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## Mothers' Reading Skills and Child Survival in Nigeria: Examining the Relevance of Mothers' Decision-Making Power

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### Abstract

Mothers' literacy skills are emerging as a key determinant of children's health and survival in low-income contexts, with emphasis on the cognitive and psychological agency that literacy skills provide. This work has clearly established a strong association between mothers' reading skills—a key subcomponent of broader literacy and language skills—and child mortality. However, this relatively nascent literature has not yet considered how broader social structures condition the process. In Nigeria and in sub-Saharan Africa more broadly, gender-based social inequality constrains many mothers' decision-making power over children's health matters; this structural feature may condition the association between mothers' reading skills and child mortality. This paper uses data from the 2003 Nigerian Demographic and Health Survey ( $N = 12,076$ ) to test the conditionality of the relationship between mothers' reading skills and child survival on mothers' decision-making power, highlighting how structural realities should factor more heavily into this individual-action-oriented literature. Among Nigerian children whose mothers have decision-making power, mothers' reading skills convey a 27 percent lower risk of child mortality; however, for children whose mothers lack decision-making power, mothers' reading skills do not yield a significant survival advantage. Overall, these findings support the need for future work to further analyze how broader social structures condition the benefits of mothers' reading skills for children's health.

### Keywords

Child Mortality; Mothers' Reading Skills; Decision-Making Power; sub-Saharan Africa; Nigeria

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Emerging evidence identifies mothers' literacy skills as a key determinant of children's health and survival in low-income countries (LeVine, 2012). In Nigeria, where 1 million of the world's 7.6 million child deaths occur each year (UNICEF, 2008), mothers' reading skills—a key subcomponent of broader literacy and language skills—are associated with children's risk of mortality (Smith-Greenaway, forthcoming). Although some of the association is attributable to social, economic, and contextual inequalities between women who can and cannot read, net of these factors, having a mother who can read—even at a

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basic level—is associated with a 28 percent lower risk of child mortality compared to children whose mothers cannot read. Furthermore, mothers' reading skills *fully* explain the association between mothers' formal schooling and child mortality.

A series of in-depth community studies across Africa, Asia, and Latin America provides a rich account of the individual-level processes that may underlie the association between mothers' reading skills and child survival (see Levine, 2012 for review). These studies establish the cognitive and psychological benefits of being able to read, arguing that reading skills engender a host of broader language skills that enable women to navigate health concerns for themselves and their children more effectively. In particular, the literature focuses on how mothers' reading skills benefit child survival vis-à-vis improving health behaviors surrounding the prevention and treatment of childhood illness. In terms of preventative behaviors, mothers who can read can better understand printed and auditory health information, including informational pamphlets and radio-broadcasted health messages (Dexter et al., 1998; Joshi, 2004; Preston et al., 1991; Schnell-Anzola et al., 2005; Stuebing, 1997), which encourages them to adopt healthier maternal and reproductive behaviors. In regard to improving treatment of childhood illness, mothers' reading skills are associated with more effective communication in medical settings (LeVine et al., 2004; Schnell-Anzola et al., 2005); for example, mothers who can read provide better organized accounts of children's symptoms to healthcare providers (LeVine, 2012). Mothers' ability to more effectively communicate promotes children's survival by improving the quality of healthcare children receive. Furthermore, being able to read improves mothers' ability to facilitate complex treatment regimens. For instance, LeVine, LeVine, Rowe, and Schnell-Anzola (2004) demonstrate that mothers' reading skills are significantly associated with their ability to accurately administer oral rehydration salts, preventing a minor childhood illness from advancing to an acute health problem.

The literature on mothers' reading skills and children's health has advanced our understanding of childhood health disparities in low-income countries in novel ways; however, this nascent literature focuses primarily on the main association between mothers' reading skills and child survival. In conceiving of mothers as agentic individuals who can readily control their own behaviors surrounding the prevention and treatment of children's illness, the literature overlooks the structural realities that can constrain mothers' health behaviors in many low-income contexts. Considering whether structural factors condition mothers' agency to utilize their reading skills in ways that produce salubrious child health outcomes will help to more fully understand the link between mothers' reading skills and child mortality.

In sub-Saharan Africa, gender-based social inequality is a structural force that may condition the association between mothers' reading skills and child mortality. Due to the intersection of social, cultural, political, and economic conditions, African women generally occupy lower status in their household compared to men and to elders (Dodoo & Frost, 2008). Although many African women enjoy considerable personal freedom and decision-making power in the midst of widespread gender inequality, some African women have very limited decision-making power (Dodoo, 1998). For instance, even though mothers are children's primary caregivers, many mothers are unable to make decisions about children's health issues independently (Kritz & Makinwa-Adebusoye, 1999). In sub-Saharan African contexts where traditional status hierarchies constrain some mothers' decision-making power, current theories on mothers' reading skills and child survival may therefore fall short.

In this article, I extend the literature on mothers' reading skills and children's health by assessing whether mothers' decision-making power conditions their ability to utilize reading skills in ways that benefit child survival. I focus on Nigeria, whose child mortality level is

one of the highest in the world (UNICEF, 2008), and where structural inequalities result in substantial variability in women's reading skills (Smith-Greenaway, forthcoming) and decision-making power (Kritz & Makinwa-Adebusoye, 1999). The study goal is two-fold: (1) to demonstrate the known association between mothers' reading skills and child mortality in Nigeria and (2) to test the conditionality of the relationship between mothers' reading skills and child mortality on mothers' decision-making power. Results from this study will enhance the literature on mothers' reading skills and child survival by demonstrating the value of future endeavors that link social structure and individual agency to more fully understand the conditions under which mothers' reading skills can powerfully benefit children's health and survival.

