Extended abstract

Re-examining the relationship between parental migration and the health of children left behind: The role of community context in Nepal

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Short abstract

While the relationship between parental migration and the health of children left behind has been examined in a range of settings, most prior research in this area has not examined the role of community context. Yet, the degree to which migration advantages or disadvantages children's health is likely determined in part by where the child lives. Using data from the Chitwan Valley Family Study, a household and community panel study in rural Nepal, a migrant-sending area, I analyze the effect of fathers' international migration on the nutritional status of 940 children under five. In a series of mixed-effect regressions, I assess how community characteristics influence odds of malnutrition by fathers' migration. I find fathers' migration is protective against acute malnutrition, as are community access to transport and money transfer services. In the coming months, I will employ marginal structural models to address issues around temporal ordering and endogeneity.

Introduction

Internal and international migration rates among young adults have increased across low- and middle-income countries globally over the last two decades, including in Nepal (Charles-Edwards et al. 2016; Ministry of Planning 2012). This population change affects an increasing proportion of children in these settings, including children left behind in households of origin as their parent(s) migrate internationally for work. Although children left behind may benefit from remittance income provided by a migrant parent, they may also experience adverse effects of parental absence and family instability (Lee and McLanahan 2015; Sigle-Rushton and McLanahan 2004). Outside the family, migration alters communities' composition, infrastructure, and social norms and networks (Massey et al. 1994; Taylor et al. 1996). However, with very few exceptions (Hamilton and Choi 2015; Kanaiaupuni and Donato 1999; Kiros and White 2004), the migration and child health literature has largely failed to consider community context, beyond individual and family effects**.**

Multiple dimensions of community context are known to influence migration decisions and patterns (Garip 2012; Massey et al. 2010). Specifically, factors such as the availability of employment and transport, the strength of community organizations, and social networks shape individual and household decisions to migrate (E. S. Lee 1966; Massey et al. 1993; Williams 2013). As more community members migrate, their subsequent remittance support strengthens community infrastructure (Pozo 2007) and contributes to social and economic change in their communities of origin (H. de Haas 2010). These migration-induced social and structural community changes cumulatively cause others to migrate (Massey 1990), contributing to a reciprocal cycle of migration and community change over time (Garip 2008, 2012). Separately, community characteristics are known to shape child health, beyond individual and family effects (Sellström and Bremberg 2006). These include access to health services, social participation, and other socio-demographic characteristics of the population (Karra et al. 2016; Nobles and Frankenberg 2009; Sastry 1996). Community context affects health through multiple mechanisms: diffusion of information; adoption of healthy norms and behaviors; increased access to health services and economic resources; and, collective efficacy, social cohesion, and psychosocial support for health (Kawachi and Kennedy 1999; Veenstra et al. 2005). Notably, these community-level pathways for health are concomitantly affected by the very social and structural changes brought about by migration.

While the existing literature suggests mechanisms through which community context may affect the relationship between parental migration and the health of children left behind, there are several challenges to identifying such effects. First, specifying the correct temporal order of migration patterns and community change is difficult given the limitations of most data. Second, these relationships are further complicated by known reciprocal causation between community context and migration as described above. Therefore, this analysis demands detailed, multilevel measures of household and community characteristics over time, which few data sources include. The Chitwan Valley Family Study (CVFS), a household and community panel study in a migrant-sending area in rural Nepal, now includes the detailed data necessary to study the relationships between parental migration, community context, and child health. CVFS has collected detailed, longitudinal measures of individual, household, and community characteristics, including monthly migration data, since 1996. Recently, in 2016, the first wave of child health data was collected.

Nepal is an ideal setting for this study: it is a country with high rates of international labor migration, where many children experience poor health outcomes (Ministry of Health and Population et al. 2012). Since the 1980s, labor migration to the Middle East, generally to work in construction on two- or three-year fixed contracts, has become an increasingly common livelihood strategy among Nepalese men (Skeldon 2015). Remittances from the Middle East alone account for 15-25% of Nepal's GDP (Lokshin et al. 2007; Thieme and Wyss 2005). Men comprise more than 96% of all international labor migrants in Nepal; men who migrate internationally are more likely to be married and have children (Compernolle 2017; Ministry of Labour and Employment 2016). In this context, given the constraints of the labor contracts, women and children typically remain in the household of origin (Wong 2011).

In this study, I use CVFS data to identify the ways in which multiple dimensions of community context shape the association between fathers' international labor migration and the nutritional status of children under five years of age in a migrant-sending area. I improve upon prior estimates of the relationship between parental migration and child health by incorporating detailed, longitudinal measures of community context, including structural, social, and demographic features. Finally, I address potential sources of endogeneity by employing advanced causal inference approaches to model change over time and account for temporal ordering, using a data source with the necessary level of detail on migration and time-varying household and community characteristics. Identifying the effects of parental migration and community context in the first five years of life is particularly important from a health perspective, as early childhood provides a critical foundation for health, education, and human capital accumulation throughout the life course (Blackwell et al. 2001; Case et al. 2005; S. Haas 2008; Victora et al. 2008).

