Labor migration, child health and mortality in rural Mozambique[*]

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Introduction

Sub-Saharan African countries are characterized by high levels of internal and international labor migration (Adepoju, 2000, 2003; Agadjanian 2008; Arthur, 1991; Davies & Head, 1995; de Vletter, 2007; Lucas, 1987; McDonald *et al*. 2000; Schrieder & Knerr, 2000). At the same time most countries of sub-Saharan Africa continue to have high rates of child mortality compared to countries in other continents of the globe (Black, Morris & Bryce, 2003; Delaunay *et al*., 2001). For example, child mortality is estimated to be 133 per 1000 in Lesotho, 200 per 1000 in Mozambique and 117 per 1000 in Zimbabwe. In comparison to industrialized countries, child mortality rates hover around 6 deaths per 1000 births (Black, Morris & Bryce, 2003). However, little is known on how labor migration may affect child health and under-five mortality in migration-origin areas of sub-Saharan Africa. Does child health/under-five mortality in migrant households differ from child health/under-five mortality in non-migrant households? What are the key factors behind observed patterns in the relationship between labor migration and child health/ mortality in origin areas?

Studies of migration and childhood health in sub-Saharan Africa have focused on the effects of migration on child mortality in destination areas, typically urban areas (Brockerhoff, 1990, 1995; Ssengonzi, De Jong & Stokes, 2002). These studies show mixed results. According to Brockerhoff (1995), children of migrant mothers have lower survival chances in urban areas than children of non-migrant residents of urban areas. Moreover, after two years of mothers' residence in urban areas, children of migrant mothers born in urban areas have lower mortality risks than children of non-migrant rural women (Brockerhoff, 1994). Nonetheless, findings from Ssengonzi and colleagues (2002) in Uganda suggest that children of urban non-migrant mothers were more likely to die than children of migrant mothers from rural areas possibly due to the fact that non-migrant children and mothers live in impoverished slums of urban areas. Ssengonzi and colleagues (2002) found that demographic and socioeconomic factors were more important in explaining child mortality differentials than migration itself.

A study carried out in rural Mexico on the effects of labor migration to the United States of America on infant mortality in sending areas (Hildebrandt & McKenzie, 2005) suggests that children from labor migrant households are less likely to die than children

from non-migrant households. However, this difference was not statistically significant. Hildebrandt and McKenzie (2005) argue that labor migration may affect childhood mortality through increasing income and wealth of labor migrant households and transfer of health knowledge from migrants to families left behind. Another study from Mexico suggests that massive migration not accompanied by remittances and migration-induced investment in sending communities results in increasing infant mortality in sending areas (Kanaiaupuni & Donato, 1999); however, infant mortality decreases with increase in sending of remittances and institutionalization of migration over time. From that study, though, it is unclear whether households of labor migrants are different of households of non-migrants regarding infant mortality.

Studies of the influence of labor migration on child health and under-five mortality in Mozambique and other parts of sub-Saharan Africa are scarce. The few existing studies of under-five mortality in Mozambique have sought to understand the effects of socioeconomic status (Macassa & Burström, 2006; Macassa et al., 2003) and ethnicity (Macassa et al., 2006) on under-five mortality. They showed that fathers occupation was statistically associated with post-neonatal mortality but not with child mortality in general, while mother's occupation was associated with child mortality but not with post-neonatal mortality. Children of professional fathers showed lower risk of post-neonatal mortality than children of fathers in agricultural self-employed, agricultural employee and unskilled manual occupations. In addition, children of fathers with no education had the highest risk of post-neonatal mortality and children of fathers with primary education had high risk of post-neonatal mortality than children of fathers with secondary and higher education. Similar patterns were observed in relation to the effect of father's education on child mortality. No association between mother's education and post-neonatal mortality and child mortality was found. Furthermore, there was no association between socioeconomic status and neonatal mortality (Macassa et al., 2003). In regard to the role of ethnicity on under-five mortality in Mozambique, Macassa et al. (2006) found that children of mothers of Tsonga ethnic group (dominant ethnic group in our study area) were less likely to die compared to children of mothers of Emakua and Cisena ethnic groups. Despite these findings, however, we still know little about childhood mortality in our study area.

