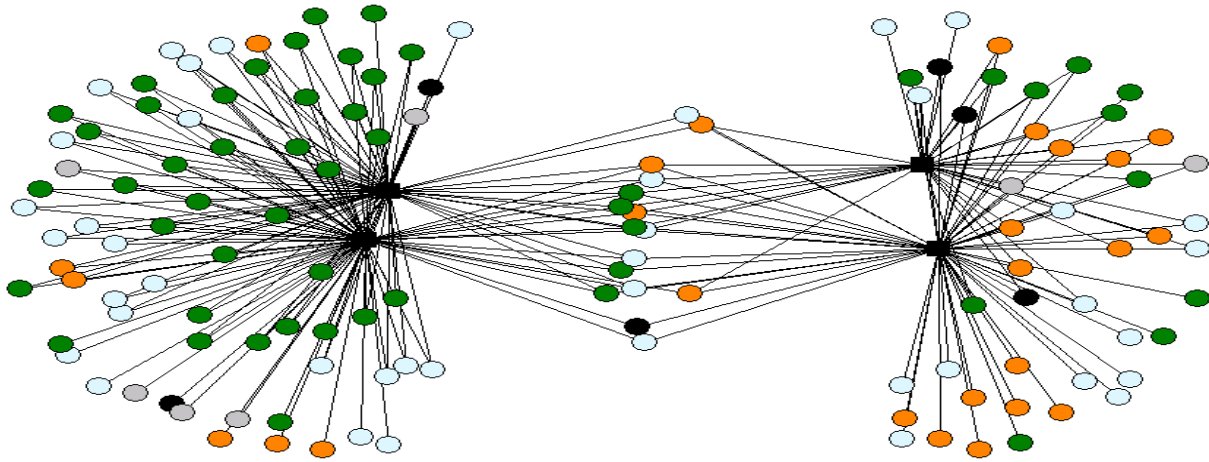


Ties, Transfers, and Health: Salience of centrality and complexity in Malawian kin networks

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ABSTRACT

Kin networks have been linked to a myriad of health outcomes, yet more research is needed to identify the underlying mechanisms and how they operate in sub-Saharan Africa. Here, we leverage unique data from the Family Transfers Project (FTP) to evaluate how the flow of two forms of transfers, services and gifts (non-monetary and monetary), in kin networks are connected to health in rural Malawi. First, we examine the stream of transfers and model 2-mode kin networks. Second, we predict self-rated health with quantifiable transfers of time and gifts (i.e. valued degree) and relational (i.e. eigenvector) support. Third, we use an innovative measure of complexity to determine the importance of diversity of transfer type for health. Preliminary analyses point to a striking patterning of transfers by lineage and the salience of centrality in kin networks, which matters more than amount of time or monetary value of net transfers.

Key words: Kin transfers; 2-mode network; Health; Malawi; sub-Saharan Africa

BACKGROUND

Kin support plays a crucial role in areas of the developing world grappling with economic instability, a lack of infrastructure, and a weak or virtually non-existent welfare state. This is particularly true in Malawi, located in southeastern sub-Saharan Africa, which has one of the lowest rankings on the UN Human Development Index (151st of 162nd, (UNDP 2001)). In this context of high mortality, economic vulnerability, and limited state support, extended kin play a major role in buffering against economic shocks, providing social support, and protecting against poor health outcomes. The structure of kinship makes visible the connections between macro-level demographic processes and normative social arrangements (Lam and Marteleto 2008; Verdery 2015; Weinreb 2002), which in turn have significant consequences for health outcomes. In this paper, we focus on the flow of two forms of transfers – services and gifts (non-monetary and monetary) – in kin networks. Using innovative 2-mode network measures, we seek to identify the relative importance for self-rated health of (1) the amount of time and monetary value transferred; (2) the structure of exchanges, i.e. position in the 2-mode network measured via eigenvector centrality; and, (3) the complexity of kin network-based transfers.

The importance of social interactions and the distinctions between kin and non-kin relationships were recognized by early theorists, such as Émile Durkheim, as powerful predictors of health and well-being (Berkman et al. 2000; Durkheim 1893/2014; Durkheim 1897/1997). In more recent decades, computational advances set off a flurry of research from this perspective, which has deepened our understanding of how social networks predict many health behaviors and outcomes (Felmlee and Faris 2013). The relationships, or ties, connecting people have consequences across multiple dimensions of health including obesity (Christakis and Fowler 2007; Trogdon, Nonnemaker, and Pais 2008), smoking behaviors (Christakis and Fowler 2008; Haas and Schaefer 2014; Schaefer, Haas, and Bishop 2012), stress (Cohen and Wills 1985), infections and infectious disease (Cohen et al. 1997; Hellingner and Kohler 2007; Klovdahl 1985), depression (Holahan et al. 1997; Holahan and Holahan 1987; Rosenquist, Fowler, and Christakis 2011), and mortality (Blazer 1982; Giles et al. 2005; Stringhini et al. 2012; Sugisawa, Liang, and Liu 1994). These findings suggest that it is not just the existence of the tie that matters for health, but also the characteristics of these ties and the flow of both material and non-material resources in networks.

