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Sociocultural Factors Shaping Trust and Teamwork among Community Maternal and
Newborn Health Workers in Rural Ethiopia

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Newborn Health Workers in Rural Ethiopia

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An abstract of
A dissertation submitted to the Faculty of the
James T. Laney School of Graduate Studies of Emory University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in Nursing
2013

Abstract

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By Michelle M. Dynes

Task shifting in response to the health workforce shortage has resulted in community-based health workers taking on greater responsibility. Research suggests that collaboration among coworkers increases performance and that trust plays a role in collaboration. Most of this research in health services has taken place in clinics and hospitals in high-income countries. Moreover, little is known about the way trust is conceptualized among health workers in low-resource areas or how to measure trust in these settings. We addressed these gaps by carrying out in-depth interviews with community health workers in rural Ethiopia to better understand their conceptualization of trust, and to develop and test a scale to measure trust among them. We built upon this research by conducting a cross-sectional, social network survey of community health workers in rural Ethiopia to explore the factors shaping teamwork. We employed fractional logit regression modeling to identify the influential factors for work interactions with each cadre of health workers. We also examined the dyadic factors for interactions through analyses of social network data using the Double-Dekker Semi-partialing Multiple Regression Quadratic Assignment Procedure. Formative work uncovered a core set of items that seemed to define trust in the study context—character, communication, and ability—in addition to locally-relevant ways of thinking about trust ('oneness'). In pilot testing, our 10-item *Rural Health Worker Trust Scale* maintained strong internal consistency and the hypotheses to test for criterion and contrasting group validity were upheld. Results of fractional logit modeling revealed that being a Health Extension Worker, a male health worker, and trusting a cadre were important factors for work interactions with all three cadres. Analyses of social network data demonstrated consistently strong evidence across study sites in support of interpersonal trust and training together as important factors for dyad-level interactions. Findings suggest that inter-professional training focused on fostering trust and gender sensitivity, and improving perceptions of health worker motivations, may be particularly effective in promoting collaboration among diverse community health workers. Future research should focus on large-scale, longitudinal studies aimed at understanding how teamwork changes in response to fluctuations in trust, motivations, and gender norms over time.

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Acknowledgements

This work would not have been possible without the kindness of others. I am grateful for the early and on-going involvement and intensive support of my dissertation committee, Dr. Lynn Sibley, Dr. Craig Hadley, Dr. Rob Stephenson, and Dr. Mark Risjord. Their unique perspectives played a significant role in the success of my research and have prepared me well for future multidisciplinary work. I would like to thank my research team in Ethiopia for their dedication, including Habtamu Abesha, Roza Abesha, Fasika Alebachew, Melkamu Bedimo, Lemma Derseh, Getachew Fekade, Woinshet Hailu, Tsehay Negash, Muluken Tesfahun, Yihenew Tesfaye, Netsanet Tsegaye, and Kidanemariam Mekonnen. I would also like to thank the Amhara Regional Bureau of Health and the MaNHEP Ethiopian team who provided logistical support for my research. To Kenny Maes, Jed Stevenson, and Yemesrach Tadesse, I am grateful to you for sharing your keen insight, mad Amharic skills, and love for the people and country of Ethiopia. I greatly appreciate the support of fellow doctoral students who have shared in this crazy process, in particular, Kristin VanderEnde, Debbie Stevens, Priscilla Hall, Erin Ferranti, and Angela Romack. I am deeply thankful for the love and support of my family, Lynn Williams, Rick Williams & family, Molly Holkesvik & family, Rod and Debby Dynes & family, and most of all, my husband, Travis, and children Forest, Amara, and Shen, who were willing to travel to the ends of the earth for me.

