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Premarital childbearing in sub-Saharan Africa: Can investing in women's education offset disadvantages for children? ☆

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ABSTRACT

Premarital childbearing is common in many parts of sub-Saharan Africa, and may become increasingly so with the rise in women's age at first marriage. These trends are concerning given the severe childhood health consequences associated with being born premaritally. However, women's could condition the experience of having a premarital birth in a way that lessens its consequences for children. Extending the large literature on the child health benefits of mothers' education—including her educational attainment and acquisition of key educational skills – I analyze whether the consequences of being born premaritally are lessened among children whose mothers are more highly-educated. The study focuses on Malawi, a southeast African country where child mortality rates remain high. I use Demographic and Health Survey data to estimate discrete-time logistic regression models (N=30,411 children younger than age five) of the relationships between premarital childbearing, mothers' educational background, and child mortality. The findings confirm that though being born premaritally is associated with higher child mortality, this is only true for children whose mothers have never been to school or discontinued at the primary level and/or never learned how to read. There is no evidence that being born premaritally is associated with elevated mortality among children whose mothers have been to secondary school and/or know how to read. The results demonstrate that analyzing how premarital childbearing intersects with other sources of health inequality enhances our understanding of the circumstances under which it poses the greatest risk to child well-being in sub-Saharan Africa.

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Introduction

Sub-Saharan African women are increasingly entering marriage at older ages (Garenne, Tollman, & Kahn, 2000). Given the commonality of premarital sex in the region (Mensch, Grant, & Blanc, 2006), the trend toward later marriage means many African women are at risk of premarital childbearing for increasingly long durations of later adolescence and early adulthood. Indeed, the rise in women's age at first marriage corresponds with higher levels of premarital childbearing in select sub-Saharan African contexts (Harwood-Lejeune, 2001).

Evidence that premarital childbearing has become more common in some sub-Saharan African countries (Barker & Rich, 1992; Gage-Brandon, & Meekers, 1993; Ocholla-Ayayo, Wekesa, & Ottieno, 1993) and is normative in many settings (Garenne et al., 2000; Garenne & Zwang, 2006a; Meekers & Ahmed, 2000; Xu, Mberu, Goldberg, & Luke, 2013; Zwang & Garenne, 2009), raises concerns over its consequences for population health. Premarital childbearing is tied to disadvantages at the aggregate and individual levels (Garenne & Zwang, 2006a). At the individual level, premarital childbearing places women at risk of numerous health problems (Kaufman, Wet, & Stadler, 2001), including an elevated risk of sexually transmitted infections (Garenne & Zwang, 2006a; Nzioka, 2004), and even penalizes women in the marriage market (Calvès, 1999; Ikamari, 2005, Klein Hattori & Larsen, 2007).

Premarital childbearing also adversely affects the health and developmental trajectory of the resulting child. The childhood consequences of being born premaritally are especially severe in sub-Saharan Africa: compared to their peers born to formally married parents, these children are often born in the absence of medical supervision (Gage, 1998), are un/under-vaccinated (Gage, 1997), and are malnourished (Gage, 1997), each of which may help explain their high risk of death under age 5 (Clark & Hamplová, 2013).

The broad societal changes that are driving African women to marry at older ages, and thus experience prolonged risk of having a premarital birth, could, however, condition the experience of

having a premarital birth in a way that lessens its consequences for children (Garenne & Zwang, 2006a). One such societal change is the expansion of female education in sub-Saharan Africa. African women's education is generally thought to reduce their risk of having a child premaritally (Grant & Hallman, 2008). However, because more highly-educated women marry at later ages compared to their less-educated peers (Derose & Kravdal, 2007, Lesthaeghe, 1989; Lloyd, 2005; Singh & Samara, 1996), they are at risk of having a premarital birth for a longer period of later adolescence and early adulthood. In fact, evidence from select sub-Saharan African contexts shows that more highly-educated women have a greater likelihood of giving birth premaritally (Meekers, 1994). Additionally, more highly-educated women's age at first birth has *declined* over the past 25 years in some contexts (Grant, 2015), suggesting that – in combination with the *increased* age at first marriage – highly-educated women could be responsible for a growing share of the region's premarital births.

Though all mothers who give birth before formalizing a marital union are likely to face greater economic, logistical, and social challenges than their married peers (Singh, 1998), those who are more highly-educated are unlikely to experience these challenges to the same degree as their less-educated peers, which may ultimately protect their children. More highly-educated mothers who give birth premaritally are likely better positioned to both independently care for their children and to mobilize family support to help them do so. It is thus possible that being born premaritally is less consequential – or not consequential at all – for children whose mothers are more highly-educated. Instead, premarital birth might be consequential only when mothers are subject to other sources of social disadvantage, such as having limited education.

This article extends the literature on premarital childbearing by assessing whether the childhood health disadvantage associated with being born premaritally varies depending on mothers' educational background. The study focuses on the context of Malawi, a southeast African country where the commonality of premarital sex puts many women at risk of experiencing a premarital pregnancy (Boileau et al., 2009; Clark, Poulin, & Kohler, 2009; Poulin, 2007). Educational gains among Malawian women have been dramatic in recent years (Grant, 2015), but significant educational inequalities remain among women (Smith-Greenaway, 2015), making it an especially important context for understanding how women's educational background conditions their childbearing experiences. The study goal is two-fold. First, I demonstrate the known associations between children's risk of mortality and mothers' marital status and educational background. Building on evidence that mothers' school experiences and mastery of key educational skills have unique bearing on children's well-being, I focus on two dimensions of mothers' educational background: educational attainment and literacy skills. Second, I analyze whether the elevated mortality risk associated with being born premaritally is lessened among children with highly-educated mothers and more pronounced among children with less-educated mothers. The results demonstrate that analyzing how premarital childbearing intersects with other sources of health inequality enhances our understanding of the circumstances under which it poses the greatest risk to child well-being in sub-Saharan Africa.