This study adds to the literature by addressing the gap in our knowledge of the impact of labor migration on health outcomes in sending areas of sub-Saharan Africa. It focus on two main issues: the effect of labor migration on under-five mortality and the effect of labor migration on selected child health outcomes. The study's approach rests on the general assumption that labor migration may both enhance and constraint household resources (financial, material, human and informational) and therefore may affect the ability of parents to take care of their children in both positive and negative ways (Kanaiaupuni & Donato, 1999; Taylor et al., 1999). Accordingly, the study explores whether male migration is a positive factor decreasing childhood mortality by enhancing household wellbeing, or it is a negative factor damaging the households left behind. Importantly, the study looks at the short and long term effects of male labor migration on under-five mortality. More broadly, the study will shed light on health consequences of labor migration within the context of sub-Saharan Africa, where migration is common and growing but the economic and social returns to migration are increasingly unpredictable (Adepoju 2003; Agadjanian 2008).

With differing consequences of male labor migration in mind, we test alternative hypotheses. On the one hand, one can expect that under-five mortality will be lower for migrant households than for non-migrant households, since labor migration tends to provide better economic means for the households. From this perspective, the positive effect of migration on child survival should increase with time of migration as the cumulative amount of remittances increases. On the other hand, however, one can also hypothesize that physical absence of the father will increase the probability of death among children under-five, because of less parental involvement as well as additional household burden for the mothers in their migrant husbands' absence. Again, these effects can accrue over time. Thus, if we find a negative association between father's migration status and probability of child's death, we can conclude that the benefits of migration outweigh the burden it imposes on the household. Alternatively, a positive association between father's migration status and under-five mortality, would suggest that the negative effects of migrants' absence prevail. Finally, if no significant association is present, we would conclude that migration has no effect on child survival either because the two countervailing tendencies that we identified above cancel each

other out or simply because father's migration is irrelevant to child's survival. In addition to child mortality, we look at selected outcomes related to child health.

For the child health outcomes, on the one hand we expect that father's current migration status will be associated with better child health due to economic returns of migration. On the other hand, however, it might also be associated with worse health outcomes for children due to the lack of parental involvement. These outcomes are described in the following section.

Data and methods

Data. The analysis uses survey data collected in rural areas of four districts in southern Mozambique in 2006 under the Men's Migration and Women's HIV/AIDS Risks research project. The survey involved interviews with 1,680 married women aged 18-40 years. In each district, 14 villages were randomly selected. A total of 30 respondents from each village were randomly selected for interview. Half of the respondents in each village were women married to migrants and, another half were women married to non-migrants. The data include detailed information on women's demographic and socioeconomic characteristics, their husbands (including husbands' migration status in six years preceding the survey) and children, and health outcomes and behavior.

Methods. The analysis of childhood mortality employs the event-history approach using Cox Regression Model (Allison, 2005). For the analysis of child health, we use logistic regression for binary outcomes.

Measures. In the event-history model the event of interest is the death of a child born between 2000 and 2006 before reaching the age 60 months. Children who did not die were censored at the time of the survey. To test the short term effects of migration the migration status of the father is measured at the time of event (migrant father coded as 1 and non-migrant father coded 0). For the long term effects, the cumulative duration of father's migration in months is calculated. The control variables include mother's age and age at first birth, mother's education, number of siblings born before the particular child and birth interval before the current and the previous child (these variables are presented in Table 1). These variables are typically included in studies of childhood mortality (Adams, Madhavan & Simon, 2002; Sastry, 1997; Ssengonzi, De Jong &

Stokes, 2002). Thus, in respect to mother's age and mother's age at first birth it has been argued that children of younger and older mothers are at high risk of mortality (Knodel and Hermalin, 1984). In sub-Saharan Africa, the risk of mortality to children born to mothers in their twenties and thirties is likely to be low (McDevitt et al., 1996). Maternal education has been considered an important factor for child survival (Basu and Stephenson, 2005; Caldwell, 1979; Ware, 1984), although some doubts have been raised about the causal role of maternal education in child survival (Adetunji, 1995; Desai and Alva, 1998; Hobcraft, 1993). In regard to birth interval, short birth intervals between the current and the previous child have been associated with higher risks of childhood mortality (Boerma and Bicego, 1992; Manda, 1999; Whitworth and Stephenson, 2002). In a study in India, for example, Whitworth and Stephenson (2002) found that short birth intervals (<18 months) increased the risk of child death compared to medium birth intervals (18-36 months).