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Chapter 1: Introduction

An estimated 350,000 women die annually from complications related to pregnancy and childbirth (Hogan et al., 2010), and 99% of maternal deaths occur in low-resource countries (Hill et al., 2007). An additional 15 million women suffer severe or long-lasting complications resulting from pregnancy and childbirth (Hindin, 2007; Say, Pattinson, & Gülmezoglu, 2004). Although a number of proven interventions exist to lower maternal mortality and improve birth outcomes, a shortage of skilled health workers has slowed progress towards meeting Millennium Development Goal (MDG) 5, to reduce maternal mortality by three-quarters by 2015 (World Health Organization [WHO], 2010).

The health workforce shortage has prompted a shift in some aspects of preventive care from facility-based, skilled providers to lower skilled, community-based health workers (Hongoro & McPake, 2004; Kinfu, Dal Poz, Mercer, & Evans, 2009; WHO, 2007; WHO, 2012). A consequence of drawing on lower skilled individuals is that the health workforce is potentially more diverse. This heterogeneous group may bring with them diverse understandings of health, varying amounts of education and experience, and a range of aspirations and community connections. It is not clear, however, the extent to which this diversity hinders overall health system performance or whether it is a strength, nor is it clear to what extent health workers in lower income settings work together toward a common goal of improving community wellbeing.

The organizational and health services research suggests that collaboration among coworkers increases performance and productivity (Hamilton, Nickerson, & Owan, 2003; Middleton, 2012; Montes, Moreno, & Morales, 2005; Moses & Stahelski, 1999; Woolley,

Chabris, Pentland, Hashmi, & Malone, 2010). Where resources are scarce and demands are high, improvement in health system functioning through collaboration is essential. Thus, understanding what factors promote—or erode—collaborative work among individuals and groups becomes especially important. One factor that emerges in ethnographic, anecdotal, and survey research as a potentially important determinant of teamwork is interpersonal trust (Dirks, 1999; Dirks & Ferrin, 2002; Hadley, Handley, & Stevenson, 2010; Kiffin-Petersen & Cordery, 2003). The majority of research on trust and teamwork, however, has taken place in clinic or hospital settings in mid- and high-income countries. Interpreting the available research from these healthcare settings provides some insight; however, more research is needed in low-income, rural areas where the factors for trust and teamwork may (or may not) differ.

The focus of the current research is on factors that shape teamwork among community health workers in rural Ethiopia. In this introductory chapter, we review the theoretical and empirical evidence regarding trust and teamwork. We discuss the aims of our research on trust and teamwork and then situate it in the context of maternal and newborn health (MNH) care provision in rural Ethiopia. Finally, we describe the linkages between the three papers included in this research.

Theoretical perspectives on cooperation and trust

Bowles and Gintis (2011) define cooperation as "engaging with others in a mutually beneficial activity" (p. 5). The issue of cooperation and competition has been a major concern in social science research for decades (Bowles & Gintis, 2011; Gintis, Bowles, Boyd, & Fehr, 2005; Henrich et al., 2005; Henrich & Henrich, 2007; Leeson, 2006). Seabright (2010) describes how social cooperation, stemming from institutions, or

sets of rules for social behavior, makes life among strangers not only survivable, but also appealing. Even in the absence of formal institutions, Leeson (2006) contends that heterogeneous groups are able to engage in peaceful interaction through shared customs and practices. Moreover, the human propensity to cooperate has been frequently demonstrated in game theory using an array of laboratory-based social dilemmas (Axelrod, 2006; Berg, Dickhaut, & McCabe, 1995; Burks, Carpenter, & Verhoogen, 2003; Fehr, Fischbacher, & Gächter, 2002), though variation in cooperative behavior has been noted across cultural and social groups (Henrich, 2000; Henrich et al., 2005).

