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Labor migration and child mortality in Mozambique

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Abstract

Male labor migration is widespread in many parts of the world, yet its consequences for child outcomes and especially childhood mortality remain unclear. Male labor migration could bring benefits, in the form of remittances, to the families that remain behind and thus help child survival. Alternatively, the absence of a male adult could imperil the household's well-being and its ability to care for its members, increasing child mortality risks. In this analysis, we use longitudinal survey data from Mozambique collected in 2006 and 2009 to examine the association between male labor migration and under-five mortality in families that remain behind. Using a simple migrant/non-migrant dichotomy, we find no difference in mortality rates across migrant and non-migrant men's children. When we separated successful from unsuccessful migration based on the wife's perception, however, stark contrasts emerge: children of successful migrants have the lowest mortality, followed by children of non-migrant men, followed by the children of unsuccessful migrants. Our results illustrate the need to account for the diversity of men's labor migration experience in examining the effects of migration on left-behind households.

Keywords

Mozambique; Labor migration; Child mortality

Introduction

The consequences of migration and immigration for families have received intense research attention in recent years. Urbanization, natural and political disasters, economic globalization and the fluidity of labor markets: these are some of the many forces that have increased migration and immigration across the world (e.g., Agadjanian, 2008; Barrios, Bertinelli, & Strobl, 2006; Berhanu & White, 2000; Castles, 2000; Orozco, 2002; Perz, 2000; Saldaña-Zorrilla & Sandberg, 2009; Samuel & George, 2002; Sanderson & Kentor, 2009; Singh, Karunakara, Burnham, & Hill, 2005; Zachariah, Mathew, & Rajan, 2001). Although some of these moves are undertaken by individuals migrating alone, even seemingly solitary migrants and immigrants often maintain ties to their areas of origin, where they have spouses, children, and other family members (Edwards & Ureta, 2003; Hildebrandt & McKenzie, 2005; Hollos & Larsen, 2003; Luke & Munshi, 2006; Mendola, 2010; Tiemoko, 2004).

Prior research has examined the associations between migration and child health outcomes but has mainly focused on the children of migrants or children who migrate. For example,

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Antai, Wedrén, Bellocco, and Moradi (2010) found that under-five mortality in Nigeria was higher for children of mothers who were rural-to-urban migrants, compared to children whose mothers remained in rural areas. Avogo and Agadjanian (2010) detected elevated risks of child death in families of forced migrants in Angola. Moss, Stone, and Smith (1992) found worse health outcomes for children of refugee mothers in Belize, although this was mainly due to their socioeconomic characteristics, and Kiros and White (2004) reported that children of migrant mothers in Ethiopia were less likely to be immunized. Although there are still questions about reasons why children of migrants tend to have worse outcomes, mechanisms that have found common support include selection into migration (Moss et al., 1992) and diminished social network support in the receiving context (Kiros & White 2004).

The impact of one family member's migration on the health of children who remain behind, however, has received less research attention. The most common type of such migration, especially in settings such as sub-Saharan Africa, is male labor migration (Agadjanian, 2008). Male labor migrants, whether they travel internationally or domestically, many times are part of a family formation system in their places of origin. This link between migration and family formation has been documented in many settings. Single, unmarried males often use labor migration as a means of raising their wealth and economic prospects in order to increase their attractiveness as marriage partners (Stark, 1988). Research has documented this strategy in settings as varied as Mexico (Parrado, 2004) and Lesotho (Murray, 1977). In impoverished rural areas, male labor migration is a common marriage market decision that generates the financial and material resources necessary for marital payments. This has been observed in Botswana (Mookodi, 2004) and Mozambique (Lubkemann, 2009). Married men, too, engage in labor migration to support households that include wives, children, and potentially other dependents. Labor migration is viewed as a beneficial family strategy in many settings, including Cameroon (Fleischer, 2007), the Philippines (Lauby & Stark, 1988), Bangladesh (Mendola, 2008), Singapore (Rahman, 2009), and Nepal (Thieme & Wyss, 2005). In some cases, it may be the only viable option men have for providing for their families. Labor migration, however, entails many risks and uncertainties, and the absence of a family member may place diverse types of stresses (economic, social, emotional, and relational) upon the household.

Studying the impact of male labor migration on child health outcomes in sending areas is important because such migration is very different from situations in which the entire family moves, a mother and child migrate together, or a child is born to a migrant mother in a destination area. First, and most importantly, the child and remaining family members do not move. The child and mother who remain behind do not experience the potential stressors from directly participating in the migration experience, such as separation from extended family (Rousseau, Drapeau, & Corin, 1997), limited access to health services (Lu, 2010), and discrimination in the receiving context (Wang, Xiaoming, Stanton, & Fang, 2010). In addition, social support networks are not disrupted in the same way they would be if the entire family moved. On the other hand, these networks may change if the father's leaving places more burden of care on the mother, or if extended family members assert control in the father's absence (Yabiku, Agadjanian, & Sevoyan, 2010). Second, the role of remittances is greater for male labor migration, as it becomes the primary way the absent father supports his family. In this case, the remaining family members are in a potentially more dependent role because they cannot enforce the sending of remittances and otherwise monitor the man's behavior (Kothari, 2003). Third, male labor migration removes an individual from the family unit, unlike a migration move that incorporates an entire family. Even if a man's remittances can make up for his absence economically, there are other dimensions of the family unit that are stressed in terms of the daily support he no longer provides to wives and children, as well as direction of household management in settings in which women typically have low autonomy (Yabiku et al., 2010).