[Table 1 about here]

We also include the following control variables: mother's religion, household dwelling quality scale (based on household's type of source of drinking water, type of toilet, type of walls of main dwelling, type of ceiling and household electricity use). Village level control variables are also included. These are: a community infra-structure scale (based on proximity of the village to the nearest city or the district headquarters, accessibility of the village during the rain season, existence of good cell phone coverage in the village and the distance to the nearest health unit from the village), whether or not number of married men in the village working in South Africa increased in the decade preceding the survey, and type of health facility functioning in the village or in the radius of one-hour walk. Village level information was based on interviews with village leaders. We acknowledge the potential problems that may arise from using current indicators to predict past events, but given the short span under consideration, we believe that the resulting biases are not large and do not affect the comparison between the migrant and non-migrant households.

For the second part of this study, we use three outcomes as proxies for child health: whether or not any of the children in the household were sick in the previous month; whether or not the youngest child slept under a mosquito net the night preceding the survey interview, and whether or not the youngest child in the household was delivered in a health care establishment. In this region of sub-Saharan Africa, malaria is of one the leading causes of childhood mortality (Chilundo, Sundby & Aanestad, 2004; Dgedge *et al*., 2001; Granja *et al*., 1998). It has been argued that the use of insecticide-treated mosquito net for protection against mosquito bites during sleeping is an important tool to control malaria (Korenromp et al., 2003). At the same time, a substantial proportion of children deliveries in some developing countries take place at home (Bolam et al., 1998; Amooti-Kaguna and Nuwaha, 2000) and the context of home delivery in developing countries may create health complications to new born babies leading to perinatal and neonatal mortality (Fikree et al., 2002; WHO, 1996). For the outcome whether any of the children in the household were sick in the previous month and whether the youngest child slept under a mosquito net the previous night, we look at children under 14 years old. For these outcomes father's migration status is measured at the time of survey. For the outcome whether the youngest child in the household was delivered in a health care establishment the father's migration status is measured at the time of birth of the youngest child. The information on fathers' migration status is available only for years 2000 to 2006, therefore we only consider the sub-sample of children born between 2000 and 2006 for the last outcome. For outcomes of child health we added some of the following control variables: mother's co-residence with in-laws, mother's type of marriage (polygynous versus monogamous marriage), number of live births, age of the youngest child, household consumer (or material) assets scale (constructed from the questions of household possession of a radio, TV set, refrigerator, metal or wood bed with mattress, fixed or cell phone, bicycle and motorcycle), share of child deliveries in the village that takes place in a health care unit and share of the village children that has received all the immunizations required for their age.

Results

Labor migration and childhood mortality

Survival analysis presented in Figure 1 shows that children of migrant fathers have higher survival to death than those of non-migrant fathers. The difference between the two groups is statistically significant. This result supports our hypothesis that fathers' migration has a positive effect on child survival. However, the results of event-history analysis using Cox regression shows mixed results (Table 2). Model 1 in Table 2 shows the hazard ratios for the model testing the effect of current migration status on the probability of child death in a given month, controlling for socioeconomic characteristics. Model 2 uses cumulative years of father's migration to predict under-five mortality, net of socioeconomic characteristics. The third column uses both current migration status and cumulative years of fathers' migration as the main predictor controlling for other socioeconomic variables.