## Women's Decision-Making Power in Nigeria

Gender inequalities and power differentials are an organizing feature of all societies (Riley, 1999). This is particularly true in sub-Saharan Africa, where widespread gender inequality is a defining feature of the sociocultural landscape (Dodoo & Frost, 2008). Within African households, gender is inarguably the central basis of stratification (Mason, 1986), although deference to elders is also religiously and socially endorsed (Caldwell & Caldwell, 1987). Gender-based status hierarchies inform household dynamics, including how spouses negotiate and make final decisions (Dodoo, 1998).

Mothers' general involvement in household decision-making directly and indirectly influences a host of reproductive and child health outcomes (Caldwell, 1979), but mothers' decision-making power in the domain of children's health is of particular relevance. Gender-based power hierarchies and traditional gender roles within African families can lead to contradictory situations wherein mothers are responsible for children's day-to-day care but do not have the authority to make the most important decisions regarding their children's health. In the midst of children's health crises, many mothers are barred from responding independently and must delay seeking healthcare until they consult with household authority figures. Approximately one-third (39 percent) of Nigerian mothers cannot independently make the decision to seek medical care when their children are ill (National Population Commission NPC [Nigeria] & ORC Macro 2004).

Structural inequalities contribute to diversity in Nigerian mothers' decision-making power over children's health. In particular, mothers' decision-making power is closely tied to their geographic residence, marriage, access to socioeconomic resources, and education. Beginning with geographic residence, in Nigeria, region is a proxy for the broader cultural, social, and political environment and is perhaps the most salient factor influencing mothers' decision-making power (Kritz & Makinwa-Adebusoye, 1999; Mikell, 1997). Four major ethnic groups are dispersed along Nigeria's regional lines: the Igbo and Yoruba in the southern regions of the country and the Hausa and Fulani in the northern regions. The majority of Igbo and Yoruba identify as Christian, whereas the Hausa and Fulani are predominantly Muslim (Adamu, 1999). Political and socioeconomic disparities between the northern and southern regions inform cultural differences: women enjoy greater access to education and economic opportunities in southern Nigeria compared to their northern counterparts (Csapo, 1981). The sociopolitical and economic disparities between Nigeria's northern and southern regions exacerbate the fact that Islam tends to promote more traditional gender roles, whereas Christianity is more inclined to adopt westernized conceptions of gender equality (Mikell, 1997). As a result, southern Nigerian women tend to have more decision-making power than their northern peers (Kritz & Makinwa-Adebusoye, 1999).

Another social structure closely tied to mothers' decision-making power is their type of marital union. Polygyny, the practice of one man being married to multiple wives at the same time, is common in Nigeria, particularly in the country's northern regions (Izugbara & Ezeh, 2010). In fact, more than one-third of Nigerian women are in polygynous marriages (National Population Commission NPC [Nigeria] & ORC Macro 2004). The gender asymmetry inherent in polygynous unions sets the stage for power differentials (Ezeh, 1997). The large age and educational inequalities common between spouses in polygynous unions intensify the imbalanced gender dynamics and contribute to mothers' limited decision-making power (Zeitzen, 2008). Additionally, polygynous households commonly pool finances, which are then controlled by the male head (Izugbara & Ezeh, 2010). This requires women to request resources—which are often scarce in polygynous households (Desai, 1995)—from the husband to support their children's health. Together, the cultural and economic norms in polygynous households limit women's autonomy and contribute to their lack of decision-making power.

Mothers' access to and control over socioeconomic resources is also closely associated with their decision-making power (Dixon, 1978). In terms of overall access to resources, mothers' household wealth has been shown to be associated with greater decision-making power in other low-income contexts (Senarath & Gunawardena, 2009). In wealthier households, mothers' decisions are unlikely to significantly burden the household budget. Wealthier mothers thus have greater access to disposable income, which enables them to make decisions about their children's health without consent from their spouse (Kritz & Makinwa-Adebusoye, 1999). Conversely, because children's health expenses consume a greater portion of poorer families' household budgets, impoverished mothers need to consult household authority figures, who then assume control over these decisions. In addition to the availability of household resources, mothers' control over their own budget is closely associated with their decision-making power. Some Nigerian women—predominantly those in the southern regions of the country—maintain their own budget (Orubuloye et al., 1991). Combined with access to sufficient resources, women's financial autonomy further enables them to pay for their children's health care independently, which increases their decision-making power over such issues (Orubuloye et al., 1991).

Mothers' decision-making power is also informed by their formal educational background (Basu & Stephenson, 2005; Caldwell, 1979; Cleland & Van Ginneken, 1988; Dreeben, 1968; Stromquist, 2002). Research shows that formal education shapes women's perceptions of themselves and increases their self-confidence and assertiveness in household decisions (Stromquist, 2002). Women's educational attainment may also shift traditional authority figures' perceptions of them. Husbands and elders may give more deference to highly educated women's opinions, thereby increasing educated women's decision-making power in household issues generally, and in child health matters specifically.