In this paper, we examine the association between men's labor out-migration in southern Mozambique and a key dimension of their non-migrating family's well-being: child survival. Rural southern Mozambique, the setting of this study, is characterized by traditionally high levels of male labor migration to South Africa that has been historically fueled by both employment opportunities in the much richer neighboring country and the lack of jobs outside of subsistence agriculture in the local labor market (Crush, Jeeves, & Yudelman, 1991; First, 1983). Although this migration has been a core part of southern Mozambique's social and economic system for generations, recent times have seen considerable changes in both the type and outcomes of Mozambican migrants' employment. While crossing the international border has become much easier thanks to the growing regional integration, finding legal, reliable, and well-paying jobs in an increasingly xenophobic South Africa has become more and more difficult (SAMP, 2008). As a result, while the economic stagnation of rural areas continues to push men into migration, financial returns to this migration become ever less stable and predictable leading to an increasing socioeconomic inequality in rural society (De Vletter, 2007).

There are some studies that have examined the association between labor migration and health outcomes of children in sending areas (Creighton, Goldman, Teruel, & Rubalcava, 2011; Frank & Hummer, 2002; Kanaiaupuni & Donato, 1999; Schmeer, 2009), but this developing research has yet to reach consensus. An important innovation of this paper is in going beyond the simple dichotomy of migrant versus non-migrant. In considering the impact of men's migration on the well-being of their non-migrating household members, including survival and health of their children, a simple migrant versus non-migrant comparison obscures the uncertainties of the migration process and may also be a contributor to conflicting results in the prior literature. Instead, a refined measure of men's migration experience, based on its success or failure, is needed to gain a clear assessment of its impact upon child mortality and other family outcomes.

We develop our hypotheses by conceptualizing male labor migration as a household-level, rather than an individual-level, decision, which is consistent with a new economics of migration approach (Massey et al., 1993). An important feature of this approach is that the costs and benefits of migration are evaluated not only by the individual migrant, but by others who are affected by the migration decision, e.g., family and household members (Massey et al., 1993). We refine our migration categories based not only on the migrant's behavior, but we also include information about the sending household's characteristics and the labor migration's success or failure.

Hypotheses

There can be divergent hypotheses of the association between men's labor migration and child mortality. Thus there are several reasons why we hypothesize a positive association between men's labor migration and child mortality (i.e., higher rates of mortality among children of male labor migrants). An absence of a household member often puts strain on the remaining members to organize, manage, and run the household. In this rural Mozambique setting, women's autonomy can be quite low, and women must often ask permission for routine, daily household activities, such as purchases, to visit markets, and to seek medical care. Thus in the husband's absence, these decisions are often left to the wife. Although this autonomy may have beneficial aspects, there is some evidence that it is also accompanied by strain due to increased, new responsibilities (Yabiku et al., 2010). The negative consequences of male absence have been documented in other settings, as well. For example, using multilevel longitudinal analysis of data from Mexico, Kanaiaupuni and Donato (1999) argue that the effect of migration on the risk of death is a complex process – at the initial stage, as larger numbers of community residents migrated, infant mortality

increased in sending areas. In later periods, infant mortality improved with increasing remittances (Kanaiaupuni & Donato, 1999). Schmeer (2009) found that father absence due to migration was associated with higher levels of child sickness. There is no guarantee that the financial successes of labor migration and the expected remittances will outweigh the drawbacks of male absence from the household. Several authors have reported, for example, that among thousands of undocumented, less educated and farm working foreign labor migrants in South Africa, many are barely able to remit to their families left behind (Bloch, 2008; Crush, 1999; Crush, Williams, & Peberdy, 2005; De Vletter, 2007).

There are also good reasons why we hypothesize that men's labor migration would be negatively associated with child mortality, i.e., the children of migrant men have lower rates of mortality. First, the main reason men engage in labor migration is that they believe the benefits of working away from home will be greater than if they did not migrate (Massey & Espinosa, 1997; Mendola, 2010; Taylor, Zabin, & Eckhoff, 1999). In sub-Saharan Africa, labor migration can bring enormous economic benefits (Kalipeni, 1993). These men and their families are hoping that the labor migration and its remittances will provide benefits for the household in the origin area. If these hopes are fulfilled, it is reasonable to believe that the remittances will allow families better nutrition, more stable and higher quality housing, and increased access to health care and medicines (De Vletter, 2007; Frank & Hummer, 2002; Mooney, 2003). All of these consequences of labor migration would promote child well-being and lower the risk of child mortality. Second, prior work has shown that male labor migration is associated with increases inwomen's decision-making autonomy. Caldwell (1986) has cited women's autonomy as a key contributor to mortality decline in children. If migration increases autonomy (Yabiku et al., 2010), then women are more likely to take measures to protect their children's lives and health—thereby lowering the risk of child mortality.