Cooperation is commonly discussed in conjunction with the concept of trust because an individual must trust or believe that another individual will not take advantage of his or her efforts. Seabright (2010) states, "participants [of cooperative societies] need to be able to trust each other—especially those they do not know…as the cost of misplaced trust can be high" (p. 7). The realm of healthcare is one area where both cooperation and trust are essential to teamwork and effective delivery of care (Gilson, 2003). For example, effective healthcare systems rely on coordination and collaboration within structural levels and between workers at different structural levels, from community health posts and health centers, to district and regional hospitals. A lack of trust between healthcare professionals at different levels of the health system, and among members of healthcare teams at the same level (Blackmore & Persaud, 2012), may cause poor communication and interfere with patient care and referrals, leading to potentially detrimental effects on patient health outcomes.

The social milieu of healthcare systems

Baer, Singer, and Susser (2003) define a healthcare system as "the social relations that revolve around the healer and his/her patient" (p. 9); this definition draws attention to the relational aspect of healthcare. In the context of medical pluralism, socially and culturally embedded health system structures can either exist in cooperation or competition with one another (Baer, 1995). The concept of "epistemic inferiority" that exists within the patient-provider relationship is similarly applicable to the asymmetric power relationships among health workers at different levels of the health system (Grimen, 2009). Many local health systems in low-resource settings are built upon the necessity and expectation, if not assumption, that heterogeneous groups of community health workers will work together effectively. Trust may be one factor that influences the level of cooperation diverse health workers are willing to engage in.

Trust theory

The way trust is defined and measured has roots in two broad theoretical traditions—behavioral and psychological—as described by Lewicki, Tomlinson, and Gillespie (2006) in their review of interpersonal trust models. The *behavioral approach* defines trust in terms of choice behavior with the assumption that there are rational choices at hand (Hardin, 1993). Hardin (1993) describes trust from the perspective of "street level" epistemology; a person can decide to trust another person based on past experiences in similar situations. Within this perspective, trust is measured by cooperative behaviors, often in the context of experimental games where behaviors can be directly observed (Lewicki et al., 2006).

The psychological tradition includes three distinct conceptualizations of trust (Rousseau, Sitkin, Burt, & Camerer, 1998). The *unidimensional approach* defines trust as confident expectations and/or a willingness to be vulnerable based on positive expectations, taking into consideration cognitive, affective, and behavioral intention elements (Mayer, Davis, Schoorman, 1995; Rousseau et al., 1998). Within this tradition, trust is measured by scale items where trust and distrust are conceptualized as opposites of a single dimension (Lewicki et al., 2006). In contrast, within the *two-dimensional approach,* trust is measured by scale items from low to high where trust and distrust are distinct constructs that can vary independently. The third conceptualization of trust in the psychological tradition is *transformational* trust. Trust develops and changes over time and is influenced by expected costs and benefits, knowledge, and the degree of shared values and identity (Lewicki & Bunker, 1996; Shapiro, Sheppard, & Cheraskin, 1992). Within this approach, trust is measured by scale items where it is rated along qualitative indicators at different trust stages (Lewicki, McAllister, & Bies, 1998).

A great deal of social science literature has been devoted to understanding and measuring trust in social relationships (Boyle & Bonacich, 1970; Butler, 1991; Colquitt, Scott, & LePine, 2007; Larzelere & Huston, 1980). Banfield (1958) was among the first to point to the importance of trust in social relations. He, and subsequent investigators, sought to develop the concept of social capital, which reflects the potential that social groups have to act effectively in their own collective interest (Bourdieu, 1977; Coleman, 1988; Lin, 1999; Putnam, 1995). Within the social sciences, trust is often considered at the interpersonal and societal level (Luhmann, 2000; Orbell, Dawes, & Schwartz-Shea 1994; Rempel, Holmes, & Zanna, 1985; Rotter, 1971), and the act of trusting

incorporates both rational choice and internal psychological states shaped by past experiences (Aguilar, 1984). The degree to which individuals form social relationships is influenced by their willingness to trust people unlike themselves and the level of social uncertainty involved (Yamagishi, Cook, & Watabe, 1998).