[Figure and Table 2 about here]

Model 1 shows that current migration status of the father decreases the hazards of child dying in any given month, net of other factors. However, the effect is not significant. Results in Model 2 indicate that cumulative years of father's migration significantly decrease the hazards of child death, net of socio-economic characteristics. Interestingly, however, when we consider both current and cumulative effects of migration on under-five mortality, we find intriguing results (Model 3). It appears that father's current migration status, controlling for the length of migration and other factors, significantly increases the hazards of child dying in a given month (children of migrants have 5.2 times higher odds to die than those of non-migrants). However, each additional month in the length of father's migration significantly decreases the hazards of a child dying. These findings support our hypothesis on the long-term effects of migration. The longer the migrant is away, the more he can support his family and improve household conditions and decrease the chances of his children's death. We can also speculate that the longer a migrant is away, the better his wife adjust to taking care of their children in his absence. However, current physical absence of the father is a burden on the household that negatively affect children's survival. These results also

show that maternal age and large proportion of child deliveries in the village taking place in a health unit are significantly associated with decrease in the hazards of under-five mortality. However, household dwelling conditions, number of siblings and birth intervals less or equal to 18 months have significantly positive effect on under-five mortality.

Labor migration and childhood health

Table 3 shows the results of a logistic regression model predicting child sickness in the month preceding the survey with the father's current migration status as the main predictor. It is observed that the effect of father's migration on the probability of a child being sick is significantly positive, increasing the odds of a child being sick in the last month by about 35 percent, controlling for other factors. This finding suggests that current absence of the father has a negative impact on child health. Interestingly, having health facility in the village or in the radius of one-hour walk increases the odds of sickness in the previous month.

[Table 3 about here]

We turn to the outcome whether the youngest child slept under a mosquito net the previous night. We find that the effect of migration of the father is significantly negative, decreasing the odds of child sleeping under a mosquito net by about 45 percent, net of other factors (Table 4). We suggest that in rural areas in Mozambique, where the availability of mosquito nets is limited and households need to travel far from their residential areas to get them (Brentlinger et al., 2007), men are more likely to be the ones to be able to buy them. Therefore, in migrants' households where the father is absent, children are less likely to sleep under a mosquito net.

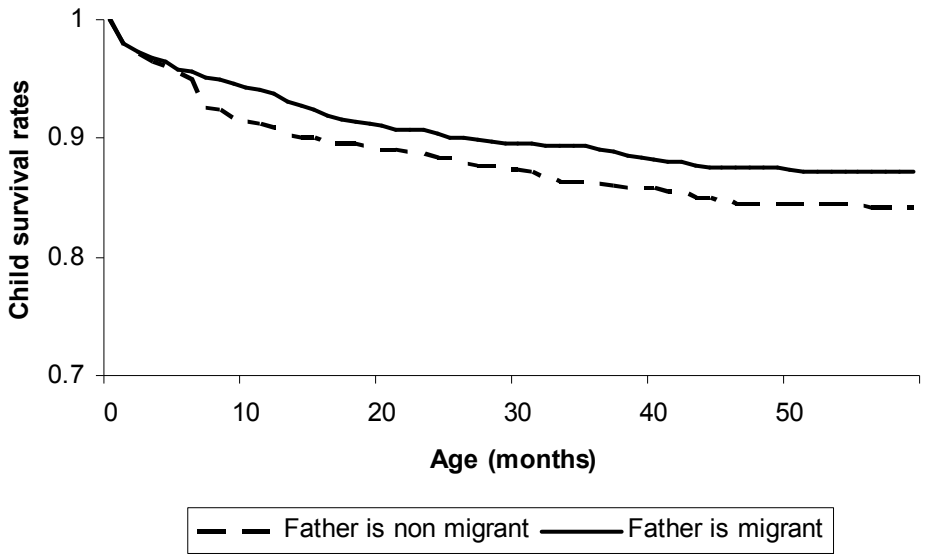
Finally, we look at the effect of father's migration on the likelihood of the youngest child having been delivered in a health care establishment. We find a significant effect of migration status: children of migrant fathers have 1.41 times higher odds to have been delivered in a health care establishment than children of non-migrants (Table 5).