## **Mothers' Reading Skills and Child Mortality: Considering the Role of Mothers' Decision-Making Power**

Despite the fact that structural inequalities generate significant diversity in Nigerian women's decision-making power, the current literature on mothers' reading skills and children's health conceptualizes all women who can read as having the personal freedom to independently make decisions regarding their health behaviors. This assumption neglects the broader social structures that limit many Nigerian mothers' capacity to make child health decisions independently. Although evidence suggests that being able to read equips mothers with a set of skills that enable them to effectively oversee the prevention and treatment of childhood illness (LeVine, 2012), structural constraints on women's decision-making power may impede many mothers' ability to implement health-promoting behaviors. As a result, it

is unlikely that the large, significant health advantages associated with mothers' reading skills are uniform across Nigeria's child population. Instead, the survival benefit of reading skills is likely concentrated among the population of children whose mothers have decision-making power, and limited, or nonexistent, among Nigerian children whose mothers lack decision-making power.

Revisiting the argument that mothers' reading skills benefit children's survival by improving behaviors surrounding the prevention and treatment of childhood illness illustrates the potential conditionality of the relationship on mothers' decision-making power. In terms of preventative behaviors, being able to read enables mothers to better understand printed and auditory health information, which encourages adoption of healthier behaviors that ultimately prevent childhood sickness (Dexter et al., 1998; Joshi, 2004; Preston et al., 1991; Schnell-Anzola et al., 2005; Stuebing, 1997). However, some Nigerian mothers' ability to adapt their health behaviors to incorporate newly acquired health knowledge is likely constrained by their lack of decision-making power regarding child health issues. For example, a mother's reading skills may enable her to learn about the importance of timely and complete vaccinations. Acquiring this knowledge will likely increase a mother's commitment to immunizing her children at the recommended age, thereby averting preventable illness, but a mother who lacks decision-making power cannot implement this new knowledge without first receiving approval from the household authority. In other words, although *all* mothers' reading skills enable them to acquire new health knowledge, the ability to act on this information is dependent on their decision-making power.

In addition to decision-making power constraining mothers' adoption of preventative health behaviors, it may also reduce their ability to implement effective medical treatment. Research shows that reading skills increase mothers' ability to communicate health needs clearly and to administer complex treatment regimens correctly (LeVine et al., 2004). However, Nigerian mothers who lack decision-making power are unlikely to manage interactions with healthcare professionals or oversee complex treatment regimens alone. For example, research has established that mothers' reading skills improve their ability to correctly administer oral rehydration therapy—a common treatment for dehydration (LeVine et al., 2004). Although *all* mothers who can read have the skills to administer the treatment effectively, mothers who lack decision-making power may be unable to independently determine if, when, and how to use oral rehydration therapy when their children have diarrhea. Thus, while reading skills are likely to universally improve mothers' ability to treat children's illnesses, variability in decision-making power may lead to a non-uniform association between mothers' reading skills and child survival.

In sum, being able to read equips mothers with a host of language skills that enable them to effectively prevent and treat child illness; social structures, however, may limit many mothers' decision-making power to fully implement health promoting behaviors. Thus, I hypothesize that mothers' reading skills will be *strongly* associated with a lower risk of mortality among Nigerian children whose mothers have decision-making power, but I anticipate mothers' reading skills will have little or no impact on the survival of the sizeable subsample of Nigerian children whose mothers lack decision-making power.

## DATA

The Demographic and Health Survey (DHS) is a multinational survey that tracks population health in developing countries. The DHS is one of the only nationally representative surveys that include information on women's reading skills alongside data on formal schooling, decision-making power, and child health in low-income countries. In the current study, I use data from the 2003 Nigerian DHS (NDHS).



The NDHS uses a probability sampling framework to draw a multistage, stratified random sample representative of the Nigerian population. Within the sampling framework, 365 clusters, based on enumeration areas taken from the 1991 population census, are the primary sampling unit. In each cluster, the NDHS uses a household listing operation to randomly select a fixed sample. A total of 7,864 households were sampled, with a household response rate of 98.6 percent.

Within each household, the NDHS collects detailed data from women of childbearing age (15 to 49 years), including information on their entire reproductive history. The NDHS collected such data from 7,620 women. A total of 4,579 women provided data on the live births of 12,076 children born between 1993 and 2003.

I use multiple imputation to handle the less than 5 percent of children ( $N = 569$ ) whose mothers had missing data on explanatory variables (see Rubin (1987) and Rubin and Little (2002) for detailed reviews of multiple imputation). I impute data using the ICE (Royston, 2004) program in Stata 12, which uses Kennickell, McManus, and Mac's (1994) iterative univariate imputation procedure. I average results across five imputation samples and account for random variation across the samples to calculate standard errors (Royston, 2004). Results using imputed data are substantively and statistically consistent with findings from analyses using listwise deletion to address missing data.

## MEASURES

### Child Mortality

I assess child mortality using retrospective birth histories. Mothers reported whether each child born within the 10 years preceding the survey was still alive at the time of the survey; for each child who died before age five, they reported the month and year of death. The dependent variable is children's hazard of mortality at any time between birth and 59 months of age or between birth and the survey date for children who had not yet reached age five in 2003.