Female education and its consequences for marriage and childbearing in Malawi

In 1994, the Malawian government eliminated all primary school fees for students under the Free Primary Education Initiative, making Malawi one of the first sub-Saharan African countries to do so (Al-Samarrai & Zaman, 2007). After implementation,

primary school enrollment rates rose dramatically, from 1.9 million to 3.1 million in the first year alone (Al-Samarrai & Zaman, 2007). The educational gains among women have been especially dramatic: whereas nearly one fifth of older Malawian women (ages 45–49) have never attended school, almost all (98%) young women (ages 15–19) have (Macro International 2010). Young Malawian women are also increasingly progressing to the secondary school: whereas merely 5% of older women (ages 45–49) have attended secondary school, over 20% of young women (ages 15–19) have secondary education.

The expansion of school participation has also made educational skills more attainable to the average Malawian woman (Smith-Greenaway, 2015). However, research has also shown that educational skills, like literacy, are far from universal. In fact, educational attainment is an unreliable marker of whether a Malawian woman has learned how to read, signaling the low-school quality that many women experience.

Both going to school and learning how to read profoundly affect multiple dimensions of Malawian women's lives, including their marital and childbearing trajectories.

In the instance that a woman does enter motherhood before marriage, her educational background could also condition the experience of doing so. In the following section, I discuss how the child health consequences of being born premaritally could vary dramatically depending on mothers' educational background. I describe how the severe health disadvantages associated with premarital childbearing are unlikely to be uniform across Malawi's child population; instead, the associated health disadvantages may be limited, or even unobservable, among children whose mothers are highly-educated, and more severe among children with educationally disadvantaged mothers.

Premarital childbearing and its disadvantage for children: **concentrated among educationally disadvantaged women**

Education offers women a number of benefits that could counteract the disadvantage their children face from being born premaritally. In particular, I hypothesize that education enhances never-married mothers' health-related behaviors and their ability to secure the support of other family members, including a child's father, each of which lessen the negative consequences of having an unmarried mother.

A key way that mothers' education could dampen the childhood health disadvantages associated with being born premaritally is by encouraging women to proactively seek reproductive healthcare. One reason premarital childbearing is associated with poor child outcomes is that never-married mothers are significantly less likely to receive high-quality healthcare during pregnancy and their child's early life (Gage, 1998; Hakansson, 1994; LeGrand & Mbacké, 1993; Magadi, Agwanda, & Obare, 2007; Mahomed, Ismail, & Masona, 1989; Ocholla-Ayayo, Wekesa, & Ottieno., 1993). Some work argues that never-married mothers avoid seeking reproductive healthcare due to stigma and the fear that providers will condemn their premarital pregnancy (Huntington, Lettenmaier, & Obeng-Quaidoo, 1990).

More highly-educated mothers who conceive premaritally will similarly be subject to stigma and shame (Johnson-Hanks, 2002). However, because mothers' education is a powerful determinant of receiving more timely and higher-quality healthcare (Basu & Stephenson, 2005; Mturi & Moerane, 2001), children born premaritally to more highly-educated mothers may experience comparable levels of healthcare as their peers whose parents are married. In other words, a mother's education may have a stronger, positive influence on her healthcare behaviors than the negative influence of her status as a never-married mother. If this

is the case, children born premaritally to highly-educated women may have similar mortality profiles as their peers whose mothers are married. Conversely, among mothers who are less-educated and never-married, the fear of stigma may more powerfully dissuade them from seeking healthcare compared to their married peers, thereby exacerbating their children's risk of poor health outcomes.

In addition to education leading women to seek healthcare despite their status as never-married mothers, education may better positions never-married mothers to manage various dimensions of their children's health. That is, because more highly-educated women are known to have healthier behaviors surrounding the prevention and treatment of childhood illness, it may be less consequential for their children if they are left to make health decisions on their own. For instance, more highly-educated mothers can better understand printed and auditory health information (Dexter, LeVine, & Velasco, 1998; Joshi, 1994; Preston & Haines, 1991; Schnell-Anzola, Rowe, & LeVine, 2005; Stuebing, 1997), more clearly articulate their children's health needs in a medical setting (LeVine, LeVine, Rowe & Schnell-Anzola, 2004; Schnell-Anzola et al., 2005), and better facilitate complex treatment regimens. Thus, among more highly-educated women who possess these health management skills, their status as never-married mothers may have little bearing on their children's well-being.

Mothers' education may further offset the childhood disadvantage associated with being born premaritally by better ensuring they receive the support of other family members. In sub-Saharan Africa single mothers rarely receive government support, and instead turn to their family for support (Gage-Brandon & Meekers, 1993). Because highly-educated Malawian women are likely to have more highly-educated relatives with greater economic resources, and because family transfers are common in Malawi (Trinitapoli, Yeatman, & Fledderjohann, 2014), children born premaritally to more highly-educated women may enjoy financial resources comparable to their peers whose mother can access her spouse's resources. Thus, their risk of mortality may be comparable. Conversely, less-educated women who give birth premaritally may have far fewer well-resourced relatives that they can turn to for support. The lack of economic resources, which a marital union would likely provide some buffer against, may make children born premaritally to less-educated mothers especially susceptible to poor childhood health outcomes.