Methods

Data and sample

The Chitwan Valley Family Study (CVFS) is a multilevel panel study with a general population sample of 151 neighborhood (community) clusters (5-15 households) and more than 10,000 individuals. In 1996, CVFS collected baseline household and individual interviews for all households and individuals in selected sites. Since that time, monthly migration data has been collected in a household registry for all study participants. CVFS features full lifetime migration histories for all individuals enrolled in the study, including specific dates and destinations. CVFS has followed all migrants after leaving the study area, including out-migrants in 53 other countries (Axinn 2015). When a child's parents migrate, CVFS maintains complete information on children remaining in the household of origin, as well as on parents while they are living away. CVFS uses Neighborhood History Calendars (NHC) to document neighborhood-level change since the beginning of settlement in the area in the 1950s, including calendars designed to capture features of health services and schools in the study area. In 2016, CVFS collected anthropometric measurements, immunization records, and other health data for children under five, the focus of the present study. At the time of interview, children's height and weight were measured by a trained nurse or interviewer using standardized equipment and protocols.

This analysis includes 940 children under five years of age with complete anthropometric data. These children live in 786 households across 149 neighborhoods in the study area. Children are linked to their mothers and fathers through a household relationship grid. Current neighborhood of residence is identified through the household registry.

Measures

The primary outcome measures are dichotomous measures of stunting (height-for-age), wasting (weight-for-height), and underweight (weight-for-age). Stunting is a measure of chronic malnutrition, while wasting is a measure of acute malnutrition. I calculate the number of standard deviations that children under five fall above/below the WHO reference population for their age and sex (World Health Organization and UNICEF 2009). Children are considered stunted, wasted, or underweight if their z-score is more than two standard deviations below the mean of a global reference population for their age in months and sex for each measure, respectively.

The primary independent variable of interest is paternal international labor migration. In the current analysis, I refer to paternal out-migration as migration to any international destination by a child's father for a period of at least one month during the child's lifetime, a measure successfully used in other CVFS studies (Massey et al. 2010; Williams et al. 2012). Although a majority of

CVFS out-migrants report labor as their primary motivation for migration, here I do not restrict by motivation.

A number of child and household socio-demographic characteristics are included in the analysis. These include children's age (years), sex (male vs. female), ethnicity (Brahmin/Chhetri, Hill Janajati, Dalit, Newar, Terai Janajati, other), maternal and paternal education (HOW), household wealth lagged one year (quintiles derived from a principal components analysis of housing characteristics, land and livestock ownership, and possession of durable goods, with an additional category for missing wealth information), and whether the household experienced any food insecurity in the preceding year.

Current models include measures of two types of community-level characteristics, distance to services and presence of groups. Distance to service measures capture community infrastructure, while measures of presence of groups provide a measure of social capital in the community. Specifically, community-level measures include: minutes to nearest school, minutes to health facility, minutes to nearest bus service, minutes to bank, minutes to money transfer, number of women's groups, number of savings and credit clubs, and number of other groups. Distance measures are rounded to five-minute intervals, and all community level controls are lagged by one year.

Analysis

I estimate adjusted odds of stunting, wasting, and underweight in a set of mixed-effects regressions, where child, parent/household, and community characteristics are entered as fixed effects, with a random effect for neighborhood of residence. Nutritional outcomes within neighborhoods are likely to be correlated depending on agricultural yields and the proximity of markets, other food sellers, and health services. However, given that few children in the sample live in a household with another child under five, I do not include a random effect for household. For brevity, I present results for wasting. These analyses use a measure of father's current migration, which would be most likely to affect short-term, or acute malnutrition; a longer-term measure of migration exposure with correct temporal ordering is most appropriate to assess the relationship between parental migration and chronic malnutrition.

All models include a measure of parental international migration and controls for child's age (years) and sex. I then add controls for child, parent, and household characteristics, as described above. Next, I test whether and how two types of community characteristics influence children's odds of malnutrition by migration status. I add community infrastructure and social capital measures in separate models, and finally in a combined model.