Overall, there are good reasons to hypothesize both positive and negative associations between male labor migration and child mortality. Moreover, although the literature tends to focus on the migrant versus non-migrant dichotomy (e.g., Brockerhoff, 1990, 1995; Stephenson, Matthews, & McDonald, 2003), there are also reasons to hypothesize that the consequences of migration are, in part, contingent on whether or not the male labor migration is successful. Importantly, we define migration success from the standpoint of non-migrating household members: for them, migration success is determined by the remittances they receive as well as the impacts of male absence. Successful migration and subsequent remittances could be expected to benefit childwellbeing and to lower child mortality. Unsuccessful migration, on the contrary, could be related to higher rates of child mortality. Prior research has found that the impacts of labor migration on family outcomes vary by the success or failure of the migrant's efforts (Agadjanian, Yabiku, & Cau, 2011; Yabiku et al., 2010). We argue that a simple migrant versus non-migrant dichotomy is inadequate to document the associations between male labor migration and child mortality because it confounds two important groups of migrants: successful migrants, i.e., those who regularly and substantially contribute to the welfare of their left-behind households and unsuccessful migrants, whose remittances are meager and/or irregular. Combining these two groups is likely to lead to inaccurate conclusions because these two types of migration outcomes have drastically different associations with child mortality and the effects of successful and unsuccessful migration may cancel each other out.

Data and methods

The data for our hypothesis tests come from a longitudinal survey of married rural women in southern Mozambique. The first wave of data collection took place in 2006. Approximately equal numbers of women married to migrants and women married to non-migrants were

sampled in 56 villages of four districts of Gaza Province; one woman per household was interviewed. In total, 1680 women aged 18–40 were interviewed; in the 2009 wave 2 survey, 1408 of these same women were reinterviewed and a freshened sample of additional women was added to the study (the freshened sample was not included in the analysis we describe here). The questionnaire content in both surveys was similar, including complete childbearing and pregnancy histories, husband's migration, woman's work, marital history and characteristics, and several measures of socioeconomic well-being. To ensure that subjects were treated ethically, the data collection and analysis were approved by the Arizona State University Institutional Review Board.

Dependent variable

Childhood mortality between the two survey waves (2006 – 2009). In our person-year file, each child contributes one observation for each year of life the child is at risk of death. For children born in 2006 or after, children begin the risk of death in the year of their birth, and they stay at risk of death through 2009. Each year the child survives, the dependent variable is coded 0; in 2009, children are censored and no longer contribute person-years. If a child dies between the age of 0 and 5, he or she is coded 0 in the years leading up to death, is coded 1 in the year of death, and does not contribute any more person-years following the year of death. Note that children born before 2006 become at risk of death in 2006, as long as they are age 5 or younger; they remain at risk until they die, become older than 5 years old, or they survive until 2009, at which point they are censored. These coding procedures are the standard way for creating a discrete-time person-year file (Allison, 1995). As is typical in poor settings, recall and timing of pregnancies outcomes in surveys are problematic. However, because our analysis focuses on a very rare event and a very recent past (three years preceding the survey), it is likely that child deaths will be more or less accurately recalled.

Primary independent variable

Men's labor migration status. Men's labor migration is measured in 2006 at the wave 1 survey of the men's wives. Men were coded as non-migrants if their wives reported that their men had spent all their nights in the women's community in the previous month. For all other responses, men were coded as migrants. Because our hypotheses differ by the success or failure of men's labor migration, we separated successful migrants from unsuccessful migrants. We employed two different approaches to defining and coding men's migration success and failure. One approach, that we dubbed “objective,” is based on whether or not the migrant husband sent remittances in the twelve months preceding the survey. The other, “subjective,” approach is based on the respondent's perceptions of the consequences of their husband's migration for their households. Of their labor migrant husbands, women were asked the question, “In your opinion, since your husband went to work there, did the living conditions in your household improve, worsen, or remain the same?” Men whose wives said their lives improved were coded as successful migrants; all others were coded as unsuccessful migrants. Although a time-varying measure of migration success would be more accurate and capture spells of repeat migration, the data do not allow this. Note, however, that the objective and subjective migration definition comes from the wave 1 data and is measured at a time prior to the risk of child mortality to reduce the possibility that child mortality causes migration to be rated as more or less successful. The data do not contain the migration behaviors of other household members, such as older children, so we are unable to examine if migration other than the husband is associated with child mortality.