### Mothers' Reading Skills

I measure mothers' reading skills using direct and indirect assessments. Among mothers who never attended secondary school (i.e., uneducated/primary-educated mothers), I use interviewer assessments of whether respondents can read aloud in their preferred language (Hausa, Yoruba, Igbo, English, or other) 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, I adopt the NDHS assumption that every mother who attended secondary school is able to read (= 1). The dichotomous indicator distinguishes women who can read some or all of the words (= 1) from those who cannot. Because the NDHS assumption that all secondary educated woman can read likely misclassifies some women as being able to read when they cannot, I conducted supplementary analyses using only the subsample of children ( $N = 9,385$ ) whose uneducated/primary-educated mothers were administered the direct assessment of reading skills. These results (see appendix) are consistent with findings using the full, nationally representative sample of Nigerian mothers.

### Mothers' Decision-Making Power

I measure decision-making power according to mothers' responses to the following question: "When (your child/one of your children) is seriously ill, can you decide by yourself whether or not the child should be taken for medical treatment?" I code women who answered "yes" as 1, and those reporting "no" as 0.

## Control Variables

Because Nigerian women's geographic residence, marriage, access to socioeconomic resources, and educational background are central correlates of their decision-making power *and* their reading skills and children's risk of mortality, and are likely to explain some of the observed association between mothers' reading skills and child mortality, I control for these factors. In terms of geographic residence, I control for mothers' current region of residence (north central [reference group], north east, north west, south east, south west, and south south), which serves as a proxy for their cultural, social, and political environment. I also control for mothers' childhood residence (countryside [reference group], city, town), and whether they lived in an urban (reference group) versus rural setting at the time of the survey.

In terms of marriage, I use women's reported marital status and whether co-wives are present in the marital union to characterize women as either monogamously married (reference group), polygynous, or single (i.e., unmarried, divorced, and/or widowed).

I utilize two measures to capture mothers' socioeconomic resources: women's reports of their partners' highest level of formal education and the DHS wealth index. The wealth index is defined in terms of household ownership of assets and household materials including basic amenities (e.g., electricity, piped water) and captures relative economic position in low-income countries (Houweling et al., 2003). Based on the household wealth index, I categorize children into one of five standard wealth quintiles: poorest (reference group), poor, average, rich, or richest.

In terms of mothers' educational background, I control for their self-reported highest level of formal education (ranging from 0 to 20 years), and whether they ever attended a literacy program (yes=1). Although only 39% of women who attended a literacy program can read, it is important to account for their attendance given that exposure to the educational setting and programmatic benefits apart from literacy could influence both women's decision-making power and their children's risk of mortality.

## METHODS

To assess the relationship between mothers' reading skills and child survival by mothers' decision-making power, I estimate a series of proportional hazard models that account for the fact that children who have not reached their 5th birthday and are still alive at the time of the survey (2003) are censored. The proportional hazards models assume that for an individual with a vector of covariates  $x$ , the hazard rate (death rate) at time  $t$  is

$$H_i(t; x_i) = h_o(t) \exp(\beta_i x_i),$$

where  $H_i(t; x_i)$  is the hazard function at time  $t$ , and  $\beta_i$  is a vector of unknown coefficients. The hazard model assumes the proportionality of child mortality risk.

Model 1 estimates the bivariate association between mothers' reading skills and child mortality. Model 2 estimates the association net of women's geographic residence, marital status, access to socioeconomic resources, and educational background. I first estimate both models among the full sample to replicate the known association between mothers' reading skills and child mortality in Nigeria. I then estimate both models among the stratified samples based on mothers' decision-making power, including the 7,422 children whose mothers have decision-making power and the 4,654 children whose mothers do not have decision-making power in order to analyze whether the main association varies across these

subsamples. Finally, I use the pooled sample and include an interaction term between mother's reading skills and decision-making power to investigate whether the observed differences by mothers' decision-making power are statistically significant.

## RESULTS

To provide insight into characteristics of the child population and the Nigerian context as a whole, Table 1 shows descriptive statistics for the full sample. In Nigeria, approximately 35 percent of children's mothers are able to read. The majority of children live in the northern regions of Nigeria and have mothers who grew up in rural settings and remain in rural areas at the time of the survey. Approximately one-third of children have mothers who are in polygynous unions and are married to partners with fewer than six years of formal schooling.

Descriptive statistics for the full sample mask the inequalities between Nigerian children whose mothers have decision-making power versus children whose mothers do not. Table 1 shows that these subgroups of children are statistically dissimilar on *every* indicator. A child's mother who has decision-making power is more than twice as likely to be able to read compared to a mother who lacks decision-making power. Reflecting the ethnic and religious differences in women's decision-making power, children whose mothers have decision-making power are concentrated in the southern regions of Nigeria and are more likely to live in monogamous households. Furthermore, mothers who have decision-making power are more likely to be married to highly educated partners, live in wealthier households, and have twice as much formal education compared to mothers who lack decision-making power.

The multivariate hazard model results in Table 2 show that although mothers' reading skills are strongly associated with child mortality in the full sample, closer examination confirms the association is conditional on mothers' decision-making power. Beginning with the full sample, Model 1 shows that mothers' reading skills are significantly associated with children's risk of mortality; children whose mothers can read experience 41 percent lower risk of mortality compared to children whose mothers cannot read. In Model 2, the size of the association is reduced after accounting for heterogeneity in mothers' geographic residence, marital status, access to socioeconomic resources, and educational background, indicating that these factors help to explain some of the relationship between mothers' reading skills and child survival. However, net of these controls, the risk of mortality for children whose mothers can read is still 17 percent lower than for children whose mothers cannot read. The results further show that each control variable is associated with child survival in the expected way.