Table 4 and 5 about here]

Conclusion

This study adds to the scarce literature on labor migration and childhood health and mortality. The literature suggests that the effects of migration on child health mainly depend on the economic returns of migration and migration-induced changes in health behaviors (Hildebrandt & McKenzie, 2005; Kanaiaupuni & Donato, 1999). Our study looked at the associations between father's seasonal migration and infant and child health and mortality in rural Mozambique. A complex picture emerged. On the one hand, the results of our study provide indirect support for the established view on the benefits of migration-generated economic resources for child health. On the other hand, however, they show a countervailing negative effect of father's migration status on infant and child survival that is attributable to the length of the father's absence rather than his current migrant status. Therefore, while a man's physical absence is a negative factor in child's health and mortality risks, the cumulative socioeconomic benefits from migration lead to better child health and survival. These findings emphasize the importance of using longitudinal than cross-sectional data for a better understanding of the outcomes of labor migration dynamics for the lives of those left behind. Two limitations of the study must be acknowledged. First, information on fathers' migration status is available only for the period 2000 to 2006 which limits the analysis to the events that happened in that time period. However, one has to keep in mind that child deaths that occurred in a remote past are more likely to be underreported that recent deaths. And second, some of the variables measured at the time of survey were used as covariates in the models predicting past events. Again, however, considering that the short time span of the study, we assume that the resulting estimation errors are not large.

Figure 1. Child survival rates by father's migration status before the child's fifth birth day.



-2LL = 4.66 (p< 0.03)

Table 1. Variable definition and distribution (percentage unless noted otherwise)

Outcomes		
Any of the children in the household were sick in the previous month	Children sick in the previous month	62.36
	Children not sick in the previous month	37.64
The youngest child slept under a mosquito net the previous night	Slept under mosquito net	30.54
	Did not sleep under mosquito net	69.46
The youngest child of the household was born in health care facility	Born in the health care facility	71.11
	Not born in the health care facility	28.89
Predictors		
Migration status	Migrant father	51.13
	Non-migrant father	48.87
Controls		
Mother's age (mean)		27.09
Mother's age at first birth (mean)		19.61
Age of the youngest child (mean)		2.23
Number of live births (mean)		3.07
Mother's education	None	26.88
	1 to 4 years	45.17
	5 or more years	27.95
Mother's religion	None	13.60
	A Mainline church	28.78
	A Zionist/other Pentecostal church	57.62
Mother's co-resident with parents-in-laws	Co-resides with at least one parent-in-law	38.44
	No co-resident parent-in-law	61.56
Mother's type of marriage	Polygynous marriage	21.04
	Monogamous	78.96
Household consumer assets scale (mean)		2.44
Household dwelling quality scale (mean)		2.22
Community infra-structure scale (mean)		4.58
Number of married men of the village working in South Africa in the last 10 years	The number increased	62.50
	The number did not increase	37.50
Type of health facility functioning in the village and the radius of one-hour walk	None	28.57
	Health Post	33.93
	First aid Post	37.50
Share of child deliveries in the village that takes place in a health unit	Almost none, some or half	44.64
	Many or almost all	55.36
Share of the village children that has received all the immunizations required for their age	Almost none, some or half	12.50
	Many or almost all	87.50

Model 2. Cox regression results for childhood mortality with father's current and cumulative migration status as the main predictors

Variable	Hazard Ratios					
	Model 1		Model 2		Model 3	
Father's migration status						
Non-migrant father (reference)	1.00				1.00	
Migrant father	0.84				5.23	**
Cumulative years of migration			0.72	**	0.40	**
Mother's age	0.85	**	0.85	**	0.88	**
Mother's education						
Less than 1 (reference)	1.00		1.00		1.00	
1-4 Years education	1.09		1.18		1.13	
5+ Years education	0.71	†	0.79		0.77	
Mother's religion						
No religion (reference)	1.00		1.00		1.00	
Mainline church	0.95		0.96		0.90	
A Zionist/other Pentecostal church	1.22		1.23		1.17	
Mother's age at first birth	1.14	**	1.14	**	1.11	**
Number of siblings	1.24	*	1.19	†	1.14	
Birth interval between the current and the previous child						
>18 months (reference)	1.00		1.00		1.00	
0-18 months	1.76	*	1.57	†	1.58	†
Household dwelling quality scale	1.07		1.13	*	1.11	
Community infra-structure scale	0.99		0.98		0.97	
More married men in the village working in South Africa	0.83		0.85		0.85	
Type of health facility in the village and the radius of one-hour walk						
None (reference)	1.00		1.00		1.00	
Health Post	1.02		1.04		1.00	
First aid Post	1.23		1.27		1.29	
-2LL	4985.09		4944.09		4891.73	
Person Years			66635			

Notes: †- p<.1; *- p≤ .05; **- p≤ .01.

