232	31 177	0.231	6562	0.204
or higher												
Completed	57 645	0.327	40 543	0.343	41341	0.339	40 673	0.341	45 720	0.339	12739	0.397
piiiiaiy					1,		' '	0			1	
No education or incomplete	82.589	0.468	49 862	0.422	5214/	0.428	STU TS	0.427	58142	0.431	12796	0.399
primary .												
Mother has a partner	ıer											
Yes	163858	0.929	109350	0.926	112890	0.927	110 666	0.927	125 468	0.929	30 192	0.941
No	12527	0.071	8784	0.074	9068	0.073	8779	0.074	9572	0.071	1904	0.059
ational level o	Educational level of the mother's partner at the time of interview	partner at ti	he time of inte	erview								
Completed	54 943	0.311	39 434	0.334	40 422	0.332	39 640	0.332	44 409	0.329	8891	0.277
secondary												
or riigner Completed	22000	0000	70000	0000	00000	0000	2000	8000	74044	7000	00101	0.070
Completed primary	20 00	0.321	38 884	0.329	39.920	0.328	39216	0.328	44 Z I /	0.327	12 180	0.379

= 0	וחמחו וחסרומוונץ	ality	Stunting		Underweight	¥	Wasting		Diarrhoea		Moderate anaemia	naemia
	n=176583		n=119018		n = 122680		n=120246		n=135121		n=31 520	
	Population	Weighted fraction	Weighte Population fraction	Weighted fraction	Population	Weighted fraction	Population	Weighted fraction	Weighte Population fraction	Weighted fraction	Population	Weighted fraction
No education or	64 787	0.367	39815	0.337	41 455	0.340	40 589	0.340	46414	0.344	11 025	0.344
incomplete												
Age band in years of the mother's partner at the mother's first birth	he mother's	s partner at 1	the mother's	first birth								
12–17	2104	0.012	1224	0.010	1236	0.010	1211	0.010	1409	0.010	373	0.012
	40 271	0.228	27 180	0.230	28018	0.230	27 483	0.230	30 594	0.227	9132	0.285
_	101 722	0.577		0.566	68 828	0.565	62 29	0.566	77 555	0.574	15 792	0.492
	22 072	0.125		0.135	16483	0.135		0.135	17 661	0.131	4797	0.149
36–41	8929	0.038		0.040	4846	0.040		0.040	5266	0.039	1342	0.042
42–59	3448	0.020	2284	0.019	2385	0.020	2332	0.020	2555	0.019	099	0.021
Wealth quintile of the c	the child's household	sehold										
	36 825	0.209		0.211	25 377	0.208	24876	0.208	28 741	0.213	6550	0.204
	37 749	0.214		0.220	26 597	0.218	26 150	0.219	29413	0.218	6961	0.217
	36 203	0.205	24 554	0.208	25319	0.208	24 853	0.208	27 932	0.207	6795	0.212
	34 324	0.195		0.192	23517	0.193	23 053	0.193	25 834	0.191	6138	0.191
Poorest (31 285	0.177			20 986	0.172	20512	0.172	23 120	0.171	5653	0.176
se of the child	's househo	ld at the time										
Urban	70 395	0.399		0.427	51 491	0.423	50 597	0.424	57 358	0.425	12301	0.383
Rural 10	105 990	0.601	902 29	0.573	70 305	0.577	68 848	0.576	77 682	0.575	19 796	0.617
ild's	house											
	76 844	0.436		0.470	26 699	0.466		0.466	62 499	0.463	14 306	0.446
t piped	99 542	0.564	62 653	0.530	65 097	0.534	63 731	0.534	72 542	0.537	17 790	0.554
to house												
Flush toilet at child's house	onse											
et	54 418	0.309	41 542	0.352	42 402	0.348	41 686	0.349	46 955	0.348	10511	0.327
at nouse No flush toilet 13	121 968	0 691	76 592	0.648	70.304	0.652	77.750	0.651	88.085	0.652	21 58G	0.673
)))]))) } } !	
Child measles vaccination	tion											
Cluster weighted		0.234		0.204		0.208		0.208		0.214		0.211

Figure 1 Child health indicator weighted prevalence by age of the mother at first birth.



the ages of 27 and 29 live in rural areas (table 3). Delaying first birth is more likely in urban areas. Women who have their first birth later are also more likely to live in conditions that are more sanitary: 57.3% of women who had their first birth between the ages of 27 and 29 have a flush toilet at the house compared to 16.4% of 15–17-year-old first time mothers (table 3).

Women who delay their first birth are more educated, more likely to have a partner, are richer, more likely to live in an urban area, and more likely to live in better sanitary conditions. Young mothers tend to have lower educational and socioeconomic characteristics. In the following analysis, we present both unadjusted results and results that control for these covariates (table 3).

Unadjusted and adjusted models

The unadjusted pooled results indicate that the risk of infant mortality is lowest for women who have their first birth between the ages of 27 and 29 (online supplementary appendix table A3). The RR ratio declines as age increases between the ages of 12 and 26, and is lowest for 27–29-year-old mothers (table A3). The RR ratio then increases for women who have their first birth at 33–35 years of age (table A3). This same U-shape is exhibited in many of the country-specific unadjusted regressions. Benin, Bolivia, India, Senegal and Tanzania are examples where child survival is maximised if the first birth is delayed to the ages of 27–29, and most countries (38/55) follow this pattern (table A3).

Age of the mother at first birth is a risk factor for infant mortality and adverse child health outcomes in adjusted analysis controlling for maternal, paternal, and household and social characteristics (table 4). The RR ratios of each age group (relative to 27–29 year olds who

are the reference group) and 95% CIs are plotted in figure 2. Child health outcomes improve with increasing age of the mother at first birth through to age 27–29 even after controlling for maternal, paternal, household and social factor covariates (table 4, figure 2).

Maternal and paternal age have different effects on child health outcomes (table 4). In the cases of infant mortality, underweight, wasting and anaemia, maternal and paternal age have similar effect sizes, indicating the role of social mechanisms (table 4). In the case of stunting and diarrhoea, while having a very young father increases the RR of poor child health outcomes, the effect is significantly smaller than that of the mother's age, strengthening the case that the effect has a biological component for these two child health outcomes (table 4). There may be concern that the effect of the age of the mother on child health outcomes may be changing over time. Although the year of birth is controlled for, this only controls for year-specific events and not for an interaction between the age of the mother and the year of birth. To explore this possibility, online supplementary table A4 is the same model as that in table 4 but the sample is restricted to surveys between 2000 and 2005. Comparison of results in table A4 and table 4 shows that the effect of the age of the mother on child health is similar across the two samples. This comparison suggests that the effect of age on child health outcomes is not changing over the study

The effect of the young age of the mother at first birth on poor child health outcomes reflects a combination of biological and social factors. If the effect were solely social, then we would expect no age gradient for women grouped into high and low socioeconomic status (SES).