Stratifying the sample by mother's decision-making power demonstrates that mother's reading skills operates differently for the two subgroups of children. Among children whose mothers have decision-making power, Model 1 shows that mothers' reading skills are associated with a 45 percent lower risk of child mortality compared to children whose mothers cannot read. Furthermore, as anticipated, in Model 2 the association is partially explained by mothers' geographic residence, marital status, socioeconomic resources, and education; however the relationship remains strong and significant: children whose mothers can read and have decision-making power experience a 27 percent lower risk of child mortality. In contrast, the association among the subsample of children whose mothers lack decision-making power tells a very different story. The association between mothers' reading skills and child mortality is nonsignificant (Model 1) and remains so after accounting for social, economic, and contextual confounders that could potentially mask it (Model 2).



These results highlight three central points. First, in line with prior work, the results show that mothers' reading skills are strongly associated with child survival. Although a portion of the association is attributable to social, economic, and contextual inequalities between women who can and cannot read, net of these factors, mothers' reading skills are associated with a 17 percent lower risk of child mortality. Second, this large, robust survival advantage associated with having a mother who can read is salient *only* for children whose mothers possess decision-making power. Mother's reading skills is a central determinant of child mortality, but its significance hinges on a mother's ability to make decisions regarding her children's health independently. Third, analyzing the protective effect of mothers' reading skills among the full sample of Nigerian children underestimates the size of the survival advantage for children whose mothers have decision-making power by 10 percentage points. This confirms that one must consider mothers' decision-making power to identify the full potential of mothers' reading skills to lower child mortality.

Table 3 shows results of the interaction between mothers' reading skills and decision-making power using the pooled sample to confirm that decision-making power significantly moderates the relationship between mothers' reading skills and child survival. The interaction term demonstrates that the association between mothers' reading skills and child mortality differs significantly ( $p < .001$ ) by decision-making power. Although mothers' reading skills has a strong, positive relationship with child survival in combination with decision-making power—conferring a 35 percent lower risk of child mortality—the main effect demonstrates that, among mothers' with no decision-making power, its association with child survival is nonsignificant (1.12).

Because the NDHS's measure of reading skills assumes that all women who attended secondary school can read, it likely overestimates how many mothers with secondary education are, in fact, able to read. In ancillary analyses (see appendix) I use the subsample of children whose uneducated/primary-educated mothers were administered the direct assessment of reading skills to verify that the conditionality of the relationship between mothers' reading skills and child survival on mothers' decision-making power is not an artifact of the reading measure. These results, which are consistent with the full, nationally representative sample, confirm that the finding is robust to the use of either the full sample or the subsample of uneducated/primary-educated women who were administered the direct reading assessment. As shown in the appendix, whereas mothers' reading skills is associated with a 24 percent ( $p < .05$ ) lower risk of mortality among children whose uneducated/primary-educated mothers have decision-making power, the association is nonsignificant among children whose uneducated/primary-educated mothers lack decision-making power.

## DISCUSSION

Mothers' literacy skills are emerging as a key determinant of children's health and survival in low-income contexts (LeVine, 2012). Recent research shows that mothers' reading skills—a subcomponent of literacy and language skills—significantly lower child mortality risk in Nigeria (Smith-Greenaway, forthcoming).

The burgeoning literature on mothers' literacy and reading skills has advanced our understanding of childhood health disparities in low-income countries. However, this work focuses narrowly on the main association and has not considered whether broader structural factors condition the individual-level process. This article extends our knowledge of mothers' reading skills and children's survival by integrating a structural perspective into the individual-action-oriented literature. The results demonstrate that structural inequalities are associated with substantial variation in Nigerian mothers' decision-making power, and that mothers' decision-making power significantly conditions the relationship between

mothers' reading skills and child survival. Mothers' reading skills are a key determinant of child survival among mothers with decision-making power—lowering mortality risk by 27 percent compared to children whose mothers cannot read. However, the association is nonsignificant among children whose mothers lack decision-making power.

The fact that *mothers'* reading skills do not convey a survival advantage among children whose mothers lack decision-making power should not lead to the conclusion that reading skills in and of themselves are irrelevant to child survival among this subpopulation. The literature's focus on mothers' reading skills is well-warranted given that mothers tend to be the primary caregiver; however, because more than one-third of children's mothers cannot make decisions independently, the exclusive focus on mothers may overshadow the child health benefits of other adults' reading skills. Among children whose mothers lack decision-making power, the reading skills of the adult who determines if, when, and how to address health concerns are likely most relevant to their well-being and survival. Future efforts to explore how other adults', particularly household authority figures', reading skills are associated with child survival may reveal that, at least among children whose mothers are unable to make decisions independently, the child health benefits of reading skills extend beyond mothers alone.

In addition to expanding the literature to more broadly assess whether and under what conditions other household members' reading skills benefit child survival, these results confirm that considering mothers' decision-making power is essential to identifying the full potential of mothers' reading skills to lower child mortality. The estimated association between mothers' reading skills and child survival in the full sample is 10 percentage points lower than the size of the association among the subsample of children whose mothers have decision-making power. Failing to consider the structural inequalities that lead to heterogeneity in Nigerian mothers' decision-making power masks the full potential of mothers' reading skills to benefit children's survival. Therefore, analyzing variability in mothers' decision-making power is critical to accurately identifying the size and strength of the link between mothers' reading skills and child mortality.