Kin, or family, networks represent a special kind of network. Family ties are usually considered to be “strong” ties (Granovetter 1973) given the “relative permanence” and “affective nature” of relationships with relatives (Verdery 2015: 4). In rural sub-Saharan Africa, kin networks are highly salient given that members of the immediate and extended family comprise a substantial proportion of one’s social network. Gifts, both monetary and non-monetary, are a common form of transfers among kin. *Monetary transfers* of income can be conceptualized as behaviors that denote solidarity with family members, especially among rural, economically insecure households (Shapiro, Simons, and Tambashe 1995). Scholars find that a majority of remittances are transferred within the nuclear family (Knowles and Anker 1981), and as many as 89 percent of households give remittances equivalent of up to one-fifth of their income (Rempel and Lobdell 1978). Almost a quarter of the incomes of some households consist of remittances (Collier and Lal 1984) although these monetary transfer networks are becoming increasingly reciprocal (Potter and Handcock 2010). These transfers support families are important in many areas including educational outcomes (Trinitapoli, Yeatman, and Fledderjohann 2014).

In addition to monetary support, it is vital to recognize that quantifiable exchanges, while easiest to measure, do not fully capture the ways that other resources flow in kin networks. The gifting and receipt of goods should also be considered a form of transfer, as *non-monetary gifts* represent a significant portion of total transfers in some contexts (Adamchak et al. 1991; Mtika 2003). Lastly, transfers of *services* from one family member to another represent the third form we examine in our analysis. Existing studies show that the intergenerational transfer of services (e.g., from parent to child, or adult child to parent) occur more frequently than lateral transfers of services (Weinreb 2002). These exchanges of time may be particularly important in families with more severe financial constraints.

Viewing these transfers from a social network perspective, individuals can be understood as embedded in 2-mode family networks that provide a framework for reference and help to shape

individuality (Breiger 1974: 181). While network approaches typically rely on the ‘canonical’ one-mode data set, often with a person-by-person matrix, Borgatti and Everett contend that the distinction between network and non-network data is far from clear-cut; any set of 2-mode data can be used when there is a connection that is ‘relational in spirit’ (Borgatti and Everett 1997). Two-mode networks, also known as affiliation or bipartite networks, are particularly useful for examining the nature and meaning of specific kin ties (Gauthier and Moody 2014). With 2-mode data, it can be conceptually useful to distinguish between relational states, or ‘consistently persistent relationships,’ versus relational events, such as transactions, which may connect individuals only momentarily (Borgatti, Everett, and Johnson 2013: 4). Our analysis focuses on the transfer of services and gifts, or a relational *event*. At the same time, we theoretically extend this idea to encompass relational *states*. Because the people involved are closely related, it is likely these transactions represent just one slice of time of what is an ongoing exchange of information, emotional and social support, time and/or resources.

RESEARCH QUESTIONS

RQ1. What do 2-mode kin networks look like and to what extent are transfer flows reciprocal versus unidirectional?

RQ2. Does relational centrality (i.e. eigenvector centrality) in a kin support network predict health better than the amount of time and monetary value (i.e. valued degree) transferred?

RQ2. How are network characteristics, specifically complexity and differentiation, associated with self-rated health?

STUDY CONTEXT & DATA

Data used here come from the Malawi Family Transfers Project (FTP), collected between June and August 1999, and wave 1 of the Malawi Diffusion and Ideational Change Project (MDICP), collected a year earlier. At the time of data collection, the southeastern sub-Saharan African country of Malawi, had a population of around 11 million (United Nations 2001), a low GDP (World Bank 2001), and high HIV/AIDS prevalence (UNAIDS 2000). High mortality, coupled the dearth of economic opportunity and a lack of government policies, generates an environment where receipt and giving of kin transfers are crucial for survival and health (Weinreb 2006). The FTP project focuses on three rural areas in Malawi. Using the first wave of the Malawi Diffusion and Ideational Change project, the researchers drew a cluster sample and interviewed 723 women (ever married; less than 50 years old). Response rates were relatively high with 84.5 percent of women completing interviews (Weinreb 2006).