Part	Age band in years Population frage Sex of child 2323 0.5 Male 2323 0.5 Female 2173 0.5 Type of birth 2323 0.5 Singleton 19 0.6 Twin 4477 0.5 48-60 0.2 0.0 36-47 1260 0.2 24-35 862 0.1 24-35 862 0.2 Completed primary 30 0.0 Completed primary 957 0.2 No education or incomplete 3509 0.1 Yes 395 0.1 No Educational level of the mother's partner at the 0.0 Completed primary 1107 0.2 No education or incomplete 2721 0.1 No education or incomplete 2721 0.1 No education or incomplete 2721 0.1 18-23 1587 0.1 24-29 213 0.1	Neighted raction P P P P P P P P P P P P P P P P P P P	4 0 <u>0</u>	g		i i l	Weighted n fraction 0.504 0.496 0.010 0.246 0.248 0.248 0.257	n=18211 Population 8941 8443 17.173 211 4269 4176 4191 4748	Weighted fraction 0.514 0.486 0.988 0.012	n=7939 Weighte Population fraction	Weighted n fraction	n=3493 Populatio	n=3493 Weighted Population fraction	n=1443	n=1443 Weighted Population fraction
Weighted Weighted Weighted Weighted Population fraction	We band in years Population frage Sex of child 2323 0.5 Female 2173 0.5 Female 2173 0.5 Female 2173 0.5 Formal 4477 0.5 Age of birth 1380 0.5 Age of child in months 1380 0.5 48-60 1260 0.5 24-23 862 0.7 24-23 862 0.7 Secondary or higher 30 0.0 Completed primary 957 0.5 No education or incomplete 3509 0.1 No 395 0.1 Completed primary 4101 0.5 No 395 0.1 Completed primary 1107 0.2 No education or incomplete 2721 0.1 No education or incomplete 2721 0.1 No education or incomplete 2721 0.1 No education or incomplete 2721 0.1 <	Neighted raction Pc 1217 21 22 22 22 22 22 22 22 22 22 22 22 22	<u></u>	ק	l titi		Weighted 0.504 0.496 0.990 0.010 0.246 0.248 0.248 0.248	Population 8941 8443 17 173 211 4269 4176 4191 4748	Weighted fraction 0.514 0.486 0.0012	Population	Weighted	Populatio	Weighted n fraction	()	Weighted in fraction
0.512 31995 0.515 19017 0.504 8941 0.488 30096 0.485 18741 0.504 8443 0.005 380 0.7173 0.099 17173 0.264 15402 0.248 9872 0.010 211 0.240 14491 0.233 9378 0.249 4191 0.240 14491 0.233 9872 0.249 4191 0.240 14491 0.233 9872 0.249 4191 0.247 16946 0.273 9687 0.257 4748 0.036 0.273 9687 0.257 4748 0.044 17 087 0.273 9687 0.257 4416 0.046 29 991 0.483 14 085 0.373 4816 0.046 17 087 0.275 14 040 0.372 4816 0.196 17 087 0.288 24 543 0.061 1006 0.196 0.278	As of child Male National Permale 1ype of birth Singleton 1ype of birth Singleton 1ype of birth Singleton 1ype of birth	1.517 21 1.483 20 1.996 42 1.004 11 1.280 11 1.221 10 1.221 10 1.221 10 1.221 10 1.028 27 2.088 27 2.088 27 2.098				19017 18741 37376 382 9272 9378 9419 9687 11213 112459 14085 35469 2288	0.504 0.496 0.990 0.010 0.246 0.248 0.248	8941 8443 17 173 211 4269 4176 4191 4748	0.514 0.486 0.988 0.012				1	Population	
0.995 61 701 0.994 37376 0.994 17173 0.005 380 0.006 382 0.010 211 0.005 380 0.006 382 0.010 211 0.006 380 0.006 382 0.010 211 0.249 14491 0.233 9378 0.248 4176 0.240 14491 0.233 9378 0.248 4176 0.240 15222 0.246 9419 0.249 4176 0.247 16 946 0.273 9687 0.257 4748 0.036 9263 0.149 11213 0.257 4748 0.044 22 837 0.368 12 459 0.37 4816 0.056 17 087 0.275 14 040 0.372 4148 0.056 17 087 0.288 24 543 0.061 1006 0.149 17 407 0.288 24 543 0.061 1006 0.149	Age band in years of the mother's partner at the Completed primary No education or incomplete 2721 0.5 Secondary or higher 3509 0.5 Primary Norther has a partner 4101 0.5 No education or incomplete 2721 0.6 Completed primary 957 0.7 No education or incomplete 2721 0.6	2.9483 200 2.0996 42 2.0004 11 2.220 11 2.220 11 2.221 11 2.221 12 2.221 13 2.208 27 2.213 38 2.213 38 2.2149 17 2.2065 20				18741 18741 37376 382 9272 9378 9419 9687 11213 12459 14085 35469 2288	0.390 0.290 0.246 0.248 0.257	211 211 211 4269 4176 4191 4748	0.988 0.0988 0.012	7900	0 1 1 0	1701		70E	0 504
0.995 61 701 0.994 37 376 0.990 17 173 0.005 390 0.006 382 0.010 211 0.249 14 491 0.248 9272 0.246 4269 0.249 14 491 0.233 9378 0.248 4176 0.240 15 252 0.246 9419 0.249 4176 0.247 16 946 0.273 9687 0.249 4176 0.247 16 946 0.273 9687 0.249 4176 0.0318 22 837 0.368 12 459 0.297 4748 0.086 9263 0.0483 14 085 0.372 4816 0.096 17 087 0.275 14 040 0.372 8148 0.097 21 683 0.299 16 372 8148 0.098 24 443 0.061 1006 0.149 467 0.024 1184 0.296 1042 0.149 1470 0.275	ype of birth Singleton 19 0.0 48 – 60 48 – 60 48 – 60 48 – 60 48 – 60 48 – 60 48 – 60 48 – 60 49 – 60 49 – 60 49 – 60 49 – 60 49 – 60 40 – 6	2.996 42 2.004 11 2.280 11 2.221 10 3.221 10 3.007 11 3.780 27 3.780 27				37376 382 9272 9378 9419 9687 11213 12459 14085 35469 2288	0.990 0.010 0.246 0.248 0.257	211 211 4269 4176 4191 4748	0.988	3685	0.518	1646	0.513	694	0.504
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0.030 407 0.007 109 0.003 20 0.347 17407 0.280 5426 0.144 898 0.525 36519 0.588 24543 0.650 10869 0.005 5480 0.088 5634 0.149 3981 0.021 1467 0.024 1319 0.035 1155 0.012 812 0.017 9490 0.251 461 0.117 10572 0.170 9490 0.251 6196 0.118 13466 0.217 9088 0.241 3972 0.217 13772 0.222 7453 0.197 2950 0.245 12770 0.206 6330 0.168 2354 0.246 11511 0.185 5397 0.143 1911 0.288 22 251 0.358 16999 0.450 763 0.7712 39 840 0.642 20759 0.502 7478 0.680	primary Age band in years of the mother's partner at th 12–17 313 0.0 18–23 1587 0.3 24–29 2256 0.3 30–35 214 0.0	:		23 321		11184	0.296	4042	0.233	1504	0.197	669	0.207	325	0.232
0.034 407 0.007 109 0.003 20 0.347 17407 0.280 5426 0.144 898 0.0525 36519 0.588 24543 0.650 10869 0.005 5480 0.088 5634 0.149 3981 0.012 1467 0.024 1319 0.035 1155 0.012 842 0.717 9088 0.241 461 0.181 13466 0.217 9088 0.241 3972 0.217 13772 0.222 7443 0.197 2950 0.245 12770 0.206 6330 0.168 2354 0.245 12770 0.206 6330 0.143 1911 0.245 11511 0.185 5397 0.143 1911 0.288 22 251 0.358 1699 0.450 763 0.7712 39 840 0.642 20759 0.502 7478 0.689	Age band in years of the motifer's partitler at the 1217 18–23 0.0 (24–29 2256 0.0 (30–35 214 0.0 (0,000	44.14 40.13												
187 0.353 14655 0.347 17407 0.280 5426 0.144 898 2256 0.502 22157 0.525 36519 0.588 24543 0.650 10869 214 0.048 2756 0.065 5480 0.088 5634 0.149 3981 89 0.019 896 0.021 1467 0.024 1319 0.035 1155 8156 0.018 44 0.010 520 0.012 1467 0.024 1319 0.035 1155 1155 810 896 0.021 1467 0.024 1319 0.035 1155 1155 810 896 0.021 1467 0.013 727 0.019 461 891 896 0.021 1467 0.019 896 0.247 3972 8191 8194 0.265 10329 0.245 12770 0.206 6330 0.168 2354 1277 0.284 10148 0.245 12770 0.206 6330 0.168 2354 1911 8174 0.265 10329 0.245 12770 0.206 6330 0.168 2354 1911 8174 0.265 0.245 12770 0.206 6330 0.168 2354 1911 8174 0.265 0.245 12770 0.206 6330 0.168 2354 1911 8181 0.265 0.270 30074 0.712 39840 0.642 20759 0.550 7663 8182 8182 8182 8182 8182 8182 8182 818	1587 2256 214			407	200.0	109	0.003	20	000	4	0 00 1	-	0000	-	000
2256 0.502 22.157 0.525 36.519 0.588 24.543 0.650 10.869 214 0.048 2756 0.065 5480 0.088 5634 0.149 3981 83 0.019 896 0.021 1467 0.024 1319 0.035 1155 44 0.010 520 0.012 1467 0.024 1319 0.035 1155 366 0.081 4937 0.117 10.572 0.170 9088 0.241 3972 356 0.211 9159 0.217 13.72 0.222 7453 0.197 2950 1194 0.265 10329 0.245 12.770 0.206 6330 0.168 2354 1277 0.284 10.148 0.245 12.770 0.206 6330 0.168 2354 1277 0.284 10.148 0.245 12.770 0.206 6330 0.168 2354 1033 0.230 12.159 0.288 22.251 0.358 16.999 0.450 9006 1 1082 0.270 30.074 0.712 39.840 0.642 20.759 0.550 7663 434 0.097 6.908 0.164 16.700 0.269 1450 0.588 832	2256 214	_		17 407	0.280	5426	0.144	868	0.052	227	0:030	- 22	0.016	17	0.012
214 0.048 2756 0.065 5480 0.088 5634 0.149 3981 83 0.019 896 0.021 1467 0.024 1319 0.035 1155 44 0.010 520 0.012 812 0.013 727 0.019 461 366 0.081 4937 0.117 10572 0.170 9989 0.251 6196 710 0.158 7659 0.181 13466 0.217 9088 0.241 3972 950 0.211 9159 0.245 12.770 0.206 6330 0.168 2354 1277 0.284 10148 0.245 12.770 0.206 6330 0.168 2354 1277 0.284 10148 0.245 12.770 0.206 6330 0.168 2354 1033 0.230 12.159 0.288 22.251 0.358 16.999 0.450 9006 9 3463 0.770 30074 0.712 39.840 0.642 20.759 0.550 7663 434 0.097 6908 0.164 16.700 0.269 14506 0.384 8551 434 0.097 6908 0.164 16.700 0.269 14506 0.384 8551 436 0.903 35.325 0.836 45.390 0.731 23.251 0.616 8832	214			36 519		24543	0.650	10 869	0.625	3671	0.480	1220	0.361	487	0.348
83 0.019 896 0.021 1467 0.024 1319 0.035 1155 s household 2.001 520 0.017 10572 0.013 727 0.019 461 461 550 0.018 41 727 0.019 461 461 566 0.081 4937 0.117 10572 0.170 9490 0.251 6196 560 0.211 9159 0.245 12.770 0.222 7453 0.197 2950 1194 0.265 10329 0.245 12.770 0.206 6330 0.168 2354 12.77 0.284 10148 0.245 12.770 0.206 6330 0.168 2354 12.77 0.284 10148 0.245 12.770 0.206 6330 0.168 2354 12.77 0.284 10148 0.245 12.770 0.206 6330 0.168 2354 10033 0.230 12.159 0.2221 0.358 16.999 0.450 9721 9.843 0.770 30074 0.712 39.840 0.642 20.759 0.550 7663 9.0450 9.0450 9.0450 9.0450 0.350 0.350 0.350 0.586 18.942 0.502 7478 9.065 9.066 9.062 0.903 35.325 0.836 45.390 0.731 2.3251 0.616 8832				5480		5634	0.149	3981	0.229	2491	0.326	1203	0.356	313	0.223
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s household 366 0.081 4937 0.117 10572 0.170 9490 0.251 6196 710 0.158 7659 0.181 13.466 0.217 9088 0.241 3972 950 0.211 9159 0.245 12770 0.206 6330 0.168 2354 1277 0.284 10.148 0.245 11571 0.185 5397 0.143 1911 usehold at the time of interview 1033 0.230 12.159 0.288 22.251 0.358 16.999 0.450 9721 1482 0.270 30074 0.712 39.840 0.642 20.759 0.550 7663 1482 0.770 30074 0.680 36.360 0.586 18.942 0.502 7478 434 0.097 6908 0.164 16.700 0.269 14506 0.384 8551 4062 0.903 35.325 0.836 45.390 0.731 2.3251 0.616 8832		0.010		812		727	0.019	461	0.027	407	0.053	267	0.079	211	0.151
366 0.081 4937 0.117 10 572 0.170 9490 0.251 6196 710 0.158 7659 0.181 13466 0.217 9988 0.241 3972 950 0.211 9159 0.217 13772 0.222 7453 0.197 2950 1194 0.265 10329 0.245 12770 0.206 6330 0.168 2354 1277 0.284 10.148 0.240 11511 0.185 5397 0.143 1911 0.181 0.284 10.48 0.240 11511 0.185 5397 0.143 1911 0.181 0.230 12 159 0.288 22 251 0.358 16 999 0.450 9721 0.330 0.770 30074 0.712 39 840 0.642 20 759 0.550 7663 9 1082 0.241 13530 0.320 25 731 0.414 18816 0.498 9906 7478 1345 0.759 28 704 0.680 36 36 0.586 18 942 0.502 7478 14062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832						!									
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194 0.284 10329 0.245 12770 0.266 6730 0.168 2354 1277 0.284 1048 0.240 11511 0.185 5397 0.143 1911 0.185 1284 1277 0.284 1048 0.240 11511 0.185 5397 0.143 1911 1913 0.230 12159 0.288 22.251 0.358 16.999 0.450 9721 3463 0.770 30074 0.712 39.840 0.642 20.759 0.550 7663 6 1082 0.241 13530 0.320 25.731 0.414 18816 0.498 9906 1082 0.759 28.704 0.680 36.360 0.586 18.942 0.502 7478 434 0.097 6908 0.164 16.700 0.269 14.506 0.384 8551 4062 0.903 35.325 0.836 45.390 0.731 23.251 0.616 8832	0 0			13 772		9000	0.241	2972	0.220	1185	0.222	517	0.241	04.0 04.0	0.243
1277 0.284 10148 0.240 11511 0.185 5397 0.143 1911 usehold at the time of interview 1033 0.230 12159 0.288 22251 0.358 16999 0.450 9721 3463 0.770 30074 0.712 39840 0.642 20759 0.550 7663 e 1082 0.241 13530 0.320 25 731 0.414 18816 0.498 9906 j 3415 0.759 28 704 0.680 36 360 0.586 18 942 0.502 7478 434 0.097 6908 0.164 16 700 0.269 14 506 0.384 8551 4062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832	1194	•		12770		6330	0.168	2354	0.135	838	0.110	350	0.103	160	0.114
usehold at the time of interview 0.288 22 251 0.358 16 999 0.450 9721 1033 0.230 12 159 0.271 39 840 0.642 20 759 0.550 7663 e 1082 0.770 30074 0.712 39 840 0.642 20 759 0.550 7663 e 1082 0.241 13 530 0.320 25 731 0.414 18 816 0.498 9906 t 3415 0.759 28 704 0.680 36 360 0.586 18 942 0.502 7478 434 0.097 6908 0.164 16 700 0.269 14 506 0.384 8551 4062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832	1277			11 511		5397	0.143	1911	0.110	642	0.084	273	0.081	126	060.0
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3463 0.770 30074 0.712 39840 0.642 20759 0.550 7663 e 1082 0.241 13530 0.320 25731 0.414 18816 0.498 9906 f) 3415 0.759 28704 0.680 36360 0.586 18942 0.502 7478 434 0.097 6908 0.164 16700 0.269 14506 0.384 8551 4062 0.903 35325 0.836 45390 0.731 23251 0.616 8832	1033			22 251		16999	0.450	9721	0.559	4969	0.650	2315	0.686	949	0.678
906 1082 0.241 13530 0.320 25731 0.414 18816 0.498 9906 9906 0.759 28 704 0.680 36 360 0.586 18 942 0.502 7478 434 0.097 6908 0.164 16 700 0.269 14 506 0.384 8551 4062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832	3463			39 840		20759	0.550	2992	0.441	2679	0.350	1062	0.314	450	0.322
1002 0.759 28704 0.680 36.360 0.586 18942 0.502 7478 434 0.097 6908 0.164 16.700 0.269 14506 0.384 8551 4062 0.903 35.325 0.836 45.390 0.731 23.251 0.616 8832	000			707	7	0	0070	9000	21	4706	0	5	000	000	0.00
434 0.097 6908 0.164 16 700 0.269 14 506 0.384 8551 4062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832	3415			167.62		18942	0.430	2478	0.27.0	9019	0.018	1228	0.636	5030	0.840
434 0.097 6908 0.164 16 700 0.269 14 506 0.384 8551 4062 0.903 35 325 0.836 45 390 0.731 23 251 0.616 8832	5			00000		-0 -0 14 -0	0.302	0/4/	0.430	2162	000	0771	000	500	0.300
4062 0.903 35325 0.836 45390 0.731 23251 0.616 8832	434			16 700		14506	0.384	8551	0.492	4380	0.573	2080	0.616	859	0.614
	4062					23251	0.616	8832	0.508	3269	0.427	1297	0.384	240	0.386
Child measles vaccination Olieter weighted mean 0.350 0.350 0.166		350	0000		0.038		0000		0 166		0 1/5		0.105		0 130