The need to assess variability in mothers' decision-making power is also relevant to future cross-national research on mothers' reading skills and child survival. In Nigeria, a sizeable minority of mothers lack decision-making power, but in some areas of Northern Africa and Asia, gender-based inequalities leave an even greater percentage of mothers without decision-making power (Dorius & Firebaugh, 2010). In these contexts, it is possible that the widespread absence of female autonomy will result in no observable relationship between mothers' reading skills and child survival. Thus, when investigating the association between mothers' reading skills and child mortality in particularly gender-biased societies, it is critical that one consider the prevalence of decision-making power among mothers prior to concluding that reading skills in and of themselves are unimportant to children's health. In other words, in addition to considering variation in mothers' decision-making power within countries, doing so across countries may provide insight into cross-national variation in the significance of mothers' reading skills for child survival.

The fact that the importance of mothers' reading skills—a powerful determinant of child survival—hinges entirely on whether a mother has decision-making power raises questions about how to promote women's status to ensure that *all* mothers enjoy personal freedom and autonomy. What social changes can foster environments wherein every mother can freely utilize her reading skills in ways that benefit her children's well-being? Women's literacy is at the forefront of policy efforts to empower women in low-income countries (see, e.g., policy initiatives from the Global Health Council, the World Health Organization, and the Organization for Economic Co-operation and Development). While this study supports

women's literacy as a powerful strategy for promoting child survival, it provides no evidence that literacy, or at least basic reading skills, *universally* “empower” women. That is, although mothers' reading skills and decision-making power are positively associated, many Nigerian mothers who can read still lack decision-making power (Table 1). Thus, while expanding women's literacy will directly benefit child health, broader structural constraints on women's ability to exercise and apply their reading skills effectively limit the scope of literacy's health advantage. Policies must thus extend beyond female literacy as an all-encompassing way to “empower women” and address the broader structural and cultural inequalities that ultimately determine women's social position and ability to utilize their reading skills in ways that produce salubrious health outcomes.

While this study powerfully demonstrates the value of integrating a structural perspective into research on mothers' reading skills and child survival, it is limited by two data constraints. First, the NDHS approach to measuring reading skills assumes that all women with secondary education can read at an elementary level, which may classify some women as being able to read when, in fact, they cannot. Supplementary analyses confirm that the probable misclassification of some of these women as being able to read does not drive the results. That is, findings among the subsample of children whose uneducated/primary-educated mothers were administered the direct assessment of reading skills are consistent with those using the full, nationally representative sample of Nigerian mothers. Although the results are robust across samples, this limitation has important implications for assessing reading skills in demographic surveys. The centrality of mothers' reading skills for child survival demonstrates a clear need for nationally representative surveys to directly assess reading skills among all respondents, regardless of their reported level of formal schooling. Additionally, more comprehensive assessments of individuals' literacy skills at multiple levels (e.g., reading evaluations at higher levels, reading comprehension, and writing ability) are essential to better understand the full extent to which literacy skills can promote child survival.

A second data limitation is that the measure of decision-making power is self-reported, which may not reflect a mother's true level of decision-making power (Becker et al., 2006) or the full range of gender inequalities that inhibit her from fully utilizing her reading skills to benefit her children's health (Lee-Rife, 2010; Mumtaz & Salway, 2009). In accordance with prior literature, the measure of decision-making power correlates with Nigerian women's geographic residence, marriage, access to socioeconomic resources, and education (Table 1). Therefore, because of the challenges associated with capturing mothers' decision-making power using survey techniques, and with assessing the full range of gender-based inequalities women experience, this conventional approach to estimating decision-making power continues to be useful, albeit limited, in population-based studies such as the current one.

In summary, despite limitations, the study's results suggest that considering broader social structures can provide a fuller understanding of the relationship between mothers' reading skills and child survival. Although this study focused only on mothers' decision-making power, it is possible—if not probable—that other structural conditions are also essential to fostering a strong association between mothers' reading skills and child survival in Nigeria and, potentially, elsewhere. For instance, mothers' access to socioeconomic resources or quality healthcare—two structural components that are highly unequal across households and communities in sub-Saharan Africa—may further condition their ability to utilize their reading skills in ways that increase the likelihood of child survival. Because of the large disparities in infrastructure and development across rural and urban settings on the subcontinent, there may be particularly striking differences in the health benefits of mothers' reading skills in rural versus urban contexts. Moreover, apart from structural inequalities, the

association between mothers' reading skills and child survival may also hinge on more nebulous cultural factors such as mothers' health beliefs and traditions. Efforts to uncover additional structural inequalities, and potentially cultural differences, that moderate the link between mothers' reading skills and child survival will not only provide a richer, more contextualized account of the association; they will also highlight the social changes that could increase the child health returns to expanding women's reading skills in low-income countries.