The FTP project represents a nontraditional source of network data which we treat as bipartite or bimodal network data. Our analytic sample consists of 150 women, as we restrict our network to women with still-living mother, father, mother-in-law, and father-in-law to avoid problems of censoring. We operationalize transfers as follows: First, *non-monetary gifts* are gifts given to or from the kin since the beginning of the last growing season (e.g., a plate of rice or a piece of clothing). Second, *monetary gifts* are defined as gifts of money given to or received from kin. Third, *services* are defined by responses to what were “the most important things that you spent time on helping your ____ [or ____ helping you] in the last month?” We collapsed and coded these services into eight mutually exclusive categories (i.e., cooking, housework, agriculture, food production, childcare, collecting fuel, fetching water, and house building/repair) based on the most common helping behaviors reported. We also include the number of person hours and the monetary value (in Malawian Kwacha) of gifts given/received. Respondents were asked about these three types of transfers to and from mother, father, mother-in-law, and father-in-law. The data collection design, while including cousins, aunts, and uncles in the survey, constrains us to looking at parents and in-laws as respondents provide detailed information on the transfer of services. With this approach, we gain nuance, although it is possible we underestimate network complexity. Yet significant results will indicate that even at a potentially under-measured level of complexity, kin support matters for health. Support represents the ties or ‘edges’ in this two-mode dataset, whereas ‘nodes’ are kin and respondents (centrality network) and kin and type of transfer (complexity network). We use the 2-mode network commands in UCINET6 and Netdraw.

METHODS

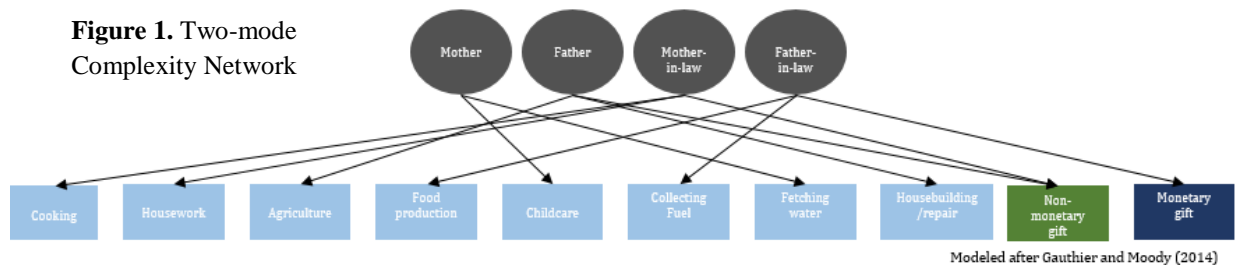
Our analyses proceed in three parts. First, we examine the pattern of transfers and model the structure of respondents' kin networks in relation to transfers in the form of services and gifts, both non-monetary and monetary. Second, we predict self-rated health [10 = no health problems at all] with quantifiable transfers of time and gifts (i.e., valued degree) and with relational (i.e., eigenvector) support. Third, we use an innovative measure of complexity and differentiation to determine the importance of diversity of transfer type for health. As seen in Table 1, below, the family support centrality network identifies type of kin as Mode A and the respondents as Mode B. To measure centrality we use valued degree, defined as the transfer amount in person-hours or kwacha (the local currency), and eigenvector centrality, which measures the centrality of a node based on the centrality of the nodes it is connected with. In a two-mode network, a respondent's eigenvector centrality is the sum of the centralities of the family members who provide him/her with support, normalized by the square root of 1 over 2 times the size of the mode the node belongs to (Borgatti and Everett 1997).

Table 1. Modes and Measures in Centrality and Complexity Kin Networks

	Mode A	Mode B	Measures
Centrality Network	Type of family member	Respondent	Valued degree, Eigenvector centrality
Complexity Network	Type of family member	Type of support	Complexity, Differentiation (Gauthier & Moody 2014)

The complexity network model is cutting edge and innovative, as it allows us to explore kin support roles and diversity of support as individual level characteristics. The family support complexity measure treats type of kin as Mode A and type of support as Mode B (see Table 1, above). Gauthier and Moody define complexity for each respondent as “the average number of unique activities [support] they report doing with each alter” (2014: 89). Further, we generate a weighted complexity measure, taking into account person-hours and monetary value. Also modeled after Gauthier and Moody (2014), we include a measure of differentiation ranging from 0 to 1, with 0 representing a support network where all family members provide the same types of support and 1 signifying a support network in which all family members provide a different form of support to the respondent. In this way, we generate a complexity and differentiation score for each respondent based on their individual two-mode network. Figure 1, below, shows a respondent's two-mode support network. Each family member can transfer a maximum of two services (light blue), in addition to a non-monetary gift (green) and a monetary gift (dark blue) for a total of 4 possible transfers per kin member.

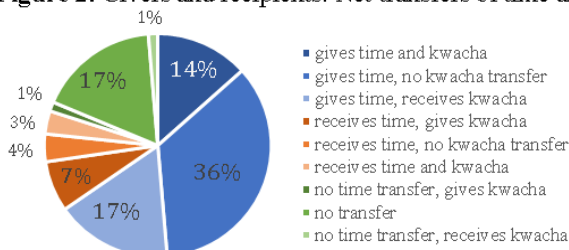
Figure 1. Two-mode Complexity Network



PRELIMINARY RESULTS

We begin by examining patterning of transfers and the overall structure of the kin networks. Figure 2, below, provides an overview of our respondents by net transfers.