More highly-educated women who give birth premaritally may also secure resources from a child's father more easily than their less-educated peers, which may further reduce health inequality between their children and children whose parents are formerly married. Research has documented considerable variation in terms of the amount of paternal support mothers receive in the instance of a premarital birth (Calvès, 2000). In a study of Botswana, less than one quarter of mothers who gave birth premaritally received support from the child's father (Ingstad, 1994). However, a mother's education significantly increased the likelihood she received paternal support. Another study in Botswana found that only 30% of uneducated never-married mothers received support from the child's father, compared to nearly 60% of secondary-educated never-married mothers (Gage-Brandon & Meekers, 1993). Because a father's social and economic support are equally valuable to a child's health—regardless of whether the parents are formally married (Cohen & Bledsoe, 1993) – if highly-educated mothers are more successful at securing paternal support, this could substantially reduce the childhood health disadvantages associated with being born premaritally. Conversely, if less-educated mothers who give birth premaritally are less likely to receive support from the child's father – while also facing greater difficulty managing their children's health alone with few family

resources—their children likely face especially high risk of poor health.

In summary, although premarital childbearing likely presents all African mothers with a number of challenges that their married peers do not experience, more highly-educated women may not only be better positioned to manage their children's health needs without the formal support of a marital union, but they may also be more adept at securing support from their family and the child's father. If this is the case, premarital childbearing may have minimal health disadvantages for children with highly-educated mothers at the same time that it is detrimental to children whose mothers are educationally disadvantaged.

Data

To determine whether the childhood health risk associated with being born premaritally is conditional on mothers' educational background, I use data from the Malawi Demographic and Health Survey (MDHS) (2010). The Demographic and Health Survey (DHS) is a cross-sectional, nationally representative survey that tracks population health in developing countries. The survey's rich information on mothers, including their marital status, educational attainment, and literacy skills, combined with detailed information on their children's health, makes it a valuable resource for studying the associations between mothers' marital status, educational background, and child survival.

The MDHS uses a probability sampling framework to draw a multistage, stratified random sample representative of the Malawian population. Within the sampling framework, clusters provide the primary sampling unit. Within each selected cluster, the MDHS randomly samples families to participate. The head of the household completes a full roster of members, from which the MDHS identifies women who are of reproductive-age (15–49 years old). All eligible women complete a full reproductive history calendar with detailed questions about each child, including whether the child is still alive and, if not, the child's age at death. The MDHS collected such information from 16,152 women.

Because of the cross-sectional nature of these data, to minimize recall bias, I adopt the same strategy as other reputable child mortality studies using DHS data and restrict the sample (Clark & Hamplová, 2013; Omariba & Boyle, 2007; Smith-Greenaway, 2013), in this case to the seven-year period prior to the survey. This restriction also increases confidence that measures of family, household, and neighborhood conditions at the time of the survey approximate those that children experienced throughout their early life. After excluding less than 1% of cases with missing data ($N=136$), the final sample includes 30,411 children born to 15,423 mothers between 2003 and 2010.

Data limitations

Before describing study measures, it is important to recognize that the study design is constrained by data limitations. Because the child mortality data are retrospective, I constructed a child-oriented, event history file to estimate the discrete-time logit models using information from mothers' retrospective reports of each child born in the past seven years. However, all covariates are measured at a single point in time: at the interview. Thus, I treat all covariates as time-invariant. Although I can appropriately classify children according to whether they were born premaritally, ideally, an analysis of mothers and their children's survival would leverage prospective data that follows women over time and tracks relevant changes in family, household, and neighborhood processes, as well as changes in children's vital status. Unfortunately, even in high-income countries, nationally representative, prospective data following women and their

children from infancy to age five are rare. Such data are virtually unheard of in low-income contexts like Malawi. Thus, the study is constrained in similar ways as other recent analyses of child mortality in low-income regions (Clark & Hamplová, 2013; Shin, 2007; Smith-Greenaway & Trinitapoli, 2014; Van de Poel, O'Don-nell, & Doorslaer, 2007). Nonetheless, it is important to remember that because of the cross-sectional nature of these data, the mul-tivariate results are associations and do not establish causal order.

Another related limitation of these data is the lack of complete information on mothers' marital and relationship histories. Although I am able to establish whether children were born pre-maritally, without a full marital history, apart from the first mar-riage, I do not have complete information on family transitions. This makes it more challenging to study single motherhood stemming from other family processes (e.g., divorce or widow-hood). Moreover, without information on the existence, timing, or nature of non-marital romantic relationships, I am unable to capture heterogeneity among children born premaritally that may correlate with their mothers' educational background and thus correspond with their possible differential risk of mortality.

Measures

Child mortality

The outcome variable is the hazard of mortality before age five. Children born less than five years before the survey are censored, which the discrete-time hazard models address. To accommodate this modeling strategy, I restructured the data from a child-based dataset to a time-based one, wherein children contribute the number of months they were observed. In addition to handling time in the modeling approach, I include a categorical indicator for the child's age (0–11 months, 12–23 months, 24–35 months, and 36+ months).

Premarital birth

The DHS asks all mothers their marital status at the time of the survey, and for women who are married, the date of their first marriage. With this information, in addition to information on the child's date of birth, I classify children according to whether they were born premaritally.[1]

To compare children born premaritally to their peers born within a formal marital union, I further categorize children according to other family types. In particular, I distinguish among children whose mothers are (at the time of the survey) divorced/separated or widowed. Given that polygyny is highly correlated with child mortality (Smith-Greenaway & Trinitapoli, 2014), I also categorize children whose mothers are in a polygynous marriage separately from those whose mothers are in a monogamous union. Thus, I compare children born premaritally to those whose mothers were married in a monogamous union at both the time of the child's birth and the survey (reference group). As noted in the preceding section, although I can accurately identify children born premaritally, the lack of complete data on the timing of divorce and widowhood makes it difficult to study the childhood consequences of these forms of single motherhood. Thus, any distinct patterns of child survival documented for children whose mothers are single due to these family transitions must be interpreted with caution.