Table 3. Logistic regression predicting child sickness in the last month with father's migration status as the main predictor (odds ratios)

Variables		
Father's migration status		
Non-migrant father (reference)	1.00	
Migrant father	1.35	*
Mother's age	0.92	**
Mother's education		
Less than 1 (reference)	1.00	
1-4 Years education	1.01	
5+ Years education	1.12	
Mother's religion		
No religion (reference)	1.00	
Mainline church	0.87	
A Zionist/other Pentecostal church	0.88	
Mother co-resides with at least one parent-in-law	1.17	
Mother in polygynous marriage	0.89	
Mother's age at first birth	1.05	*
Number of live births	1.38	**
Household consumer assets scale	0.90	**
Household dwelling quality scale	1.06	
Community infra-structure scale	0.96	
More married men in the village working in South Africa	0.69	**
Type of health facility in the village and the radius of one-hour walk		
None (reference)	1.00	
Health Post	1.61	*
First aid Post	1.75	**
Many or almost all child deliveries in the village take place in a health unit	0.91	
Many or almost all children have received all the immunization required for their age	0.83	
-2LL	1601.37	
Number of cases	1236	

Notes: †- p<.1; *- p≤ .05; **- p≤ .01.

Table 4. Logistic regression predicting child sleeping under a mosquito net the last month with father's migration status as the main predictor (odds ratios)

Variables		
Father's migration status		
Non-migrant father (reference)	1.00	
Migrant father	0.69	*
Mother's age	1.00	
Mother's education		
Less than 1 (reference)	1.00	
1-4 Years education	1.24	
5+ Years education	1.21	
Mother's religion		
No religion (reference)	1.00	
Mainline church	1.57	†
A Zionist/other Pentecostal church	1.11	
Mother co-resides with at least one parent-in-law	0.79	
Mother in polygynous marriage	0.83	
Mother's age at first birth	1.04	
Number of live births	1.04	
Age of the youngest child	1.00	
Household consumer assets scale	1.19	**
Household dwelling quality scale	0.96	
Community infra-structure scale	0.86	**
More married men in the village working in South Africa	1.02	
Type of health facility in the village and the radius of one-hour walk		
None (reference)	1.00	
Health Post	0.71	*
First aid Post	0.65	*
Many or almost all child deliveries in the village take place in a health unit	0.51	**
Many or almost all children have received all the immunization required for their age	1.23	
-2LL	1236.30	
Number of cases	1050	

Notes: †- p<.1; *- p≤ .05; **- p≤ .01.

Table 5. Logistic regression predicting youngest child delivery in a health care establishment with father's migration status as the main predictor (odds ratios)

Variables		
Father's migration status		
Non-migrant father (reference)	1.00	
Migrant father	1.41	*
Mother's age	1.03	
Mother's education		
Less than 1 (reference)	1.00	
1-4 Years education	1.05	
5+ Years education	1.77	*
Mother's religion		
No religion (reference)	1.00	
Mainline church	2.20	**
A Zionist/other Pentecostal church	1.22	
Mother's age at first birth	1.01	
Number of live births	0.88	
Age of the youngest child	1.00	
Household dwelling quality scale	1.22	**
Community infra-structure scale	0.98	
More married men in the village working in South Africa	1.54	**
Type of health facility in the village and the radius of one-hour walk		
None (reference)	1.00	
Health Post	1.66	*
First aid Post	0.81	
-2LL	1104.29	
Number of cases	949	

Notes: †- p<.1; *- p≤ .05; **- p≤ .01.

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