Controls

We include a variety of controls to rule out spurious associations between male labor migration and child mortality. These include the woman's and husband's age and terms for

age-squared, as well as their education. Education is coded in categories: no education, 1–4 years, and 5 or more years. Religion, another control, is coded into three categories: no church membership, a mainline denomination (mostly Catholics and Mainline Protestant), and other denominations (primarily Evangelicals and Pentecostals). Whether or not the marital union is polygamous is coded 1 if polygamous, and 0 otherwise. Woman's employment is another source of selectivity if men's migration decisions are based on other household members' productive activity. Woman's employment is included as a time-varying binary measure coded 1 if the woman worked outside the household (excluding unremunerated agricultural work), and zero otherwise. Because the number of siblings may represent the degree to which scarce household resources need to be distributed, we include a time-varying measure of the woman's children ever born. Because short birth intervals are also associated with higher mortality, we include a binary measure of whether or not there was a birth to the mother in the two years prior to the focal child at risk. We also include the child's gender. Finally, an important control is the household's economic conditions in 2006, prior to the risk of child mortality. Income and other precise numeric measures of wealth are not easily obtained in this setting, and instead we use indicators of a household's status with regards to three components: ownership of consumer items (radio, frame bed with mattress, and motorcycle or car), quality of the dwelling's ceiling and walls (solid construction materials versus reeds, grasses, or palms), and access to electricity (yes or no). Household economic status is thus measured with a three point scale. Given the importance of household economic conditions in shaping migration and child health outcomes, our modeling also explored interactions between our migration indicators and household economic status. None of these interactions was found significant; thus in our results we present models with only the main effects.

Community measures

We consider community context for two reasons: 1) potential spuriousness in the association between labor migration and child mortality, and 2) potential interactions between men's labor migration and community context on child mortality. First, with regards to spuriousness, there may be a clustering or a confluence of poor, deleterious community conditions such as few job opportunities, scarce or degraded farmland, and a dearth of community infrastructure, especially health care facilities and schools. In an alternative explanation, these community factors could be both the root cause of men's labor migration and child mortality: limited economic prospects in depressed communities could propel men into labor migration, and these same communities could lack resources for preventing child deaths. Our models attempt to control for these exogenous or contextual effects (Manski, 1993).

Second, prior research has shown that community context can moderate the influence of the migration experience on health (Cagney, Browning, & Wallace, 2007; Johnson & Marchi, 2009), and this moderating effect can be present in the association between men's labor migration and child mortality. For example, if men's absence makes it harder for families left behind to manage households and protect child well-being, it is reasonable to expect that the effects of men's absence would be even more acute in poorer, less developed communities. Fewer health care facilities mean less support for children at risk. Furthermore, in communities with high levels of labor out-migration, there could be fewer support networks remaining: families are busy coping with their own men's absence, and the ability to help others may be reduced. Many families similarly responding to their men's absence could be considered “correlated effects” in Manski's (1993) typology of group behavior.

We have several indicators of the communities in which the surveyed families were living. As a measure of community access to resources, we use the distance to the nearest health

clinic. Longer distances to clinics may characterize more impoverished, resource-poor communities; distance to a clinic also represents access to health care for child illness prevention and treatment. To capture variation in economic conditions in these communities, we also create a village-level economic indicator, which is formed by taking the village mean household economic status. Because male migration may be a response to "push" factors such as degraded economic opportunities, we also have two community measures of male labor migration. The first comes from the initial household enumeration from which the sample was drawn. Survey staff canvassed the villages and asked if households had a married man involved in labor migration. From this we have a measure of the percent of households in the community in which a husband was currently working away. Because this comes from the household enumeration, it may be a more accurate estimate than the sample average (we also examined models in which we used the sample average, but the results did not differ). The second measure of male labor migration reflects the perceived trend in migration behaviors (in contrast to the snapshot, point-in-time measure derived from the household enumeration). This measure was derived from answers to the following question in the community survey, which was administered to community leaders in parallel with the women's survey: "In your opinion, in the past 10 years, did the number of married men (18 or older) of this village working in South Africa increase, decrease, or remained more or less the same?" We coded this trend measure 1 if there was a perceived increase in men working in South Africa, and 0 otherwise. Note that all our community measures come from the 2006 wave, before the risk of child mortality.

Analysis method: multi-level discrete-time event history

Because our dependent variable is a rate and data may be censored, event history models are appropriate (Allison, 1995). With a properly constructed person-year file, a discrete-time event history model can be estimated using logistic regression procedures. Our person-year file contains multiple children per woman, and thus there is a potential dependence between observations that must be modeled. Furthermore, because of the clustered sampling design, women within the same clusters (villages) may share some characteristics, as may children with the same mother. In our analysis, 1932 children are clustered in 1360 women (an average of 1.4 children per woman) who are in 56 villages (an average of 24 women per village). We use multi-level models, specifically random intercept models estimated using SAS PROC GLIMMIX, to account for the clustering of multiple children per woman and multiple women per village.