Some children's mothers (approximately 15%) were in more than one marital union. Although I am able to identify these

women, without information on when each union transition occurred, it possible that some children may have experienced family instability that the analyses do not explicitly account for. This is most problematic in the instance of children whose mothers are currently married (the reference group). That is, some of these children's mothers were continuously married since their birth, whereas others may have experienced their mother divor-cing and remarrying. As a result, the survival gap between children born premaritally and children with married parents is likely to be a conservative estimate. To address this complexity, in all multi-variate models I include a dummy variable for whether a child's mother is remarried at the time of the survey.[2]

Mothers' educational background: educational attainment and lit-eracy skills

I focus on two dimensions of mothers' educational background: educational attainment and literacy. The DHS asks mothers the highest level of education they have attained. I adopt the same approach as previous research on premarital childbearing in sub-Saharan Africa (Gage, 1997) and classify children's mothers as having (1) no education, (2) primary education, or (3) secondary education. Because a very small percentage of Malawian women have higher education (N=119;.77%), I group their children with those whose mothers have secondary education.

In addition to mothers' educational attainment, based on litera-ture demonstrating that mothers' educational skills produce unique child health advantages (Smith-Greenaway, 2013), I measure mothers' literacy skills using direct and indirect assessments. The DHS asks mothers who have never attended secondary school (i.e., uneducated/primary-educated mothers) to read aloud one of four possible sentences: "Parents love their children," "Farming is hard work," "The child is reading a book," or "Children work hard at school." For mothers with secondary school, the MDHS assumes they can read (=1) and does not administer the literacy assessment. With this information, I created a dichotomous indicator that distinguishes women who can read all the words (=1) from those who can read only some or none of the words (=0).[3]

Based on past research (Smith-Greenaway, 2015), the assumption that all secondary-educated women can read likely misclassifies some Malawian women as literate when they truly are unable to read. I conducted supplementary analyses using only the subsample of children (N=26,486) whose uneducated/pri-mary-educated mothers were administered the direct reading assessment. These results are consistent with the findings shown here.

Control variables

In all models, I include a set of controls to better isolate the associations between premarital childbearing, mothers' educa-tional background, and child mortality. I account for several known proximate determinants of mortality: maternal age at the time of the child's birth, birth order, birth spacing (first born, born fewer than 36 months after sibling, and born 36 months or more after sibling), child's sex, and whether the child is from a singleton or multiple birth.

I also use the DHS-constructed wealth index to account for inequality in children's access to material resources in their home. The DHS collects information on households' ownership of mate-rial assets (e.g., radio, television, refrigerator, bicycle, car) and their

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[1] In select cases, mothers of children born premaritally later married. In the analyses shown here, I consider these children as having been born premaritally. Supplementary analyses confirm that the survival differential between children born premaritally and children born within a marital union is comparable regardless of whether these children are analyzed as a separate group or included with children with continuously married mothers.

[2] Supplemental models confirm that excluding children whose mothers have married more than once leads to similar conclusions as the ones found here.

[3] In additional analyses, I recoded women who could read some of the words from 0 to 1, and I found less consistent evidence of a child survival differential, suggesting that, at least in Malawi, a higher level of literacy is needed to produce distinct child survival patterns.

house construction (e.g., availability of electricity, access to drinking water, type of toilet facility, number of rooms) and aggregates these variables into a principal component factor analysis. The factor scores are used to categorize households into five quintiles that I use here: poorest, poor, middle, rich, and richest.[4] Of course, living in a relatively better-off household does not mean that resources are allocated in a way that meets children's needs. In fact, never-married mothers' contributions to a household have been shown to determine her and her children's share of household resources (Gage, 1997). Thus, to approximate distribution of household resources, I also account for household size. Including an indicator for household size also accounts for overcrowding, which is known to influence children's risk of mortality (Garenne & Aaby, 1990).

Additionally, because child mortality is geographically patterned within African countries (Black et al., 2010; Storeygard, Balk, Levy & Deane, 2008), I include an indicator of whether the child lives in the northern (reference group), central, or southern region of Malawi.

Methods

To model the interrelationships between premarital childbearing, mothers' educational background, and child survival, I estimate a series of discrete-time logistic regression models. These models allow me to address the fact that these data are censored. That is, because the mortality data are retrospective, children who are alive or are younger than 5 years old at the end of the observation period (i.e., time of survey) are right censored. The model is specified as:

$$\text{logit}(h_{ti}) = \alpha_t + \boldsymbol{\beta}_1 \mathbf{X}_i$$

where h_{ti} is the hazard that child i dies at time t; $\boldsymbol{X}_i$ is a vector of covariates; and the $\boldsymbol{\beta}$s represent the corresponding coefficients. As noted earlier, I account for the effect of age on mortality (α_t) by including a dummy variable for four age-groups: 0–11 months, 12–23 months, 24–35 months, and 36+ months. I estimate two sets of models. The first set aims to establish the known relationships between (1) premarital childbearing and mothers' educational background, including her (2) educational attainment and (3) literacy, and children's subsequent risk of mortality. In the second set of models, I disaggregate the sample according to women's (1) educational attainment and (2) literacy to analyze whether the survival disadvantage associated with premarital childbearing is conditional on mothers' educational background.

Results

Table 1 shows descriptive statistics for the full sample. A small percentage (3%) of Malawian children was born premaritally whereas the vast majority of children (69.7%) were born to mothers who married before their birth. There is further diversity in mothers' marital status: approximately 15% of children have mothers who are married in a polygynous arrangement, and approximately 13% of children have mothers who are single due to either divorce/separation or widowhood. Nearly one in five children has a mother who has been married more than once, which I include to further account for family instability.