	Infant mortality	Stunting	Underweight	Wasting	Diarrhoea	Moderate anaemia
Age band in years	of the mother at fi	rst birth				
27–29	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
12–14	1.703 (1.478	1.507 (1.416	1.351 (1.236	1.027 (0.870	1.365 (1.216	1.315 (1.13
	to 1.962)	to 1.603)	to 1.477)	to 1.211)	to 1.533)	to 1.528)
15–17	1.307 (1.160	1.341 (1.274	1.218 (1.131	1.040 (0.923	1.326 (1.224	1.357 (1.22)
	to 1.474)	to 1.412)	to 1.313)	to 1.170)	to 1.436)	to 1.507)
18–20	1.083 (0.963	1.272 (1.210	1.122 (1.043	1.007 (0.899	1.244 (1.151	1.327 (1.20)
04 00	to 1.219)	to 1.338)	to 1.207)	to 1.129)	to 1.343)	to 1.468)
21–23	1.018 (0.903	1.191 (1.132	1.052 (0.976	1.018 (0.908	1.227 (1.135	1.349 (1.219
24–26	to 1.148)	to 1.254)	to 1.132)	to 1.141)	to 1.326)	to 1.493)
24-20	1.079 (0.948 to 1.228)	1.087 (1.028 to 1.148)	0.989 (0.912 to 1.071)	1.004 (0.889 to 1.135)	1.108 (1.019 to 1.203)	1.239 (1.114 to 1.378)
30-32	1.191 (0.981	0.925 (0.845	0.824 (0.717	0.915 (0.749	0.979 (0.860	1.117 (0.94)
00 02	to 1.445)	to 1.013)	to 0.947)	to 1.119)	to 1.115)	to 1.317)
33–35	1.340 (1.041	1.025 (0.908	0.872 (0.715	0.976 (0.733	0.831 (0.687	1.079 (0.85
	to 1.725)	to 1.156)	to 1.062)	to 1.299)	to 1.006)	to 1.362)
Sex of child						
Male	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
Female	0.787 (0.759	0.900 (0.888	0.915 (0.895	0.854 (0.821	0.927 (0.903	0.956 (0.92)
	to 0.815)	to 0.913)	to 0.935)	to 0.889)	to 0.951)	to 0.985)
Type of birth						
Singleton	1.00	1.00	1.00	1.00	1.00	1.00
(reference)	4.000 (4.000	1 000 (1 007	4 007 /4 450	1 004 (1 010	0.040 (0.700	4 405 (0 00)
Twin	4.998 (4.609 to 5.421)	1.302 (1.207 to 1.404)	1.627 (1.459 to 1.814)	1.264 (1.018 to 1.570)	0.918 (0.782 to 1.077)	1.135 (0.96) to 1.337)
Age of child in mon	•	10 1.404)	10 1.014)	10 1.570)	10 1.077)	10 1.337)
48–59	1113	1.00	1.00	1.00	1.00	1.00
(reference)		1.00	1.00	1.00	1.00	1.00
36–47		1.146 (1.119	1.023 (0.986	0.986 (0.916	1.392 (1.311	1.219 (1.14
		to 1.174)	to 1.062)	to 1.060)	to 1.477)	to 1.296)
24-35		1.246 (1.217	1.123 (1.083	1.145 (1.066	2.446 (2.316	1.609 (1.51
		to 1.275)	to 1.164)	to 1.229)	to 2.582)	to 1.711)
12-23		1.169 (1.141	1.114 (1.073	1.572 (1.466	3.818 (3.625	2.240 (2.10)
		to 1.198)	to 1.156)	to 1.686)	to 4.021)	to 2.386)
Educational level of						
Secondary	1.00	1.00	1.00	1.00	1.00	1.00
or higher						
(reference)	1 266 (1 160	1 006 (1 040	1 000 (1 014	1 000 (0 045	1 142 /1 000	1 070 /1 000
Completed primary	1.266 (1.160 to 1.382)	1.286 (1.243 to 1.329)	1.282 (1.214 to 1.354)	1.022 (0.945 to 1.105)	1.143 (1.092 to 1.196)	1.079 (1.009 to 1.154)
No education	1.626 (1.480	1.482 (1.429	1.586 (1.495	1.243 (1.141	1.192 (1.131	1.159 (1.07)
or incomplete	to 1.786)	to 1.536)	to 1.681)	to 1.355)	to 1.256)	to 1.248)
primary	10 1.700)	10 1.000)	10 1.001)	10 1.000)	10 1.200)	10 1.2 10)
Mother has a partne	er					
Yes	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
No	0.977 (0.881	1.148 (1.106	1.237 (1.158	1.232 (1.101	1.105 (1.043	1.110 (1.02)
	to 1.084)	to 1.193)	to 1.322)	to 1.379)	to 1.170)	to 1.206)
Educational level of	•					
Higher	1.00	1.00	1.00	1.00	1.00	1.00
(reference)	4 000 (4 007	1 000 (1 0 10	4 007 /4 070	1 007 (0 000	4.050 /4.045	1 050 /0 05
Completed	1.099 (1.027	1.068 (1.040	1.097 (1.052	1.037 (0.969	1.059 (1.015	1.053 (0.99)
primary	to 1.176)	to 1.097)	to 1.144)	to 1.109)	to 1.104)	to 1.117)
No education or incomplete	1.232 (1.147	1.131 (1.099	1.233 (1.180	1.151 (1.070	1.068 (1.019	1.098 (1.029
or incomplete	to 1.324)	to 1.163)	to 1.288)	to 1.238)	to 1.120)	to 1.172)