In a discrete-time event history model, the baseline hazard must be specified. Typically, the age pattern of mortality is a quadratic, which allows for the well-known "bathtub" shape. However, our initial analyses indicated that over the short period of risk we model (only up to 5 years), a linear specification of the decreasing hazard was adequate. We also explored modeling in which we allowed for period effects of mortality unique to each year (2006 – 2009), but these did not significantly add to the model.

Selection issues

There is a potential selectivity if households in the worst financial conditions send male labor migrants in the hopes of economic success (Borjas, 1987, 1994; Brockerhoff, 1995; Kanaiaupuni, 2000). For example, economic shocks and distress may precipitate labor migration and subsequent remittances (Ponce, Olivié, & Onofa, 2011). If financial distress is a cause of both male labor migration and increased risk of child mortality, the positive association between migration and child mortality could be spurious. On the other hand, there may also be selectivity processes operating when male labor migration has a negative, or preventative, association with child mortality. If families believe the stresses and risks of male labor migration are too great, they may withhold their men from migration. For

example, the costs of entering migration may be too high and thus discourage migration from the most disadvantaged households (Collinson, 2010). In other words, male labor migrants could be positively selected from the families who are best-positioned to weather the uncertainties and challenges of migration (Egger & Radulescu, 2009; Ghatak, Levine, & Price, 1996; Kothari, 2003; Skeldon, 2002). The families that can afford to send a migrant might also beat lower risk of child mortality: with regards to child well-being, this is a positive selection process.

These issues of selection, however, are highly complex because the selectivities may not vary simply at the household level, but instead at the level of individuals: Lu (2008), for example, found that for migrant health in Indonesia, younger migrants were positively selected, but older migrants were negatively selected. Thus while the men who enter labor migration might be positively selected on health, they could be motivated into migration by poor child health at home—a negative selection process with regards to their children.

Part of the selectivity issues could be addressed by having a model that is well-specified for the family's economic status as well as using measures of male labor migration that are causally prior to child health problems. It is important that the predictor variables are measured prior to the risk of child mortality. Thus we use the 2006 men's migration status (non-migrant, migrant, successful migrant, or unsuccessful migrant) to predict the mortality of their children ages 0–5 in 2006–2009. The other independent variables in the model (the control variables) also come from the 2006 survey. Information on child mortality between 2006 and 2009 come from the wave 2 survey in 2009.

For missing data in the predictor variables that were collected in 2006, we use multiple imputation. We do not impute values for child mortality that were collected in 2009; thus our missing data approach is to impute for item missing data of women who were interviewed in both waves and had valid child mortality data. The highest level of missing data was for the husband's age and education measures, because wives often do not know them. Husband's age was missing for 26%of the sample, and husband's education was missing for 18% of the sample. For the multiple imputation, we created 5 datasets that replaced the missing values with plausible values from the distributions of observed variables. Each imputed dataset was analyzed separately, and the results were combined to properly reflect the uncertainty in the missing values. This approach has successfully been used before with the data (Yabiku et al., 2010).

Our analysis proceeds in several steps. First, we examine the association between child mortality and a simple binary indicator of male labor migration. Second, we reexamine this association by creating two indicator categories for the heterogenous male migrant group: more successful versus less successful migrants, as determined by remittances as well as by the wife's perception. Third, we introduce community measures to control for prior factors that may be related to both child mortality and the decision to engage in labor migration. Fourth, we interact these community measures with the labor migration measures to test if community conditions moderate the effect of men's absence on child mortality.

Results

Table 1 presents the descriptive statistics for the variables used in the analysis. Of the 1932 children at risk of death between the ages of 0 and 5 from 2006 to 2009, 8% died. Almost 40% of the children had a father who was a labor migrant. Based on the “objective” definition of sending a remittance in the last year, 27% of children had fathers who were successful labor migrants, and 10% had fathers who were unsuccessful labor migrants. By the “subjective” assessment by wives, 20% of children had fathers who were successful, and

17% had fathers who were unsuccessful. In terms of the community measures, communities' households were, on average, 5.6 km from the nearest health clinic. About half (54%) of communities' households had a member engaged in male labor migration, and 61% of surveyed community leaders thought that there was an increase in the number of married men going to South Africa to work over the past 10 years. The descriptives for the remaining control variables are also in Table 1.