Importantly, the results presented here do not account for temporal ordering of migration and community change, nor do they address potential sources of endogeneity. Therefore, the planned next step in this analysis is to conduct an analysis using marginal structural models (MSMs) with inverse-probability of treatment weights (IPTWs) in order to address potential endogeneity in the relationship between parental migration, community context, and child health. Marginal structural models appropriately account for time-varying confounders to address confounding that arises from common causes of the exposure and outcome (Robins, Hernan, and Brumback 2000), such as those related to migration and community context. MSMs can be used to model average causal effects of time-varying exposures (i.e., parental migration) on outcomes (i.e., child nutritional status), using IPTWs to adjust for the over- or under-representation of parents who have and have not migrated out based on observed covariates that are also associated with the child health outcomes of interest. IPTWs create a pseudo-population with balanced exposed and unexposed samples with the same overall distribution of covariates, mimicking randomized assignment to the exposure. With this modelling strategy, the estimated effects of parental out-migration on child health should no longer be influenced by the confounding community-level variables (Hernán and Robins Forthcoming).

Preliminary results

Children in the sample have a mean age of 2.0 years (SD=1.4); 55.4% are boys (Table 1). Mothers have a mean educational attainment of 8.9 years (SD=3.8), while fathers' educational attainment is slightly higher (mean=9.9 years, SD=6.8). Households with young children tend to be wealthier on average when compared to the full sample, although 37.2% of children live in a household that experienced any degree of food insecurity in the preceding year. In terms of community characteristics, communities are closest to bus stops and markets, and farthest from banks. The mean distance to the nearest health facilities is 11 minutes walking (SD=9.2). Examining health outcomes, 33.2% are stunted, 9.9% are wasted, and 15.6% are underweight.

Among all children under five, 26.8% have a father who is currently migrated internationally. Compared to non-migrant households, households sending an international migrant are wealthier (p=0.007). However, migrant and non-migrant households do not differ significantly in their proximity to community infrastructure, nor in their likelihood of living in communities with more social groups.

Turning to the mixed-effects regression results (Table 2), I find having a father who is an international migrant is marginally associated with lower odds of acute malnutrition, adjusted for age and sex (Model 1). In all models, older children have significantly lower odds of acute malnutrition. In a model that adds individual, parent, and household characteristics, children's risk of acute malnutrition increases significantly with each additional sibling; Terai Janajati children, a minority group, are also at significantly higher risk of acute malnutrition. The addition of the additional individual, parent, and household controls in Model 2 attenuates the effect of father's international migrant on children's risk of acute malnutrition. Model 3 adds community-level variables related to distance to community services; however, of these, only distance to the nearest bus stop is statistically significant. In Model 4, community-level variables associated with social networks are added; none are significant. The final model includes all variables (Model 5). The addition of both sets of community-level variables does not influence the magnitude or direction of the association of paternal international migration with acute malnutrition.

Preliminary Conclusions and Next Steps

In the coming months, I will continue to refine and improve models, in particular by testing alternate ways of coding exposure to migration, such as minimum durations of three or sixth months, and testing whether effects vary by destination (such as India versus Gulf States). I will also explore alternate ways of coding community-level characteristics, including geo-weighted models of access to health and community services, an approach used in other CVFS analyses that may better capture the landscape of services, particularly for health (Brauner-Otto et al. 2007). I will expand the number and type of community controls tested to include measures of demographic characteristics and migration patterns. Additionally, I will explore how controls for additional household and parent characteristics, such as living arrangements, affect models.

As noted above, I will estimate a series of marginal structural models to deal with potential endogeneity in the relationship between parental migration, community context, and child health. I will supplement these estimates with sensitivity analyses to identify how varying levels of unmeasured confounding may affect estimates.

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Table 1. Characteristics of children under five (N=940).

	International migrant		Non-migrant		Total	
	N	**%**	**N**	**%**	**N**	**%**
Total	252	26.8	688	73.2	940	100
Mean age in years (SD)	2.3 (1.4)		1.9 (1.4)		2.0 (1.4)	
Child sex						
Male	136	54.0	385	56.0	521	55.4
Female	116	46.0	303	44.0	419	44.6
Household wealth quintile						
Poorest	24	9.5	129	18.8	153	16.3
Poor	35	13.9	104	15.1	139	14.8
Middle	38	15.1	104	15.1	142	15.1
Rich	60	23.8	118	17.2	178	18.9
Richest	61	24.2	164	23.8	225	23.9
Missing	34	13.5	69	10.0	103	11.0
Household is food insecure	81	32.1	269	39.1	350	37.2
Mean number of siblings (SD)	6.0 (1.8)		5.0 (1.9)		5.2 (1.9)	
Ethnicity						
Brahmin/Chhetri	113	44.8	274	39.8	387	41.2
Hill Janajati	57	22.6	128	18.6	185	19.7
Dalit	41	16.3	90	13.1	131	13.9
Newar	8	3.2	51	7.4	59	6.3
Terai Janajati	33	13.1	145	21.1	178	18.9
Mother's education in years (SD)	9.1 (3.4)		8.8 (3.9)		8.9 (3.8)	
Father's education in years (SD)	9.8 (2.8)		9.5 (3.8)		9.5 (3.6)	
Mean distance in walking time to nearest community services (SD)						
School	7.3 (4.8)		7.9 (5.0)		7.7 (5.0)	
Health facility	11.4 (9.9)		10.9 (8.9)		11.0 (9.2)	
Bus stop	2.3 (3.4)		2.6 (3.6)		2.6 (3.6)	
Bank	30.9 (22.8)		30.2 (25.7)		30.4 (24.9)	
Money transfer	18.5 (14.3)		17.4 (13.3)		17.7 (13.6)	
Market	5.5 (6.1)		5.6 (6.7)		5.5 (6.5)	
Mean number of social groups in community (SD)						
Women's groups	3.0 (1.7)		2.9 (1.8)		3.0 (1.8)	
Savings & credit groups	0.6 (1.0)		0.6 (1.1)		0.6 (1.1)	
Other groups	1.5 (1.5)		1.6 (1.5)		1.6 (1.5)	