Table 4 Continued						
	Infant mortality	Stunting	Underweight	Wasting	Diarrhoea	Moderate anaemia
Age band in years	of the mother's pa	rtner at the mothe	er's first birth			
24–29	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
12-17	1.410 (1.237	1.148 (1.081	1.125 (1.017	1.008 (0.801	1.049 (0.932	1.090 (0.937
	to 1.606)	to 1.219)	to 1.245)	to 1.269)	to 1.181)	to 1.269)
18–23	1.077 (1.026	1.054 (1.035	1.026 (0.997	0.979 (0.927	1.032 (0.997	1.050 (1.010
00.05	to 1.130)	to 1.073)	to 1.056)	to 1.034)	to 1.068)	to 1.092)
30–35	0.942 (0.884	0.964 (0.939	0.953 (0.918	0.941 (0.882	0.958 (0.915	0.997 (0.949
06 44	to 1.005)	to 0.990)	to 0.990)	to 1.004)	to 1.002)	to 1.046)
36–41	0.996 (0.904	0.986 (0.945	0.932 (0.875	0.929 (0.835	1.032 (0.960 to 1.108)	1.069 (0.994
42-59	to 1.097) 1.046 (0.932	to 1.028) 1.036 (0.983	to 0.992) 1.030 (0.954	to 1.034) 0.977 (0.855	1.101 (1.004	to 1.149) 0.962 (0.874
42-39	to 1.173)	to 1.093)	to 1.111)	to 1.118)	to 1.207)	to 1.060)
Wealth quintile of th			10 1.111)	10 1.110)	10 1.207)	10 1.000)
Richest	1.00	1.00	1.00	1.00	1.00	1.00
(reference)	1.00	1.00	1.00	1.00	1.00	1.00
Rich	1.138 (1.063	1.182 (1.148	1.272 (1.216	1.110 (1.032	1.171 (1.117	1.157 (1.093
	to 1.219)	to 1.216)	to 1.331)	to 1.194)	to 1.227)	to 1.224)
Middle	1.223 (1.136	1.257 (1.218	1.416 (1.348	1.276 (1.176	1.209 (1.149	1.246 (1.170
	to 1.316)	to 1.297)	to 1.486)	to 1.384)	to 1.272)	to 1.326)
Poorer	1.268 (1.173	1.332 (1.289	1.524 (1.448	1.344 (1.233	1.244 (1.177	1.287 (1.203
	to 1.371)	to 1.376)	to 1.604)	to 1.466)	to 1.314)	to 1.378)
Poorest	1.289 (1.187	1.445 (1.397	1.671 (1.585	1.458 (1.331	1.289 (1.213	1.338 (1.245
	to 1.399)	to 1.496)	to 1.762)	to 1.598)	to 1.369)	to 1.438)
Residence of the ch						
Urban	1.00	1.00	1.00	1.00	1.00	1.00
(reference)	1 0 10 10 00 1	4 000 /4 050	4 000 /0 000	0.040 (0.004	2 222 /2 225	0.004 (0.00=
Rural	1.043 (0.991	1.082 (1.059	1.029 (0.996	0.943 (0.891	0.939 (0.905	0.981 (0.937
Matau wiwa al ta tha	to 1.099)	to 1.106)	to 1.064)	to 0.998)	to 0.974)	to 1.026)
Water piped to the		1.00	1.00	1.00	1.00	1.00
Piped to house	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
Water not	1.100 (1.047	0.956 (0.938	1.031 (1.000	1.034 (0.980	1.002 (0.969	0.988 (0.950
piped	to 1.156)	to 0.975)	to 1.063)	to 1.092)	to 1.037)	to 1.029)
to house	10 1.100)	10 0.070)	10 1.000)	10 1.002)	10 1.007	10 1.020)
Flush toilet at child'	s house					
Flush toilet	1.00	1.00	1.00	1.00	1.00	1.00
at house						
(reference)						
No flush	1.137 (1.062	1.224 (1.191	1.137 (1.091	1.045 (0.978	1.041 (0.997	1.035 (0.982
toilet at house	to 1.217)	to 1.259)	to 1.184)	to 1.116)	to 1.087)	to 1.090)
Child measles vacc	ination					
Vaccinated	1.00	1.00	1.00	1.00	1.00	1.00
(reference)						
Not vaccinated	1.108 (1.038	1.070 (1.042	1.164 (1.120	1.195 (1.113	1.072 (1.020	1.109 (1.051
OI "	to 1.183)	to 1.100)	to 1.209)	to 1.284)	to 1.127)	to 1.170)
Observations	176 583	119018	122 680	120 246	135 121	31 520