In Table 2 we present multivariate results. In model 1 of Table 2, we use a simple measure of men's labor migration – a 1/0 dichotomy of whether or not the child's father is a labor migrant, which is how much of previous research has operationalized male labor migration. The difference in child mortality for migrants and non-migrants is not significant. Of the control variables, short birth intervals were associated with higher rates of mortality: the odds ratio of 1.85 means that children born within 2 years of a previous sibling had rates of mortality 85% higher (1.85–1.00 = 0.85) than children not born within 2 years. The effect of household economic status is significant, and it has the expected negative direction on child mortality (odds ratio less than 1). Women with 1–4 years of education had children with significantly lower rates of mortality than women with no education ($p < .10$), and children whose mothers were in polygamous unions had higher mortality ($p < .10$). Male children had higher mortality, which is consistent with other findings from Mozambique (Gonçalves, 2009; Ministry of Health, 2009). The baseline hazard of child mortality is parameterized with the child's age, and it has an expected negative effect: the rate of mortality decreases as children become older. The random effects (variances of the random intercepts at the village and woman level) were significant at the village level ($p < .05$, one-tailed) but not the woman level ($p = .16$, one-tailed). Significant village-level but not woman-level effects are consistent with other multilevel studies of child mortality (Sastry, 1997). The significant village-level random effect in the models suggests that there are unmeasured factors at the village level that are related to child mortality.

In model 2 we use the indicators for successful and unsuccessful migrants, based on the objective assessment (whether or not the husband sent remittances in the last year). This conceptualization of labor migration shows no difference between non-migrants, successful migrants, and unsuccessful migrants.

In model 3, we assign the migrant categories based on the wife's perception of success. The results show important differences between the groups of men. Men who are unsuccessful migrants have children with rates of 0–5 mortality that are 1.63 times as high as non-migrants. In addition, children of men who are unsuccessful migrants have significantly higher rates of mortality than children of men who are successful migrants (the coefficient of 1.63 is significantly different than 0.79; model formally testing this contrast not shown). In sum, the results show that child mortality outcomes in households with men who are unsuccessful migrants are significantly worse than those in households of both successful migrants and non-migrants.

Recall that our measures of male labor migration status come from 2006, which is before the risk of child mortality begins. Thus the woman's opinions on the man's migration success or failure are not influenced by child deaths after the first survey wave. Although there still may be unmeasured factors affecting both male labor migration and child mortality, our longitudinal design excludes the possibility that women are letting child deaths influence their evaluations about the success of their husband's migration.

We also explored models (not shown) in which we examined both subjective and objective measures of migration success simultaneously. We created five categories: (1) non-migrants, (2) subjectively successful migrants that sent remittances, (3) subjectively successful

migrants that did not send remittances, (4) subjectively unsuccessful migrants that sent remittances, and (5) subjectively unsuccessful migrants that did not send remittances. This additional stratification reduced the power to differentiate effects, but we observed some patterns. There were no differences in mortality rates among non-migrants and the two subjectively successful migrant groups. As expected, the subjectively unsuccessful migrants that did not send remittances had the highest rates of child mortality ($p < .05$). Interestingly, the subjectively unsuccessful migrants that sent remittances also had higher rates of child mortality ($p = .10$) than subjectively successful migrants that sent remittances. Although merely suggestive, the results imply that with regards to child mortality in this context, whether or not the migrant is successful from a subjective assessment appears to be a better predictor of child mortality than the sending of remittances.

‘The analyses so far have not considered the potential role of community characteristics, such as possible effects of disadvantaged economic conditions. In model 4, we investigate these possibilities and add contextual measures for community access to health care resources (distance to the nearest health clinic), percent of the community's households that has a male labor migrant, the trend of male labor migration (whether or not the community has been sending increasingly more men to South Africa for work over the past 10 years), and mean village-level household economic status. These measures fail to show a significant association with child mortality, and coefficients for the male labor migration measures remain unchanged compared to model 3. In results not shown, the contextual measures did not show significant associations with mortality even when estimated singly, suggesting that collinearity between contextual measures is not a reason for a lack of significant associations. Although model 4 does not contain all the possible measures that might characterize a community, it captures several important dimensions. The model does not support the alternative explanation that male labor migration and child mortality are endogenous to community characteristics.

Finally, we estimated another series of models that built upon model 4 and added interaction terms between the male labor migration variables and the community measures. This tested the possibility that the impact of the predictor variable might be magnified in certain communities (Axinn & Yabiku, 2001; Yabiku, 2004), such as economically disadvantaged ones. In each of the models, however, the interaction between male labor migration and the community characteristics was not significant (not shown). This offers further evidence that community measures are not structuring the relationship between male labor migration and childhood mortality.

Discussion

While a growing body of research has examined the associations between migration and diverse child health outcomes, much of this work has focused on children who migrate or children born to migrants in destination settings (e.g., Antai et al., 2010; Avogo & Agadjanian, 2010; Kiros & White, 2004; Moss et al., 1992). Our work has addressed a less-studied question—how migration of a single family member may be associated with survival of children who remain behind. The processes, mechanisms, and impacts of this type of migration differ substantially from migration in which entire families participate. Our work therefore adds to this understudied topic.

Our results illustrate the importance of going beyond simple assumptions about the nature of men's labor migration and its consequences for child mortality. This diversity of outcomes of migration for left-behind households in sending areas proves very important. When ignoring the success or failure of migration, the children of male labor migrants are no different from the children of non-migrants. An objective measure of migration success

(sending of remittances) also showed no association with child mortality. When the women's perceptions of fathers' migration success are considered, however, the children of unsuccessful migrants fare the worst. Although we tested our hypotheses in the context of male labor migration in rural Mozambique, the nature, patterns, and consequences of that migration have many universal features, and we believe that our findings have broad importance for studying the associations between labor migration and child mortality and other family outcomes across the world. Simply classifying families into migrant or non-migrant may hide significant variations in the experience of labor migrants and their left-behind household members.