## Appendix

Cox Proportional Hazard Model Results of Mothers' Reading Skills and Decision-making Power on the risk of Child Mortality among Nigerian Children born 1993–2003 whose Uneducated/Primary Educated Mothers were Administered the NDHS Direct Reading Assessment, expressed as hazard ratios

	Full Sample						Decision-Making Power						No Decision-Making Power								
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		
	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	
Mother Can Read	0.72	0.05 ***	0.82	0.08 *	0.73	0.07 ***	0.76	0.09 *	0.81	0.11	0.95	0.16									
<i>Geographic Residence</i>																					
Region																					
North Central (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
North East	1.17	0.09 *	1.18	0.09 *	1.29	0.14 *	1.42	0.16 **	1.00	0.12	0.93	0.11									
North West	1.18	0.09 *	0.91	0.11	0.91	0.13	0.91	0.13	1.05	0.22	0.93	0.11									
South East	0.91	0.11	0.90	0.12	1.13	0.19	1.13	0.19	0.64	0.15 †	1.12	0.34									
South West	0.90	0.12	1.24	0.15 †	1.33	0.19 *	1.33	0.19 *	1.12	0.34											
South South	1.24	0.15 †																			
<i>Mother's Childhood Residence</i>																					
Countryside (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
City	1.22	0.14 †	1.22	0.14 †	0.98	0.15	0.98	0.15	1.73	0.30 **	1.73	0.30 **									
Town	1.11	0.07 †	1.11	0.07 †	1.07	0.09	1.07	0.09	1.10	0.10	1.10	0.10									
<i>Place of Residence</i>																					
Urban (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rural	0.78	0.05 ***	0.78	0.05 ***	0.79	0.07 **	0.79	0.07 **	0.77	0.08 **	0.77	0.08 **									
<i>Mother's Marital Status</i>																					
Monogamous union (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Single	1.28	0.14 *	1.28	0.14 *	1.34	0.20 *	1.34	0.20 *	1.27	0.23	1.27	0.23									
Polygynous union	1.15	0.06 **	1.15	0.06 **	1.17	0.08 *	1.17	0.08 *	1.16	0.08 *	1.16	0.08 *									
<i>Socioeconomic Resources</i>																					
Partner's Education (0-20)	0.98	0.01 **	0.98	0.01 **	0.98	0.01 *	0.98	0.01 *	0.99	0.01	0.99	0.01									
Household Wealth																					
Poorest (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Poor	1.09	0.07	1.09	0.07	1.28	0.12 **	1.28	0.12 **	0.97	0.08	0.97	0.08									



	Full Sample						Decision-Making Power						No Decision-Making Power					
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2			
	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE		
Average	0.83	0.06 <sup>*</sup>			0.92	0.10			0.77	0.07 <sup>**</sup>			0.94	0.13				
Rich	0.86	0.08 <sup>†</sup>			0.87	0.11			0.89	0.26			0.89	0.26				
Richest	0.45	0.07 <sup>***</sup>			0.42	0.08 <sup>***</sup>												
<i>Mother's Educational Background</i>																		
Highest-level of Primary Education	1.00	0.01			1.04	0.02 <sup>*</sup>			0.97	0.02			0.97	0.02				
Attended literacy program	1.19	0.15			1.02	0.20			1.24	0.20			1.24	0.20				
N	9,385				5,139				4,246									

Source: 2003 Nigerian Demographic and Health Survey

<sup>†</sup>  $p < .1$ ,

\*  $p < 0.05$ ,

\*\*  $p < 0.001$ ,

\*\*\*  $p < 0.001$

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**Highlights**

- Mothers' reading skills lower children's risk of mortality
- It remains unclear if broader social structures condition this process
- This paper finds the relationship is conditional on mothers' decision-making power

Table 1

Characteristics of Nigerian Children born 1993-2003

	Full Sample	Decision-Making Power	No Decision-Making Power
	Percent/ Mean(SD)	Percent/ Mean (SD)	Percent/ Mean (SD)
Mother Can Read	34.63	45.97	* 16.55
<i>Geographic Residence</i>			
Region			
North Central (Ref)	16.44	19.40	* 11.71
North East	24.57	21.21	* 29.93
North West	30.22	20.98	* 44.95
South East	9.47	12.36	* 4.86
South West	10.03	12.87	* 5.50
South South	9.27	13.18	* 3.05
Place of Residence			
Urban (Ref)	34.87	42.14	* 23.27
Rural	65.13	57.86	* 76.73
Mother's Childhood Residence			
Countryside (Ref)	59.97	53.98	* 69.53
City	10.24	13.43	* 5.14
Town	29.79	32.59	* 25.33
<i>Mother's Marital Status</i>			
Monogamous union (Ref)	58.66	60.92	* 55.07
Single	5.40	6.29	* 3.98
Polygynous union	35.94	32.79	* 40.95
<i>Socioeconomic Resources</i>			
Partner's Education (0-20)	5.31 (5.53)	6.58 (5.58)	* 3.28 (4.78)
Household Wealth			
Poorest (Ref)	24.17	18.09	* 33.87
Poor	22.48	18.57	* 28.71
Average	19.60	19.63	19.55
Rich	18.89	22.54	* 13.06
Richest	14.86	21.17	* 4.81
<i>Mother's Educational Background</i>			
Highest-level of Formal Education	3.63 (4.64)	4.82 (4.91)	* 1.75 (3.44)
Attended literacy program	3.53	3.21	* 4.04
N	12,076	7,422	4,654

Source: 2003 Nigerian Demographic and Health Survey

\* p&lt;.05 from chi-square test



Table 2

Cox Proportional Hazard Model Results of Mothers' Reading Skills on the risk of Child Mortality among Full Sample of Nigerian Children born 1993-2003 and Stratified Samples based on Mothers' Decision-Making Power, expressed as hazard ratios