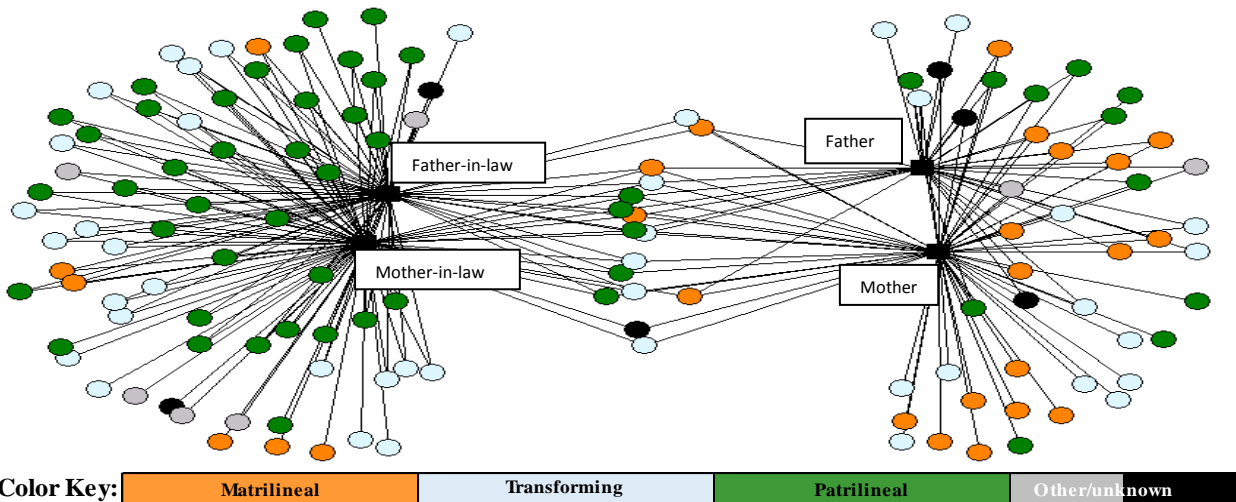
Figure 2. Givers and recipients: Net transfers of time and kwacha



of time; about half of these report no net exchange of kwacha while the other half either receive or give items of value. It is much less common to be a net recipient of time (only 11% total). Just under one-fifth do not report any transfers of either time or valued items (gifts/money).

We next visualize the two-mode network, which makes it possible to see that transfers to and from parents and in-laws represent two unique forms of support. Women tend to group around them and very few are linked to both parents and in-laws. Only 16 respondents receive/give transfers to/from all four kin. About half of the respondents are linked only to one or both in-laws. A substantial number of women are tied only to one or both parents. The colors display lineage (based on groupings by Mtika and Doctor 2002) and we see that a majority of women linked only to their in-laws are of patrilineal or transforming lineage. On the other hand the majority of matrilineal respondents are linked only to their own parents.

Figure 3. Two-mode Kin Transfer Network, existence of any transfer, women only



Further investigating the importance of centrality in the two-mode network we regress valued degree (net kwacha and time transfers) on health (see Table 2, below). Valued degree is not a significant predictor of health, suggesting that the amount transferred is not the driver of health benefits. However, eigenvector centrality (see Model 2) significantly predicts better self-rated health ($p < 0.05$), indicating that relationship centrality in kin transfer networks matters for health. Even when health a year prior is controlled for in Model 3, eigenvector centrality remains a statistically significant predictor of health, speaking to the power of relational centrality within social networks.

Table 2. Predicting health with transfers and relational structure (N = 150)

	(1) net transfers		(2) network centrality		(3) + health last year	
	b	se	b	se	b	se
Kwacha transfer (net)	0.001	0.00				
Time transfer (net)	-0.001	0.00				
Eigenvector centrality			0.141*	-0.05	0.106*	-0.05
Health status last year					0.257***	-0.06
constant	8.093***	-0.17	7.529***	-0.28	5.963***	-0.47
R-squared		0.006		0.043		0.142

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

NEXT STEPS

The next step in our analysis is to calculate network complexity and differentiation and regress these measures on self-rated health. In future models, we will include a number of controls (age, education, marital status, lineage, and others) to test if the significant effect of network centrality and complexity on health holds after controlling for possible confounding variables. The complexity and differentiation measures, to the best of our knowledge, have not yet been used to predict outcomes linked to network support. This paper provides the opportunity to validate these novel 2-mode network measures and gives insight into the roles of kin and structures of family networks in providing transfers meaningful for health.

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