Contrary to what most remittances literature would suggest, our objective assessments of the migration experience (sending of remittances) failed to predict child mortality. A possible explanation is that whether or not a migration is perceived as successful depends on more than the absolute quantity of remittances. While 27% of the children had fathers who were successful migrants based on objective assessment, only 20% of children had successful migrant fathers based on the wife's subjective assessment. This suggests that in her subjective assessment of the migration outcomes, a migrant's wife relates actual remittances to her expectations of material and social benefits of migration. In short, we do not suggest that remittances do not matter, but, in contrast, we argue that the perception of success is deeply intertwined with remittances and broader changes in household life following migration. The importance of our subjective measure of migration success suggests that researchers need highly detailed measures of household finances, motivations for migration, and household changes after migration in order to isolate causal pathways.

We also investigated how various community measures were associated with child mortality. This was to address the selectivity of men into migration and higher risks of child mortality, and also to explore how community factors moderated the association between migration and child mortality. These community measures had little predictive power, which suggests that the disadvantage of less successful migrants is independent of a broad set of individual, household, and community level controls.

Our work here is related to prior research that examined the diversity within male labor migrants, and how this diversity is related to a variety of outcomes at the household level. For example, Yabiku et al. (2010) found that women's autonomy increased due to male absence in households that sent both more and less successful male labor migrants. The increase was greater, however, in households with less successful migrants: it is likely that these women had to take greater roles—and probably experienced more strain and stress—to manage the household. This work is directly relevant to our analyses here, which suggests that the level of success of migrants is related to the household's ability to care for its members. It is telling that we find differences in child mortality across three groups: children of more successful male labor migrations, children of less successful male labor migrations, and children whose fathers are not migrants. There appears to be multiple resources at play: economic benefits from labor migration and benefits from having a husband physically present. Successful migration provides economic resources to keep children healthier and is able to countervail many negative aspects of husband's physical absence. Children of non-migrants do not reap the economic benefits of labor migration, but father's presence seems to confer some benefit. It is the children of less successful male labor migrants who appear the most disadvantaged: they lack the economic benefits of migration, and they may also be negatively affected by the father's physical absence. Selection into migration and different, hard to observe household economic conditions at the time of the migration decision further makes it difficult to compare these groups.

Our study, of course, is not without limitations. We had a limited number of community-level indicators in the data and their measurement could be imprecise, which may explain why these indicators were not predictive of child mortality, despite expectations that community “push” factors would be related to men's migration decisions and child mortality. The potentially non-random attrition of women in the survey from 2006 to the follow-up may also affect the results, especially if attrition was selective of women whose children experienced higher levels of mortality. From analysis of which women participated in the second survey, we do know that, based on wave 1 characteristics, attrition was higher for women married to unsuccessful migrants (subjective assessment), women who were younger, women married to husbands who were younger, and women from households with lower economic status. We cannot know what the impact of attrition is, but our results may be underestimates of the relationship between migration success and mortality because our data probably miss more child deaths among the unsuccessful migrant group (who is more likely to have had attrition). Other selection processes hinder our ability to causally link migration success to child mortality if there are unmeasured factors influencing men's migration decisions, wives' perception of migration success, and child mortality. The new economics of migration approach motivated us to include a rich set of measures at the household and community level in addition to the individual level. But the possible existence of important omitted factors, and thus unobserved heterogeneity (e.g., factors leading to different levels of frailty between children), remains.

Our work in the future will incorporate data from later survey waves. One particularly useful avenue of further research would be to examine if the benefit of male labor migration is maintained even after men return. In other words, might we observe improved health for the children whose fathers were successful migrants at wave 1, yet have returned by wave 2 and maintain their physical presence with their children through wave 3? Prior work on the consequences of male labor migration for women's autonomy suggested that the impacts of labor migration were not temporary, and persisted once men returned (Yabiku et al., 2010). Just as we argue for the importance of recognizing the variation of migration experience within current migrants, there is likely to be important variation within current non-migrants: those who have never migrated and those who have prior migration experience—both successful and unsuccessful. It is reasonable to expect that male labor migration may have a long-term impact on child survival, health, and other family outcomes.

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Table 1

Descriptive statistics.