That is, if all women are of the same SES, then any age gradient reflects the biological mechanism. This hypothesis is explored by stratifying low and high SES. For the high SES group, we select children who have mothers who have completed at least primary school, in households that are in one of the top two wealth quintiles and who live in an urban area (table 5). In contrast, we select the children with mothers who have not

completed primary school, are in households that are in the bottom two wealth quintiles and live in a rural area into the low SES group. At the top of table 5 we report the absolute prevalence of the child health outcome by this stratification. In the high SES group, 3.0% of the infants die, while in the low SES households, 10.4% of the infants die (table 5). Stunting, underweight, wasting, diarrhoea and anaemia are all much more prevalent

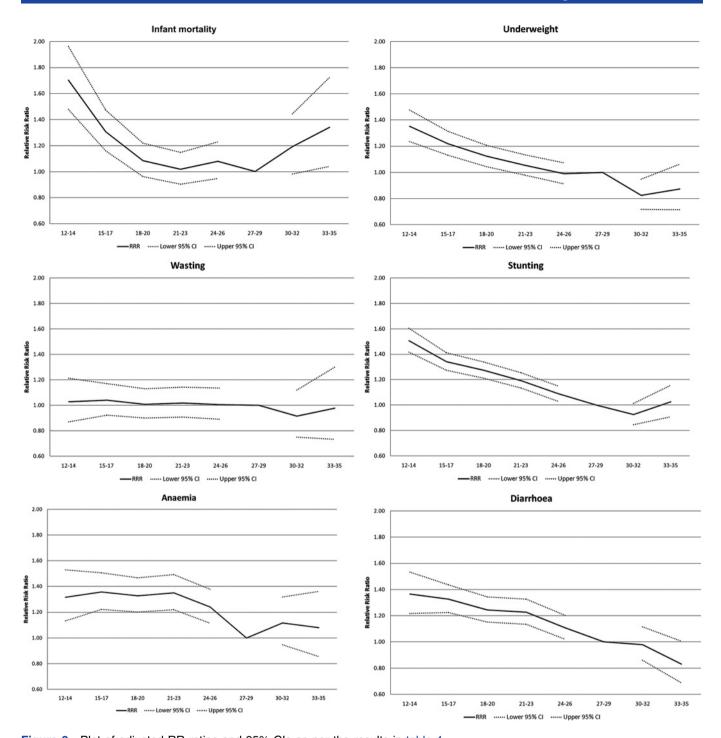


Figure 2 Plot of adjusted RR ratios and 95% Cls as per the results in table 4.

in low SES households than in high SES households (table 5). However, when considering the RR ratios across the age groups for the outcomes of stunting, underweight and diarrhoea, the RR of a poor health outcome for young mothers is higher in the high SES households than in the low SES households (table 5). The difference in the RR of age on these child health outcomes across the two groups indicates that early childbearing is not just a risk factor in lower socioeconomic groups, and that the biological mechanism of young mothers plays a role in determining child health outcomes.

Sensitivity analysis

Recent work by Subramanian $et\ al^2$ and Ozaltin $et\ al^3$ indicates that maternal height is a significant predictor of infant mortality, anthropometric failure and anaemia in India. At the cost of a smaller sample (n=101054), height is included as a control variable in the regression, in addition to the controls used in the adjusted regressions, to examine whether in the sub-set of countries for which the DHS have data on women's height, the age effect that we observe is confounded by maternal height. Household religion is also included as a control variable as in many low- to middle-income countries religion has