The descriptive results further demonstrate inequality in the educational background of children's mothers. In terms of educational attainment, approximately one in five children have a mother who never went to school, nearly 70% of children's mothers went to primary school, and approximately 12% of mothers went to secondary school. There is also considerable inequality in terms of whether the child's mother acquired educational skills, such as literacy: less than one half of children in the sample have a mother who can read a basic sentence in any language. It is important to note that even this low prevalence of mothers who can read is likely inflated due to the fact that the MDHS assumes that all women who have attended secondary education can read.

To provide a sense of how children's characteristics, as well as their household and community characteristics, differ according to their mothers' educational background, in Table 2 I disaggregate the descriptive statistics by mothers' (1) educational attainment and (2) literacy. The results confirm that premarital childbearing is significantly more common among secondary-educated women in Malawi compared to their less-educated peers. Merely 1% of children whose mother had never been to school were born premaritally, whereas one in ten children with secondary-educated mothers were born premaritally. A similar finding emerges when looking at women's literacy: premarital childbearing is twice as prevalent among women who are literate versus non-literate. These findings demonstrate the need to consider the diverse circumstances under which women have premarital births.

The descriptive results further confirm the diversity in children's characteristics by mothers' educational background. For

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Table 1

Characteristics of the full sample of Malawian children born within the past 7 years (N=30,411).

Source: Malawi demographic and health survey (2010).

	Mean/Percent (SD)
Mothers' marital status	
Premarital birth: mother never-married	2.86
Mother monogamously married (ref)	69.70
Mother polygynously married	14.77
Mother currently divorced	9.91
Mother currently widowed	2.76
Married more than once	16.43
Mothers' educational background	
Educational attainment	
No education	20.15
Primary education	68.04
Secondary education	11.82
Literacy skills	
Can read	51.25
Cannot read	48.75
Controls	
Mothers' age at time of child's birth	25.61 (6.66)
Length of preceding birth interval	
First born	20.79
Short interval	42.02
Long interval	37.19
Birth order	3.57 (2.29)
Female	50.11
Twin	4.13
Household wealth	
Poorest	22.54
Poor	21.84
Average	21.80
Rich	19.75
Richest	14.07
Total number of household residents	2.34 (1.18)
Rural community (urban reference)	90.27
Region of residence	
North	17.63
Central	34.27
South	48.11

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[4] For more detailed information on this widely used construct, see Bollen, Glanville, and Stecklov (2007), Filmer and Pritchett (1998), and Houweling, Kunst, and Mackenbach (2003).

instance, children whose mothers are more highly-educated tend to be of lower birth order (signaling their mothers' lower fertility) and live in wealthier households in more urbanized communities. These findings highlight the importance of accounting for these factors when trying to analyze the links between premarital childbearing, mothers' educational background, and child survival.

Turning to the multivariate models, the results in Table 3 begin with the direct associations between mothers' marital status, educational background, and children's risk of mortality. The first model focuses on premarital childbearing and confirms that, in line with past evidence, children born premaritally have significantly elevated risk of mortality compared to their peers born to married mothers. In fact, these children experience a 35% increase in the odds of mortality before their 5th birthday, compared to their peers whose mothers were married at the time of their birth.

Whereas premarital childbearing is a significant risk factor for child survival, the opposite is true of mothers' education. Though there is minimal benefit associated with having primary-educated mothers, the results in Model 1 show that children with secondary-educated mothers experience a substantially lower risk of mortality – an 18% reduction in the odds of death – compared to their peers whose mothers have never been to school. Furthermore, when comparing children with secondary-educated versus those with primary-educated mothers, the results confirm that those with secondary-educated mothers experience substantially lower risk of mortality compared to their peers with primary-educated mothers. The results in Model 2 confirm that another dimension of mothers' educational background – literacy – is also

highly protective of children's survival: children whose mothers can read experience an 8% reduction in the odds of dying.

The powerful survival *disadvantage* associated with premarital childbearing – matched with the equally powerful survival *advantage* associated with having a more highly-educated and/or literate mother – raises the question of whether the benefits of the latter offset the consequences of the former. To assess whether this is the case, Table 4 shows model estimates from discrete-time hazard models disaggregated by mothers' educational attainment. As Model 1 shows, children born premaritally to mothers who had never been to school experience a substantially larger risk of dying compared to their peers whose uneducated mothers gave birth within the context of marriage. However, the results in Models 2 and 3 confirm that premarital childbearing is only marginally associated with an elevated risk of death among primary-educated women ($p < .01$ level) (Model 2) and non-significantly associated with an elevated risk of death ($p < .05$ level) among the subsample of children whose mothers had gone to secondary school (Model 3). That is, the disadvantage associated with premarital childbearing is concentrated among children with the least educated mothers. Supplemental models including an interaction term confirms these differences are statistically significant ($p < .05$).

To confirm that these findings are consistent when looking at another dimension of mothers' educational background – literacy skills – in Table 5, I disaggregate the sample according to whether the child's mother can read. As results in Model 1 show, children whose mothers cannot read experience a substantially higher risk of death compared to their peers born to married mothers. In fact, compared to their peers born within marriage, children born

Table 2
Characteristics of Malawian children born within the past 7 years ($N=30,411$) by mothers' educational background.
Source: Malawi Demographic and Health Survey (2010)