	Mean	Std. dev.
Child died	0.08	0.27
Husband is not migrant	0.62	0.49
Husband is migrant	0.38	0.49
Objective migration success: husband sent remittances in past year		
Husband is successful migrant	0.27	0.45
Husband is unsuccessful migrant	0.10	0.30
Subjective migration success: based on wife's perceptions		
Husband is successful migrant	0.20	0.41
Husband is unsuccessful migrant	0.17	0.38
Community measures		
Village average household economic status (0–3 scale)	1.21	0.39
Average distance to health clinic (kilometers)	5.63	4.56
Percent of households with male labor migrant	0.54	0.10
Male labor migration from community increased in past 10 years	0.61	0.49
Wife's age	26.75	5.62
Wife no education	0.27	0.44
Wife education 1–4 years	0.46	0.50
Wife education 5+ years	0.27	0.45
Polygamous union	0.19	0.39
Wife is currently employed (time-varying)	0.29	0.45
Wife's children ever born (time-varying)	3.86	1.91
Wife had short birth interval (≤24 months) before focal child	0.67	0.47
Child is male	0.52	0.50
Husband's age	33.18	8.82
Husband no education	0.18	0.38
Husband education 1–4 years	0.44	0.50
Husband education 5+ years	0.38	0.48
No religion	0.15	0.36
Mainline religion	0.26	0.44
Other religion	0.58	0.49
Household economic status (0–3 scale)	1.20	0.74

N = 1932 children.

Table 2

Relationship between male migration and rate of child mortality.

	1	2	3	4
Operationalization based on migrant/non-migrant dichotomy				
Husband is migrant (ref = non-migrant)	1.20 (1.00)			
Objective operationalization based on remittances				
Husband is successful migrant (ref = non-migrant)		1.11 (0.51)		
Husband is unsuccessful migrant (ref = non-migrant)		1.32 (0.98)		
Subjective operationalization based on wife's perception				
Husband is successful migrant (ref = non-migrant)			0.79 (−0.91)	0.78 (−0.93)
Husband is unsuccessful migrant (ref = non-migrant)			1.63 * (2.30)	1.63 * (2.31)
Contextual measures				
Village average household economic status				0.85 (−0.40)
Average distance to health clinic				1.02 (0.66)
Percent of households with male labor migrant				2.01 (0.56)
Community leader thinks labor migration increased in past 10 years				0.88 (−0.53)
Wife's age	0.82 (−1.25)	0.82 (−1.23)	0.82 (−1.27)	0.82 (−1.28)
Wife's age squared	1.00 (1.45)	1.00 (1.43)	1.00 (1.48)	1.00 (1.49)
Wife education 1–4 years (ref = no education)	0.69 + (−1.75)	0.69 + (−1.75)	0.70 + (−1.68)	0.70 + (− 1.68)
Wife education 5+ years (ref = no education)	0.95 (−0.19)	0.96 (−0.17)	0.96 (−0.15)	0.96 (−0.16)
Polygamous union	1.46 + (1.69)	1.45 + (1.66)	1.39 (1.50)	1.40 (1.52)
Wife is currently employed (time-varying)	1.06 (0.30)	1.06 (0.31)	1.04 (0.18)	1.04 (0.22)
Wife's children ever born (time-varying)	0.93 (−1.02)	0.93 (−1.03)	0.93 (−1.03)	0.93 (−1.04)
Wife had short birth interval before child	1.85 ** (3.09)	1.85 ** (3.08)	1.87 ** (3.12)	1.87 ** (3.12)
Husband's age	1.16 (1.32)	1.16 (1.33)	1.17 (1.40)	1.17 (1.40)
Husband's age squared	1.00 (−1.48)	1.00 (−1.49)	1.00 (−1.54)	1.00 (−1.54)
Husband education 1–4 years (ref = no education)	0.84 (−0.72)	0.85 (−0.68)	0.86 (−0.66)	0.86 (−0.62)
Husband education 5+ years (ref = no education)	0.76 (−1.03)	0.77 (−0.98)	0.79 (−0.88)	0.80 (−0.84)
Mainline religion (ref = no religion)	1.22 (0.67)	1.22 (0.66)	1.22 (0.66)	1.22 (0.66)
Other religion (ref = no religion)	1.02 (0.06)	1.02 (0.06)	1.00 (0.02)	1.01 (0.05)
Household economic status	0.73 * (−2.36)	0.74 * (−2.28)	0.76 * (−2.02)	0.77 + (− 1.76)
Child is male	1.66 ** (2.91)	1.66 ** (2.92)	1.68 ** (2.96)	1.68 ** (2.97)
Child's age	0.65 *** (−7.08)	0.65 *** (−7.08)	0.65 *** (−7.08)	0.65 *** (−7.05)
Intercept	0.05 (−1.51)	0.04 (−1.54)	0.04 (−1.60)	0.03 (−1.60)
Random variance (village)	0.19 * (1.67)	0.19 * (1.69)	0.20 * (1.74)	0.24 * (1.86)
Random variance (woman)	0.28 (1.01)	0.29 (1.03)	0.26 (0.93)	0.27 (0.97)
N (person-years)	7640	7640	7640	7640

+ $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$, two-tailed tests

one-tailed tests for random variances.

Coefficients are odds ratios (except for random variances), with *z*-statistics in parentheses.