	Infant mortality Stunting	tality	Stunting	Unde	Underweight	ht	Wasting		Diarrhoea		Moderate anaemia	ınaemia
	High SES	Low	High SES	Low	High SES	Low	High SES	Low	High SES	Low	High SES	Low
Prevalence (weighted %)	2.99	10.4	18.6	54.2	7.92	33.6	4.46	11.7	=	15.4	21.4	42.2
Age band in years of the mother at first birth	of the mother	at first birth										
27–29	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(rererence)	1	1771	000	7	0	7 7	0 0	000	7	7	0	7
41 – Z1	1./5/	1.747	(1.839	(1 118	1.750	(1.16/	0.875	1.062	1.792	1.342	0.388	1.438
	to 3.040)	to 2.283)	to 2.449)	to 1.385)	to 2.619)	to 1.355)	to 2.140)	to 1.452)	to 2.612)	to 1.702)	to 1.400)	to 1.974)
15–17	1.297	1.315	1.474	1.143	1.377	1.066	1.234	0.968	1.377	1.181	1.234	1.504
	(0.984	(1.029	(1.313	(1.040	(1.147	(0.935	(0.950	(0.744	(1.172	(0.964	(1.001	(1.144
0	to 1.710)	to 1.681)	to 1.655)	to 1.257)	to 1.654)	to 1.215)	to 1.602)	to 1.258)	to 1.618)	to 1.446)	to 1.521)	to 1.978)
18-20	1.08/ (0.846	1.104	1.308	0.987	1.26U (1.071	0.984	(0.951	0.964	1.395	(0.905	1.154 (0.964	(1.092
	to 1.398)	to 1.409)	to 1.452)	to 1.192)	to 1.482)	to 1.121)	to 1.467)	to 1.250)	to 1.603)	to 1.354)	to 1.381)	to 1.880)
21–23	1.020	1.016	1.221	1.065	1.156	0.948	1.198	0.990	1.318	1.126	1.203	1.500
	(0.800	(0.790	(1.102	(0.968	(0.985	(0.830	926.0)	(0.759	(1.152	(0.917	(1.008	(1.141
0	to 1.300)	to 1.307)	to 1.352)	to 1.171)	to 1.357)	to 1.084)	to 1.472)	to 1.292)	to 1.508)	to 1.382)	to 1.437)	to 1.972)
24–26	1.015	1.116	1.083	0.989	1.028	0.941	1.207	1.076	1.206	1.139	1.105	1.424
	(0.783 to 1.315)	(0.848	(0.972 to 1.208)	(0.890	(0.87.1	(0.811	(0.979	(0.011	(1.048	(0.911 to 1.425)	(0.925 to 1.320)	(1.066
30–32	1.647	0.710	0.918	0.911	0.875	0.827	0.971	0.832	0.940	1.111	1.151	1.270
	(1.183	(0.414	(0.771	(0.760	(0.666	(0.624	(0.697	(0.488	(0.757	(0.777	(0.886	(0.820
	to 2.291)	to 1.216)	to 1.093)	to 1.093)	to 1.150)	to 1.097)	to 1.351)	to 1.418)	to 1.167)	to 1.590)	to 1.496)	to 1.966)
33—35	1.407	0.956	1.049	1.222	0.743	0.860	1.128	0.650	0.769	0.821	1.036	1.438
	(0.846 to 2.341)	(0.525 to 1.740)	(0.822 to 1.338)	(1.013 to 1.473)	(0.471 to 1.170)	(0.594 to 1.245)	(0.713 to 1.785)	(0.287 to 1.473)	(0.555 to 1.065)	(0.488 to 1.379)	(0.686 to 1.565)	(0.826 to 2.502)
Sex of child						() ! !	() :: ::	() : : :		2	(2)	(1 2 2 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3
Male	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(rererence)	1		i c			0	0	0	0	i L	0	0
remale	0.700	0.829	0.850	0.929	0.911	128.0	0.886	0.843	0.913	0.959	0.942	0.963
	(0.62/ to 0.782)	(0.781) to 0.881)	(0.014 to 0.888)	(0.90o to 0.951)	(0.030) to 0.977)	(0.090 to 0.954)	(0.00z to 0.979)	(0.700 to 0.905)	(0.039) to 0.969)	(0.910 to 1.011)	(0.000 to 1.021)	(0.910 to 1.019)
Type of birth	(1)		(2)				(0.000)	(200:000)	(22)) ;	(1)	
Singleton (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Twin	5.439	4.557	1.212	1.271	1.704	1.448	1.365	1.392	0.768	1.015	1.061	1.183
	(4.278 to 6.916)	(3.932 to 5.281)	(0.991 to 1.482)	(1.111 to 1.454)	(1.290 to 2.251)	(1.179 to 1.778)	(0.898 to 2.074)	(0.917 to 2.112)	(0.533 to 1.106)	(0.716 to 1.437)	(0.733 to 1.534)	(0.860 to 1.627)
												Continued

	Infant mortality	tality	Stunting		Underweight	ᆂ	Wasting		Diarrhoea		Moderate anaemia	anaemia
	High	Low	High SES	Low	High SES	Low	High	Low	High SES	Low	High SES	Low
Age of child in months Age 48–59	uths		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(reference) 36–47			1.239	1.118 (1.076	1.037	1.037	0.877	0.994 (0.868	1.410 (1.229	1.453	1.258 (1.064	1.219
24—35			1.415 (1.310	1.172 (1.129	1.182 (1.049	1.142 (1.077	0.956 (0.806	1.236 (1.086	2.466 (2.174	2.507 (2.246	1.763 (1.493	1.469 (1.319
12–23			to 1.528) 1.392 (1.287 to 1.506)	to 1.216) 1.081 (1.040 to 1.124)	to 1.331) 1.107 (0.977 to 1.254)	to 1.211) 1.151 (1.084 to 1.222)	to 1.133) 1.156 (0.974 to 1.371)	to 1.408) 1.853 (1.632 to 2.104)	to 2.796) 3.891 (3.449 to 4.389)	to 2.799) 3.720 (3.347 to 4.135)	to 2.081) 2.585 (2.163 to 3.090)	to 1.637) 1.927 (1.727 to 2.149)
Educational level of the mother at time of interview Secondary 1.00 or higher	of the mother of 1.00	at time of inte	arview 1.00		1.00		1.00		1.00		1.00	
(reference) Completed primary	1.220 (1.049 to 1.420)		1.266 (1.191 to 1.346)		1.208 (1.101 to 1.325)		1.103 (0.969 to 1.255)		1.177 (1.085 to 1.277)		1.099 (0.987 to 1.223)	
Mother has a partner Omitted category: yes No	1.012 (0.811 to 1.263)	0.960 (0.739 to 1.246)	1.215 (1.108 to 1.332)	1.038 (0.949 to 1.135)	1.333 (1.127 to 1.577)	1.180 (1.012 to 1.377)	1.249 (0.985 to 1.583)	1.608 (1.179 to 2.193)	1.038 (0.926 to 1.163)	1.223 (1.030 to 1.451)	1.100 (0.930 to 1.301)	1.063 (0.814 to 1.388)
Educational level of the mother's partner at the time of interview Secondary 1.00 1.00 1.00 1.00 or higher	of the mother's 1.00	partner at the 1.00	ne time of inte 1.00	arview 1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
(reference) Completed primary	1.046 (0.911 to 1.201)	1.100 (0.902 to 1.341)	1.115 (1.052 to 1.182)	0.997 (0.926 to 1.074)	1.137 (1.041 to 1.242)	1.056 (0.940 to 1.187)	0.910 (0.807 to 1.027)	1.266 (0.994 to 1.613)	1.071 (0.989 to 1.159)	0.989 (0.852 to 1.148)	1.087 (0.979 to 1.208)	0.987 (0.782 to 1.246)
No education 1.303 1.277 1.206 1.03 or incomplete (1.059 (1.059 (1.109 (0.5 primary to 1.602) to 1.540) to 1.312) to 1 Age band in years of the mother's partner at the mother's first	1.303 (1.059 to 1.602) of the mother	1.277 (1.059 to 1.540) 's partner at	1.206 (1.109 to 1.312) the mother's	1.039 (0.968 to 1.116) first birth	1.381 (1.218 to 1.566)	1.224 (1.094 to 1.370)	1.180 (0.981 to 1.420)	1.452 (1.149 to 1.834)	1.209 (1.069 to 1.368)	1.002 (0.869 to 1.156)	1.221 (1.043 to 1.428)	0.974 (0.777 to 1.222)
24–29 (reference)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table College												
	Infant mortality	ality	Stunting		Underweight	ht	Wasting		Diarrhoea		Moderate anaemia	ınaemia
	High SES	Low	High SES	Low	High SES	Low	High SES	Low SES	High SES	Low	High SES	Low
12–17	1.284 (0.668	1.528 (1.261		1.087 (0.996	1.106 (0.627	1.085 (0.937	0.551 (0.141	0.959 (0.672	1.206 (0.847	1.091 (0.883	1.124 (0.664	1.005 (0.785
18–23	10.24/0) 1.122 (0.948	1.090 1.008	_	to 1.186) 1.036 (1.006	1.072 (0.970	1.015 (0.970	10 2.147) 1.028 (0.872	0.977 (0.889	0.967 (0.881	1.076 1.006 (1.006	1.069 (0.954	1.061 (0.989
30—35	to 1.327) 0.907 (0.770	to 1.178) 0.970 (0.863	to 1.217) 0.937 (0.875	to 1.068) 0.964 (0.919	to 1.186) 0.917 (0.825	to 1.063) 0.960 (0.898	to 1.211) 1.012 (0.880	to 1.073) 0.878 (0.767	to 1.061) 0.911 (0.831	to 1.149) 0.990 (0.895	to 1.198) 0.892 (0.795	to 1.138) 1.122 (1.027
36–41	to 1.069) 0.784 (0.587	to 1.090) 0.950 (0.797	4 (to 1.012) 1.030 (0.963	to 1.019) 0.760 (0.614	to 1.026) 0.970 (0.880	to 1.163) 1.070 (0.842	to 1.004) 0.851 (0.701	to 1.000) 0.994 (0.851	to 1.094) 0.993 (0.855	to 1.000) 0.876 (0.715	to 1.226) 1.180 (1.044
42–59	to 1.048) 0.698 (0.413 to 1.178)	to 1.132) 1.100 (0.912 to 1.327)	to 1.086) 1.106 (0.907 to 1.349)	to 1.101) 1.054 (0.973 to 1.141)	to 0.940) 1.119 (0.807 to 1.550)	to 1.069) 0.960 (0.854 to 1.079)	to 1.360) 1.388 (0.940 to 2.052)	to 1.034) 0.885 (0.711 to 1.103)	to 1.160) 0.949 (0.731 to 1.233)	to 1.152) 1.078 (0.909 to 1.280)	to 1.074) 0.910 (0.656 to 1.263)	to 1.334) 1.012 (0.869 to 1.178)
Wealth quintile of the child's household Richest 1.00	e child's hous	sehold			1.00		1.00		1.00		1.00	
(reference) Rich	1.267 (1.111 to 1.445)		1.223 (1.161 to 1.290)		1.288 (1.187 to 1.398)		1.045 (0.926 to 1.180)		1.143 (1.065 to 1.226)		1.121 (1.023 to 1.228)	
Middle Poorer Poorest (reference)		0.996 (0.938 to 1.057) 1.00		0.936 (0.913 to 0.959) 1.00		0.923 (0.891 to 0.956) 1.00		0.937 (0.870 to 1.008)		0.957 (0.905 to 1.012) 1.00		0.977 (0.922 to 1.037) 1.00
Water piped to the child's house Piped to house (reference) Water not 1.066 piped to house to house to house to house Flush toilet at child's house at house	thild's house 1.066 (0.924 to 1.229) s house	1.138 (1.017 to 1.273)	0.936 (0.883 to 0.993)	0.964 (0.925 to 1.004)	1.001 (0.919 to 1.089)	1.066 (0.995 to 1.142)	0.991 (0.874 to 1.123)	1.163 (1.015 to 1.333)	0.966 (0.884 to 1.055)	1.065 (0.979 to 1.159)	0.976 (0.886 to 1.076)	1.028 (0.933 to 1.133)
(reierence)												Continued