	No education	Primary education	Secondary education	Cannot read	Can read
Mothers' marital status					
Premarital birth: mother never-married	1.20	2.38	8.13	1.83	3.84
Mother monogamously married (ref)	66.89	70.25	71.06	68.55	70.78
Mother polygynously married	18.77	14.70	8.89	16.76	12.90
Mother currently divorced	9.12	10.21	9.44	9.91	9.88
Mother currently widowed	4.02	2.46	2.48	2.95	2.59
Married more than once	22.73	16.26	7.52	20.06	12.99
Mothers' educational background					
Educational attainment					
No education	–	–	–	38.81	0.59
Primary education	–	–	–	61.19	75.42
Secondary education	–	–	–	0.00	23.98
Literacy skills					
Can read	1.58	56.44	100.00	–	–
Cannot read	98.42	43.56	0.00	–	–
Controls					
Mothers' age at time of child's birth	29.26 (7.16)	24.97 (6.45)	23.49 (4.61)	26.77 (7.11)	24.49 (5.98)
Length of preceding birth interval					
First born	8.46	20.96	39.32	15.38	25.97
Short interval	49.38	42.64	26.88	46.51	37.74
Long interval	42.16	36.40	33.80	38.11	36.29
Birth order	4.89 (2.50)	3.44 (2.19)	2.15 (1.30)	4.09 (2.44)	3.05 (2.02)
Female	50.30	50.14	49.61	50.61	49.62
Twin	4.71	3.85	4.76	4.16	4.09
Household wealth					
Poorest	35.03	22.13	5.27	30.58	14.91
Poor	26.77	22.82	8.64	25.33	18.57
Average	20.35	23.29	15.71	21.72	21.87
Rich	13.88	20.65	23.95	16.23	23.08
Richest	3.97	11.11	46.43	6.14	21.57
Total number of household residents	2.45 (1.05)	2.41 (1.09)	2.62 (1.31)	2.43 (1.07)	2.46 (1.16)
Rural community (urban reference)	95.49	92.14	71.65	94.69	86.08
Region of residence					
North	4.31	19.97	25.41	14.31	20.80
Central	38.50	33.90	29.66	35.82	32.77
South	57.19	46.13	44.93	49.87	46.43

Table 3
Discrete-time hazard model results of Malawian children's risk of under-five mortality, by mothers' marital status and educational background.
Source: Malawi Demographic and Health Survey (2010).

	Model 1				Model 2			
	O.R.	Sig	Coeff	S.D	O.R.	Sig	Coeff	S.D
Mothers' marital status								
Premarital birth: mother never-married	1.35	**	0.30	0.11	1.32	*	0.27	0.11
Mother monogamously married (ref)	–				–			
Mother polygynously married	1.15	**	0.14	0.05	1.15	*	0.14	0.05
Mother currently divorced	1.32	***	0.28	0.06	1.32	***	0.28	0.06
Mother currently widowed	1.91	***	0.65	0.10	1.90	***	0.64	0.10
Married more than once	1.46	***	0.38	0.05	1.46	***	0.38	0.05
Mothers' educational background								
Educational attainment								
No education	–							
Primary education	1.06		0.06	0.05				
Secondary education	0.82	*	−0.20	0.09				
Literacy skills								
Can read					0.92	*	−0.09	0.04
Cannot read					–			
Controls								
Mothers' age at time of child's birth	1.00		0.00	0.01	1.00		0.00	0.01
Length of preceding birth interval								
First born	–				–			
Short interval	0.79	***	−0.24	0.06	0.80	***	−0.22	0.06
Long interval	0.52	***	−0.65	0.07	0.53	***	−0.63	0.07
Birth order	1.02		0.02	0.02	1.03		0.03	0.02
Female	0.84	***	−0.17	0.04	0.84	***	−0.17	0.04
Twin	4.20	***	1.44	0.06	4.14	***	1.42	0.06
Household wealth								
Poorest	–				–			
Poor	1.12	*	0.11	0.06	1.13	*	0.12	0.06
Average	1.16	*	0.14	0.06	1.16		0.15	0.06
Rich	1.10		0.10	0.06	1.11		0.10	0.06
Richest	0.99		−0.02	0.08	0.95		−0.05	0.08
Total number of household residents	1.02		0.02	0.02	1.02		0.02	0.02
Rural community (urban reference)	0.94		−0.06	0.07	0.96		−0.04	0.07
Region of residence								
North	–				–			
Central	1.25	***	0.22	0.06	1.24	***	0.22	0.06
South	1.35	***	0.30	0.06	1.34	***	0.29	0.06
Model Fit								
L.R. Chi-square	−18613.77				−18584.70			

* $p < .05$.
** $p < .01$.
*** $p < .001$.

premaritally to women who are unable to read experience a 72% increase in the odds of dying before their 5th birthday. However, when focusing only on children whose mothers can read, we see no elevated risk of mortality associated with being born premaritally versus being born to a married mother. Again, supplemental models including an interaction term confirm these differences are significant ($p < .05$).

Discussion

Research from diverse global contexts confirms that children born premaritally experience distinct health and developmental challenges compared to children born to married mothers (Singh, 1998). In sub-Saharan Africa, the consequences of being born premaritally are especially severe, including a higher risk of under-five mortality (Clark & Hamplová, 2013).

The broader social changes that may be driving a possible rise in premarital childbearing, however, could also be shaping the phenomenon itself, and thus the consequences it bears for children. In this paper, I explore this idea through an analysis of women's education. In recent decades, women's educational participation has increased dramatically across many sub-Saharan

African countries, including Malawi. Although large inequalities – including disparities in the opportunity to go to school, remain enrolled, and acquire educational skills – are a defining feature of the country's educational landscape, advances in women's education have been a powerful determinant of the shifting patterns of marriage, including delayed entry to marriage.

Premarital childbearing has been historically concentrated among very young adolescent girls (Garenne & Zwang, 2006b); however, as more highly-educated African women postpone marriage and maintain sexual and romantic relationships while doing so, premarital childbearing may increase among this more advantaged group of women. This raises the question of whether these women's experience giving birth premaritally differs from those of their less-educated peers, and if so, whether it conditions the consequences for children.