Table 2: Mixed-effects regression models of log odds of acute malnutrition among children under five (N=940).

	Model 1	Model 2	Model 3	Model 4	Model 5
	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)
Father is international migrant	-0.57^{+} (0.31)	-0.47 (0.32)	-0.43 (0.32)	-0.48 (0.32)	-0.23 (0.32)
Child's age (years)	-0.37*** (0.09)	-0.44*** (0.10)	-0.46*** (0.10)	-0.44*** (0.10)	-0.46*** (0.09)
Child is female	0.14 (0.24)	0.28 (0.25)	0.28 (0.25)	0.28 (0.25)	0.28 (0.25)
Mother's education (years)		-0.01 (0.05)	-0.01 (0.05)	-0.01 (0.05)	-0.004 (0.05)
Father's education (years)		-0.03 (0.05)	-0.02 (0.05)	-0.03 (0.05)	-0.03 (0.05)
Wealth: poorest (*vs. richest*)		-0.32 (0.47)	-0.42 (0.47)	-0.33 (0.47)	-0.43 (0.48)
Wealth: poor (*vs. richest*)		-1.01^{+} (0.52)	-1.03* (0.52)	-1.03^{+} (0.52)	-1.05* (0.52)
Wealth: middle (*vs. richest*)		0.04 (0.42)	-0.11 (0.42)	-0.01 (0.42)	-0.12 (0.42)
Wealth: rich (*vs. richest*)		0.29 (0.37)	0.22 (0.37)	0.30 (0.37)	0.23 (0.37)
Wealth: missing (*vs. richest*)		-0.21 (0.49)	-0.11 (0.48)	-0.22 (0.49)	-0.13 (0.49)
Household is food insecure		-0.33 (0.28)	-0.33 (0.28)	-0.34 (0.28)	-0.34 (0.28)
Child's number of siblings		0.35** (0.13)	0.36** (0.13)	0.35** (0.13)	0.37** (0.13)
Ethnicity: Hill Janajati (*vs. Brahmin/Chhetri*)		-0.82^{+} (0.43)	-0.76^{+} (0.43)	-0.82^{+} (0.43)	-0.75^{+} (0.43)
Ethnicity: Dalit (*vs. Brahmin/Chhetri*)		-0.26 (0.45)	-0.22 (0.45)	-0.28 (0.46)	-0.24 (0.45)
Ethnicity: Newar (*vs. Brahmin/Chhetri*)		-1.13 (0.79)	-1.03 (0.79)	-1.13 (0.79)	-1.03 (0.79)
Ethnicity: Terai Janajati (*vs. Brahmin/Chhetri*)		0.85* (0.40)	0.84* (0.39)	0.84* (0.40)	0.83* (0.39)
Community distance to nearest school			0.02 (0.03)		0.02 (0.03)
Community distance to nearest health facility			-0.02 (0.02)		-0.01 (0.02)
Community distance to nearest bus stop			0.10* (0.04)		0.10* (0.04)
Community distance to nearest bank			-0.004 (0.01)		-0.004 (0.01)
Community distance to nearest money transfer			0.02 (0.02)		0.02 (0.02)
Community distance to nearest market			-0.04 (0.03)		-0.04 (0.03)
Community number of women's groups				-0.01 (0.09)	0.01 (0.08)
Community number of savings/credit groups				-0.08 (0.15)	-0.05 (0.14)
Community number of other groups				-0.03 (0.11)	-0.01 (0.11)
Community-level variance	0.56 (0.32)	0.60 (0.38)	0.40 (0.33)	0.59 (0.38)	0.39 (0.33)
Constant	0.17	-1.74	-2.10	-1.63	-2.05
Log likelihood	-287.95	-266.61	-261.87	-266.39	-261.794

***p<0.001, **p<0.01, *p<0.05, $^{+}$p<0.10