	Infant mortality	rtality	Stunting		Underweight	yht	Wasting		Diarrhoea		Moderate anaemia	anaemia
	High SES	Low	High SES	Low	High SES	Low	High SES	Low	High SES	Low	High SES	Low SES
No flush	0.948	1.369	1.158	1.173	1.082	1.239	1.011	966.0	1.088	1.057	0.984	0.982
toilet at house	(0.818	(1.075	(1.089	(1.064	(0.988	(1.037	(0.879	(0.753	(0.994	(0.889	(0.872	(0.797
	to 1.098)	to 1.745)	to 1.232)	to 1.294)	to 1.185)	to 1.481)	to 1.164)	to 1.318)	to 1.191)	to 1.257)	to 1.110)	to 1.209)
Child measles												
vaccination												
Not	1.653	1.000	1.190	1.066	1.211	1.200	1.229	1.185	1.045	1.030	1.299	1.127
vaccinated	(1.309	(0.905	(1.072	(1.022	(1.037	(1.130	696.0)	(1.050	(0.907	(0.940	(1.101	(1.035
	to 2.088)	to 1.106)	to 1.320)	to 1.111)	to 1.414)	to 1.275)	to 1.559)	to 1.337)	to 1.204)	to 1.129)	to 1.531)	to 1.228)
Observations	40 299	38612	28 797	23 657	29345	24846	28 783	24 251	32 809	27 435	8027	9209
High SES includes children who are in households that are in the rich or richest wealth quintiles, have mothers with completed primary school or higher, and live in a rural area. Low SES includes children who are in households that are in the poor and poorest wealth quintiles, have mothers with incomplete primary or no education, and live in a rural area. SES, socioeconomic status.	hildren who are nouseholds that status.	in households are in the poo	that are in the r	rich or richest v wealth quintiles	vealth quintiles, s, have mother	, have mothers s with incompl	with complete ete primary or	d primary scho no education,	ol or higher, ar and live in a r	nd live in an urk ural area.	an area. Low	SES includes

a bearing on household decision-making that may include health seeking behaviour. Moreover, religion may influence the autonomy of women to make decisions over the timing of their first birth. Even after controlling for height and religion, the age of the mother at first birth remains a significant risk factor for infant mortality, anthropometric failure and child health outcomes (online supplementary table A5). When height, which is an additional biological covariate, and religion, which is an additional social covariate, are controlled for, the general relationship between the age of the mother at their first birth and child health outcomes persists (table A5).

DISCUSSION Principal findings

In this paper we show that, controlling for maternal, paternal and household and social factors, there is an improvement in child health outcomes as the age of the mother at first birth increases to age 27–29. This is a much higher age than has been previously reported, where teen pregnancy is emphasised as a risk factor. In the adjusted model, we show that there is an elevated risk of infant mortality in first-born children to mothers below the ages of 27–29, although the effect is only statistically significant for women below age 18. However, the lack of significance may be because cases of infant mortality in our sample are relatively rare, whereas we find that mothers below age 27–29 have elevated and statistically significant risks for stunting, diarrhoea and anaemia outcomes.

Our results indicate that children to mothers below age 27-29 are at higher risk of poor health outcomes. In our sample of low- to middle-income countries, only 7% of women delay their first birth until the age of 27 or older. The USA has seen a steady rise in the average age at first birth from 21 in 1970 to 25 in 2000. 37 Age at first birth is increasing in some of our sample countries, but is still lagging behind the level seen in the USA. For example, in the 1993 Bangladesh DHS, the mean age for first births in the last 5 years was 18.2, but in 2007 had risen to 18.5. In Ghana, age for first births increased from a mean of 19.8 in 1988 to 21.2 in 2008. In Tanzania, mean age at first birth increased from 19.2 in 1991 to 19.6 in 2004. Bongaarts found that family planning programs can reduce the child mortality rate by delaying the age at first birth, preventing high parity births and improving birth spacing.³⁸ The results in this paper indicate that delaying the age at first birth even for women in their early 20s reduces infant mortality and improves child health.