The results from this study make two contributions to the literature. First, they confirm that premarital childbearing is *more common* among secondary-educated women in Malawi than among their less-educated peers, who have either never been to school or discontinued their education at the primary level. That is, whereas less than 1–2% of children with uneducated or primary-educated mothers are born premaritally, nearly one in ten of Malawian children born to a secondary-educated mother are

Table 4
Discrete-time hazard model results of Malawian children's risk of under-five mortality, disaggregated by mothers' educational attainment.
Source: Malawi Demographic and Health Survey (2010)

	Model 1: Mother has no education				Model 2: Mother primary- educated				Model 3: Mother secondary-educated			
	O.R.	Sig	Coeff	S.D	O.R.	Sig	Coeff	S.D	O.R.	Sig	Coeff	S.D
Mothers' Marital Status												
Premarital birth: mother never-married	2.39	**	0.87	0.30	1.29	+	0.25	0.15	1.42		0.35	0.23
Mother monogamously married (ref)	–				–				–			
Mother polygynously married	1.25	*	0.23	0.11	1.12	+	0.11	0.07	1.15		0.14	0.20
Mother currently divorced	1.67	**	0.51	0.15	1.23	***	0.20	0.08	1.54	*	0.43	0.20
Mother currently widowed	2.12	***	0.75	0.20	1.76	***	0.57	0.13	2.51	**	0.92	0.31
Married more than once	1.38	**	0.32	0.11	1.41	***	0.34	0.06	2.72	***	1.00	0.19
Controls												
Mothers' age at time of child's birth	1.00		0.00	0.01	1.00		0.00	0.01	1.03		0.03	0.02
Length of preceding birth interval												
First born	–				–				–			
Short interval	0.68	*	− 0.39	0.17	0.74	***	− 0.30	0.07	0.85		− 0.16	0.21
Long interval	0.38	***	− 0.96	0.18	0.48	***	− 0.73	0.08	0.90		− 0.11	0.20
Birth order	1.01		0.01	0.03	1.05	*	0.04	0.02	0.94		− 0.06	0.08
Female	0.74	**	− 0.30	0.09	0.87	**	− 0.14	0.05	0.88		− 0.13	0.12
Twin	4.10	***	1.41	0.13	4.12	***	1.42	0.08	5.11	***	1.63	0.19
Household wealth												
Poorest	–				–				–			
Poor	1.29	*	0.26	0.11	1.07		0.07	0.07	1.05		0.05	0.30
Average	1.16		0.15	0.13	1.16	*	0.15	0.07	0.87		− 0.14	0.29
Rich	1.21		0.19	0.14	1.08		0.08	0.07	0.85		− 0.16	0.28
Richest	0.64		− 0.44	0.30	1.04		0.04	0.10	0.76		− 0.27	0.28
Total number of household residents	1.09	+	0.08	0.04	0.99		− 0.01	0.02	1.11	*	0.10	0.04
Rural community (urban reference)	0.76		− 0.27	0.20	0.89		− 0.12	0.09	1.21		0.19	0.17
Region of residence												
North	–				–				–			
Central	0.96		− 0.04	0.22	1.23	***	0.21	0.07	1.58	**	0.46	0.17
South	1.04		0.04	0.21	1.39	***	0.33	0.07	1.27		0.24	0.17
Model Fit												
L.R. Chi-square	− 3642.00				− 13058.98				− 1866.71			
Person-month observations	214,780				765,983				138,477			

+ *p* < .1.
* *p* < .05.
** *p* < .01.
*** *p* < .001.

born premaritally—meaning that premarital childbearing often occurs in the context of educational *advantage.*

Second, the findings confirm that premarital childbearing in the context of educational advantage does not bear the negative consequences that it does for children whose mothers are educationally disadvantaged. Premarital childbearing is associated with a substantially higher risk of premature death (Table 3) – even net of a host of factors, including household wealth. However, accounting for mothers' educational background (Tables 4 and 5) confirms that the risk is concentrated among children whose mothers' have never been to formal school – and to some extent those who discontinued at the primary level – or never acquired literacy skills. Conversely, children born premaritally to educationally advantaged women face comparable risk of premature death as their peers with married parents. Although all women who give birth premaritally are subject to economic, social, and logistical challenges, mothers' education appears to offset the consequences of these disadvantages for children, which are compounded among children with less-educated women.

The study demonstrates the value of integrating research on various sources of social inequality to better understand health disparities; however, many questions remain. Especially pressing is the need to understand why children with more highly-educated mothers are immune to the survival disadvantage associated with being born premaritally. Building on past research, I discuss a number of possible explanations. I suspect that education

may encourage mothers to consistently use healthcare, and may more generally improve their overall management of their children's health, lessening the disadvantage associated with them more frequently making childcare decisions alone compared to their married peers. I further hypothesize that more educated mothers who give birth premaritally may be better positioned to receive support, not only from family members with greater resources, but also from the child's father. Yet, additional work is needed to confirm these mechanisms.

Though questions remain, the current study adds to past work that has shown variable consequences of premarital childbearing across distinct ethnic groups (Gage, 1997; Shell-Duncan & Wimmer, 1999), by identifying education as another factor that conditions the experience of never-married mothers. From one perspective, the results can be read as good news: as women's education continues to increase in the region, even if premarital childbearing becomes more common, it may not bear the same severe consequences for children that it has historically. That is, the results suggest that as long as women have the opportunity to complete school and acquire educational skills, their marital status at the time of their child's birth will have minimal bearing on their subsequent survival. Of course, although education can lessen the consequences of premarital childbearing among this advantaged group, the findings also imply that the intersecting nature of inequalities means childhood health disparities may grow on some fronts. That is, there will be persistent, and possibly increasing,

Table 5
Discrete-time hazard model results of Malawian children's risk of under-five mortality, disaggregated by mothers' literacy skills.
Source: Malawi Demographic and Health Survey (2010)