	Full Sample		Decision-Making Power				No Decision-Making Power					
	Model 1 Hazard Ratio	SE	Model 2 Hazard Ratio	SE	Model 1 Hazard Ratio	SE	Model 2 Hazard Ratio	SE	Model 1 Hazard Ratio	SE	Model 2 Hazard Ratio	SE
Mother Can Read	0.59	0.03 ***	0.83	0.08 *	0.55	0.04 ***	0.73	0.09 **	0.90	0.08	1.03	0.16
<i>Geographic Residence</i>												
Region												
North Central (Ref)	--	--	--	--	--	--	--	--	--	--	--	--
North East	1.22	0.09 **	1.29	0.13 *	1.29	0.13 *	1.02	0.12	1.02	0.12	1.02	0.12
North West	1.17	0.09 *	1.17	0.09 *	1.29	0.13 *	0.95	0.11	0.95	0.11	0.95	0.11
South East	1.03	0.11	1.09	0.14	1.09	0.14	1.02	0.20	1.02	0.20	1.02	0.20
South West	0.84	0.10	0.93	0.13	0.93	0.13	0.79	0.16	0.79	0.16	0.79	0.16
South South	1.23	0.13 *	1.33	0.16 *	1.33	0.16 *	1.44	0.31 †	1.44	0.31 †	1.44	0.31 †
<i>Mother's Childhood Residence</i>												
Countryside (Ref)	--	--	--	--	--	--	--	--	--	--	--	--
City	1.12	0.11	0.96	0.12	0.96	0.12	1.52	0.25 *	1.52	0.25 *	1.52	0.25 *
Town	1.09	0.06	1.05	0.08	1.05	0.08	1.04	0.09	1.04	0.09	1.04	0.09
<i>Place of Residence</i>												
Urban (Ref)	--	--	--	--	--	--	--	--	--	--	--	--
Rural	0.88	0.05 *	0.90	0.07	0.90	0.07	0.79	0.07 *	0.79	0.07 *	0.79	0.07 *
<i>Mother's Marital Status</i>												
Monogamous union (Ref)	--	--	--	--	--	--	--	--	--	--	--	--
Single	1.17	0.12	1.17	0.16	1.17	0.16	1.12	0.18	1.12	0.18	1.12	0.18
Polygynous union	1.13	0.05 **	1.17	0.08 *	1.17	0.08 *	1.13	0.07 *	1.13	0.07 *	1.13	0.07 *
<i>Socioeconomic Resources</i>												
Partner's Education (0-20)	0.98	0.01 **	0.97	0.01 **	0.97	0.01 **	0.99	0.01	0.99	0.01	0.99	0.01
Household Wealth												

	Full Sample						Decision-Making Power						No Decision-Making Power					
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2			
	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE	Hazard Ratio	SE		
Poorest (Ref)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
Poor	1.12	0.07 *	1.34	0.12 **	0.98	0.08	0.97	0.10	0.80	0.07 *	0.96	0.13	0.96	0.13	0.73	0.17		
Average	0.87	0.06 *	0.94	0.11	0.80	0.07 *	0.60	0.09 **	0.98	0.02	1.24	0.20	1.24	0.20	4.654			
Rich	0.90	0.07	1.01	0.01	1.01	0.01	1.07	0.21	1.07	0.21	7.422		7.422					
Richest	0.55	0.07 ***	1.22	0.15	1.22	0.15	12.076		12.076									
<i>Mother's Educational Background</i>																		
Highest-level of Formal Education	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01		
Attended literacy program	1.22	0.15	1.22	0.15	1.22	0.15	1.22	0.15	1.22	0.15	1.22	0.15	1.22	0.15	1.22	0.15		
N	12,076		12,076		12,076		12,076		12,076		12,076		12,076		12,076			

Source: 2003 Nigerian Demographic and Health Survey

†  $p < 1$ ,

\*  $p < 0.05$ ,

\*\*  $p < 0.001$ ,

\*\*\*  $p < 0.0001$

**Table 3**

Cox Proportional Hazard Model Results of Mothers' Reading Skills and Decision-making Power on the risk of Child Mortality among Full Sample of Nigerian Children born 1993-2003, expressed as hazard ratios

	<b>Full Sample</b>	
	<b>Hazard Ratio</b>	<b>SE</b>
Mother Can Read * Mother's Decision-Making Power	0.65	0.07 ***
Mother Can Read	1.12	0.13
Mother's Decision-Making Power	0.89	0.05 *
<i>Geographic Residence</i>		
Region		
North Central (Ref)	--	--
North East	1.15	0.09 †
North West	1.10	0.08
South East	1.05	0.11
South West	0.86	0.10
South South	1.30	0.13 *
Mother's Childhood Residence		
Countryside (Ref)	--	--
City	1.15	0.11
Town	1.09	0.06
Place of Residence		
Urban (Ref)	--	--
Rural	0.87	0.05 *
<i>Mother's Marital Status</i>		
Monogamous union (Ref)	--	--
Single	1.16	0.12
Polygynous union	1.15	0.05 ***
<i>Socioeconomic Resources</i>		
Partner's Education (0-20)	0.98	0.01 **
Household Wealth		
Poorest (Ref)	--	--
Poor	1.12	0.07 *
Average	0.88	0.06 †
Rich	0.92	0.08
Richest	0.59	0.07 ***
<i>Mother's Educational Background</i>		
Highest-level of Formal Education	1.00	0.01
Attended literacy program	1.19	0.15
N	12,076	

Source: 2003 Nigerian Demographic and Health Survey

<sup>†</sup>  
 $p < .1,$

\*  
 $p < 0.05,$

\*\*  
 $p < 0.001,$

\*\*\*  
 $p < 0.001$