Overall, the risk of a poor health outcome dissipates by age 21, but the general trend of improvement continues through to age 27–29. Thus, while the early 20s present a lower risk of a poor child health outcome than a first birth to a teen mother, delaying to the late 20s means that the risk of a poor child health outcome is minimised. Moreover, we find evidence of a paternal age gradient, although it is weaker than the maternal age

gradient. This indicates that social mechanisms play some role, but the biological maturity of the mother also helps determine child health outcomes. This finding was also supported by the stratification by low and high SES, where we found that the age gradient was not solely reflecting socioeconomic differences across the ages.

Comparisons to other studies

Consistent with country studies, in this paper we show that delaying first birth beyond the teen years and into the 20s has a positive impact on child survival. While from the 2005–2006 India sample, Raj et al^{13} found that maternal age only has a significant effect on stunting and underweight, in the current study that applies to 55 lowto middle-income countries, we find that older maternal age has a significant effect on reducing infant mortality, stunting, underweight, diarrhoea and moderate to severe anaemia. The broadening of the significant results to include other child health outcomes results from the inclusion of more countries, and also from a wider time span. As the 2005-2006 India National Family Health Survey-3 is one of the 118 surveys within our current study, the comparison between our study and that of Raj et al¹³ highlights the fact that generalising across countries does not always reflect each country's experience. Thus we include the country-specific examples in the online supplementary appendix (table A3). Even so, for the case of India in our sample we include three National Family Health Surveys (1992, 1998, 2005-2006). Thus, even the country-specific results may differ from the survey-specific results. Taking a broad view, however, the two papers yield the same fundamental conclusion that delaying first birth beyond the teen years is beneficial for child health outcomes.

The results in this paper also compare to those of Subramanian $et\ al^{39}$ which tease out the biological from the socioeconomic predictors of child health outcomes. If being a young mother is associated with low SES in ways we have not controlled for, maternal age at first birth may simply be a proxy for SES. However, if this were true, we would expect the effect of young fathers to be similar to that of mothers (Subramanian $et\ al^{39}$ put forward this idea of looking at the differential effects of maternal and paternal indicators on child health as a method of distinguishing between biological and social mechanisms).

Limitations of the study

Although this study provides important insights into the benefits to child health of delaying first birth to age 27–29, there are certain limitations that should be considered when interpreting the results. The primary variable of interest, the age of the mother at first birth, is subject to measurement error as data collection of this variable relies on recall by the respondent. The same holds true for identifying the population of children within the 0–11- and 12–60-month age ranges. We already include the 60-month-old children (which would

normally be restricted to 12–59 months) as it is common for the mother to round up in her recall of the child's age. The result is that a larger fraction of children are reported to be 60 months rather than 59 months. As this inconsistency is attributed to recall error, we follow the WHO guidelines and include the 60-month-old children in the child group. For the women's age, we assume that measurement error increases with actual age. Given our concern over young mothers, then the measurement error on the age will be minimised for this group of interest.

A further limitation of the model is that the socioeconomic measures of male and female education, along with the wealth index, may not fully capture the SES of the woman and her child. While we include information about location of residence, piped water to the house and flush toilet, these all serve as proxies for actual SES. Any unobserved wealth captured in the residual will confound the current results. Factors such as actual household income and education quality are such variables that we are unable to control for in the regression and may significantly influence child health outcomes and shape our understanding of the role of SES factors.

Observational studies are subject to the limitation of omitted variables. In this case, there may be variables that are correlated with the age of the mother at birth, but for which we do not control. This would mean that the significance attributed to the age of the mother as a significant correlate of child health outcomes, may in fact be a proxy for other omitted factors. Fixed effects on year of birth are included in both the unadjusted and adjusted regressions to control for common factors in a given year, and secular changes over time. Country fixed effects are also included in the unadjusted and adjusted regressions to control for factors that may be common to women within the same country and are unchanging over time. The covariates control for deviations from the country average and the global time trends in the variables included in the adjusted regressions. However, there may be some factors that are correlated to the explanatory variable of interest that is omitted from the regression. In which case, the regression coefficients have omitted variable bias. Omitted variables correlated to the age of the mother could include place of delivery, trained or untrained birth attendance and breastfeeding.

One of the key outcomes of interest in this study is infant mortality. Infant mortality is aggregated across all causes of death. However, it could be reasonably expected that the age of the mother affects infant mortality outcomes by cause of death. Using a range of child health outcomes in this study, we have illustrated how the age of the mother is differentially (or similarly) related to various outcomes. However, an investigation of the vulnerability to death by, say, pneumonia, diarrhoea, malaria or AIDS, by the age of the mother is beyond the scope of this study as cause of death for children is not recorded in the DHS.

Conclusions and implications

The current study documents that the first-born child of a woman aged <27-29 in low- to middle-income countries, is at a higher risk of infant mortality, stunting, underweight, diarrhoea and moderate to severe anaemia, but not wasting. Children born to women aged 12-14 or 15-17 are significantly more likely to die in their first year of life than children born to women aged 27-29. The risk of stunting, diarrhoea and anaemia diminishes significantly as a woman delays her first birth through to age 27-29, when the risk is minimised. The risk of underweight decreases significantly as a woman delays her first birth and is minimised by age 21. These results offer support to the evidence of the benefits of delaying first birth to offspring. Importantly, beyond just avoiding teen pregnancy, the results in this study show that it is optimal to delay first birth until age 27–29. The results reveal that interventions designed to target adolescents potentially omit a group of women in their early 20s who are also at risk of having children with poor health outcomes. The development of programmes targeting women in general, and not just teen mothers, should provide women and families with the tools to make informed decisions over the timing of their first birth. These programmes can highlight the benefits of delaying the first birth, allowing women to mature biologically, and provide a mechanism for young female family members to improve their knowledge and skills in childcare and family planning, and empowering female autonomy in decision making within the household.

Our results indicated that while the absolute risk of poor child health outcomes is lower when mothers are in a high SES household, there remains a high RR of poor child health outcomes for young mothers even in high SES households. The persistence of the age gradient across the SES groups highlights that child and maternal health issues associated with the age of the mother cut across socioeconomic lines and the children of young rich women are not shielded from the RR of a poor health outcome. This indicates that the biological immaturity of young mothers also affects child health outcomes in addition to the social disadvantage young mothers often face.

When encouraging women to delay their first birth, and encouraging families to permit the delay when the women are not granted autonomy over their reproductive health decisions, this should be accompanied by the provision of viable and valuable alternatives. Education programs aimed at encouraging women to stay in school, take on meaningful employment opportunities, and provide service to the community, relieve the immediacy of the need or desire for childbearing. It also empowers women by demonstrating to themselves and their families that their contribution to society need not only be defined by their reproductive life. By delaying a few years and engaging in other activities the women contribute to society as well as broadening their skills and knowledge to go on to be more informed and better educated

mothers. These benefits to the women then trickle down through the generations and benefit their offspring. In this paper, we show what those benefits are in terms of health, but future studies may highlight the educational and social benefits for children if women delay their first birth.

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Competing interests None.

Ethics approval The Demographic and Health Surveys data collection procedures were approved by ICF Macro International (Calverton, Maryland, USA) Institutional Review Board as well as by the relevant body in each country which approves research studies on human subjects. Oral informed consent for the interview/survey was obtained from respondents by interviewers. The current study was reviewed by the Harvard School of Public Health Institutional Review Board (Protocol #20069-101) and was ruled exempt from full review because the study was based on an anonymous public use data set with no identifiable information on the survey participants.

Contributors JEF co-led the conception and interpretation of results in this study. She assisted with drafting the manuscript. She prepared the data, empirical analysis and tables presented in the paper. As guarantor, she accepts full responsibility for this submitted work, had access to the data and controlled the decision to publish. EÖ assisted with conception of the article themes, compilation of the data set and empirical analysis for this study, and critical revision of the paper. DC led the conception of this study and interpretation of study findings as well as assisting with the drafting of the manuscript. All authors have seen and approved the final version of the manuscript.

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The association of maternal age with infant mortality, child anthropometric failure, diarrhoea and anaemia for first births: evidence from 55 low- and middle-income countries

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