	Model 1: Mother can read				Model 2: Mother cannot read			
	O.R.	Sig	Coeff	S.D	O.R.	Sig	Coeff	S.D
Mothers' Marital Status								
Premarital birth: mother never-married	1.72	**	0.54	0.17	1.15		0.14	0.15
Mother monogamously married (ref)	–				–			
Mother polygynously married	1.09		0.08	0.07	1.23	*	0.21	0.08
Mother currently divorced	1.76	***	0.57	0.15	2.03	***	0.71	0.14
Mother currently widowed	1.31	**	0.27	0.09	1.31	**	0.27	0.09
Married more than once	1.50	***	0.41	0.07	1.38		0.32	0.08
Controls								
Mothers' age at time of child's birth	0.99		−0.01	0.01	1.01		0.01	0.01
Length of preceding birth interval								
First born	–				–			
Short interval	0.82	*	−0.20	0.09	0.71	***	−0.35	0.09
Long interval	0.46		−0.77	0.10	0.56	***	−0.58	0.09
Birth order	1.02		0.02	0.02	1.04		0.04	0.03
Female	0.81		−0.22	0.05	0.88	*	−0.13	0.06
Twin	3.94		1.37	0.09	4.36	***	1.47	0.09
Household wealth								
Poorest	–				–			
Poor	1.16		0.15	0.07	1.07		0.07	0.10
Average	1.16		0.15	0.08	1.14		0.14	0.09
Rich	1.08		0.08	0.09	1.10		0.10	0.09
Richest	1.01		0.01	0.13	0.91		−0.09	0.11
Total number of household residents	1.01		0.01	0.03	1.03		0.03	0.02
Rural community (urban reference)	0.85		−0.17	0.12	1.01		0.01	0.09
Region of residence								
North	–				–			
Central	1.19		0.17	0.09	1.31	**	0.27	0.08
South	1.30		0.26	0.09	1.40	***	0.34	0.08
Model Fit								
L.R. Chi-square	−9521.29				−9036.22			
Person-month observations	542,365				574,437			

* $p < .05$.
** $p < .01$.
*** $p < .001$.

inequality between children who experience compounding disadvantage (e.g., a less-educated and unmarried mother) versus children who experience compounding advantage (e.g., a more highly-educated *and* married mother).

The results are also relevant to future cross-national research on premarital childbearing and children's well-being. It is important to explore whether discrepant findings between country-specific studies on the topic are due to the differing profiles of women who give birth premaritally in the respective country. According to the present study, in contexts where women's education is, on average, higher and thus a larger share of premarital births are to these women, this could mask what are truly detrimental consequences for the subsample of children whose never-married mothers are less-educated. Thus, when investigating associations between premarital childbearing and child survival, this study confirms the importance of considering the variable profiles of the women who are engaging in premarital childbearing, and how unmeasured factors may be masking its negative health implications for some groups.

Of course, the fact that premarital childbearing is not associated with a survival disadvantage among children whose mothers are highly-educated should not lead to the conclusion that premarital childbearing is not at all disadvantageous to this subpopulation. There is a need to better understand the extent to which premarital childbearing still poses economic, social, and logistical obstacles for these mothers. It is possible that – from the mothers' perspective – premarital childbearing is as detrimental as it is for their less-educated peers, but that their more-resourced peers and the child's father offsets the disadvantages for their

child. That is, a never-married mother may not individually benefit from the support of others to the same degree that her child does. Instead, she may continue to face stigma and long-term consequences just as her less-educated peers do. Thus, there is a need for future efforts to explore whether women's education conditions the experience of premarital childbearing for their own well-being, or only their children.

Though future work is needed on whether education also lessens the consequences for women's own well-being, the results demonstrate the importance of initiatives to keep young girls in school. African girls who become pregnant while attending school are often forced to drop out (Meekers & Ahmed, 1999); however, this need not be the case. Research has shown that young mothers can succeed in their education as long as appropriate support systems are in place (Kaufman et al., 2001; Madhavan and Kevin, 2005). Efforts to enable unmarried, pregnant women to gain even one additional year of school, or to receive literacy training outside the formal school setting, could powerfully shape their future children's well-being.

The results also highlight the value of thinking about gender-based educational disparities in broader terms than school participation alone. In many low-income contexts, the rapid increase in enrollment has been at the expense of school quality (Pritchett, 2013), and, compared to boys, girls' school performance appears to be more adversely affected by low-quality schools (Grant, Soler-Hampejsek, Mensch, & Hewett, 2011). In Malawi, compared to boys, girls are more likely to leave low-quality school experiences with weaker literacy and numeracy skills that are more vulnerable to being lost over time (Soler-Hampejsek et al., 2014). This

suggests that although gender inequality in educational participation is declining in many African countries (Grant & Behrman, 2010), there is a need to address other forms of gender-based educational inequality, including the acquisition and retention of key skills like literacy.

Beyond its substantive contributions, the study also illuminates the importance of complete data on women's marital histories and circumstances surrounding premarital childbearing in low-income countries. In addition to the lack of complete marital history data, the DHS lacks information on the level of paternal involvement, reflecting a long-standing bias that fathers are less relevant to child well-being in low-income contexts. Select country-specific and qualitative studies show considerable variation in fathers' level of involvement when parents are not married (Ingstad, 1994), with evidence that some men do fail to assume the financial and social responsibilities associated with fatherhood (Calvès, Cornwell, & Enyegue, 1996; Cohen & Bledsoe, 1993). However, increasing research from South Africa confirms that – even in the absence of marriage – fathers are involved in their children's well-being (Clark, Cotton, & Marteleto, 2015; Madhavan, Richter, Norris, & Hosegood, 2014). More detailed data on fathers would not only allow future research to better understand premarital childbearing in the region, but may also illuminate why we see such large inequalities in the cost of premarital childbearing by mothers' educational background.

Acknowledgement

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