Increasing attention has been given to the importance of trust in the healthcare context (Gilson, 2003; Goudge & Gilson, 2005). The discourse surrounding trust in the health sciences, however, has been bounded primarily to the patient-provider relationship (Hupcey, Penrod, Morse, & Mitcham, 2001) of which trust is considered an essential element (Thorne & Robinson, 1988). Patient trust in their healthcare provider, and in the medical profession as a whole, is a significant predictor of continuity of care (Bachinger, Kolk, & Smets, 2009; Hall et al., 2002; Thom Ribisl, Stewart, Luke, & The Stanford Trust Study Physicians, 1999), satisfaction with care (Anderson & Dedrick, 1990; Bachinger et al., 2009; Hall et al., 2002; Thom et al., 1999), adherence to treatment recommendations (Hall et al., 2002; Nguyet et al., 2009; Piette, Heisler, Krein, & Kerr, 2005; Thom et al., 1999), and utilization of preventative services (Musa, Schulz, Harris, Silverman, & Thomas, 2009). Drawing on social theory, Gilbert (1998) argues that trust is manufactured within the social and power relationships of healthcare, and therefore, functions in the context of competition and conflict.

Less is known about trust among healthcare professionals (Calnan & Rowe, 2006a; Calnan & Rowe, 2006b), and few studies describe the correlates and outcomes of healthcare coworker trust. Level of trust among healthcare professionals has been linked to past experiences (Barrera & van de Bunt, 2009), information gathered from colleagues (Barrera & van de Bunt, 2009), acceptance of each other's roles (McDonald, Jayasuriya,

and Harris, 2012), communication patterns (McDonald et al., 2012; Walker & Gilson, 2004), job security (Gilson, Palmer, & Schneider, 2005), and the ability of coworkers to provide culturally appropriate care (Isaacs, Valaitis, Newbold, Black, & Sargeant, 2012). Conversely, issues of trust among health providers have been noted when prior experiences and knowledge is not recognized (Vivian, Marais, McLaughlin, Falkenstein, & Argent, 2009), health workers perceive public mistreatment by supervisors or other unfair management practices (Gilson et al., 2005; Yañez-Gallardo & Valenzuela-Suazo, 2012), practicing in poor working conditions (Gilson et al., 2005), and in times of uncertainty associated with changes in role boundaries within and between healthcare groups (McDonald et al., 2012). Research has also shown that relationship problems within the healthcare environment have negative consequences for health systems such as increasing worker intention to quit (Alexander, Lichtenstein, Oh, & Ullman, 1998) and adversely influencing the implementation of new healthcare programs and strategies (Scott, Mathews, & Gilson, 2012). Taken together, these findings reinforce the importance of understanding the determinants of trust in the realm of healthcare delivery.

The concept of trust has been well developed in the organizational management and applied psychology literature. Within this body of knowledge, trust has been described as evolving over time from conditional to unconditional states of trust, where shared values become the means through which trust is experienced (Jones & George, 1998). Organizational research has demonstrated that high trust among working groups increases worker performance (Colquitt et al., 2007; Dirks, 1999; Dirks & Ferrin, 2002), citizenship behavior (Colquitt et al., 2007), and employee preference for working in teams (Kiffin-Petersen & Cordery, 2003), while low trust is associated with

counterproductive behavior (Colquitt et al., 2007) and increased monitoring of work progress (Strickland, 1958).

Mayer and colleagues (1995) extended earlier definitions of trust by including vulnerability of the trustor as an essential element of trust, writing that trust is "the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (p.712). The Integrative Model of Organizational Trust was developed by Mayer et al. (1995) to reflect this definition (Figure 1). The model stresses the need to consider both the characteristics of the trustor—an individual's propensity to trust—and the perceived characteristics of the trustee—an individual's perception of another's ability, benevolence, and integrity— along with one's perception of risk, when evaluating trust. Development of trust (trust that is felt) is followed by risk-taking in the relationship (trust that is acted upon), which leads to some outcome (Calnan & Rowe, 2006b; Mayer et al., 1995).
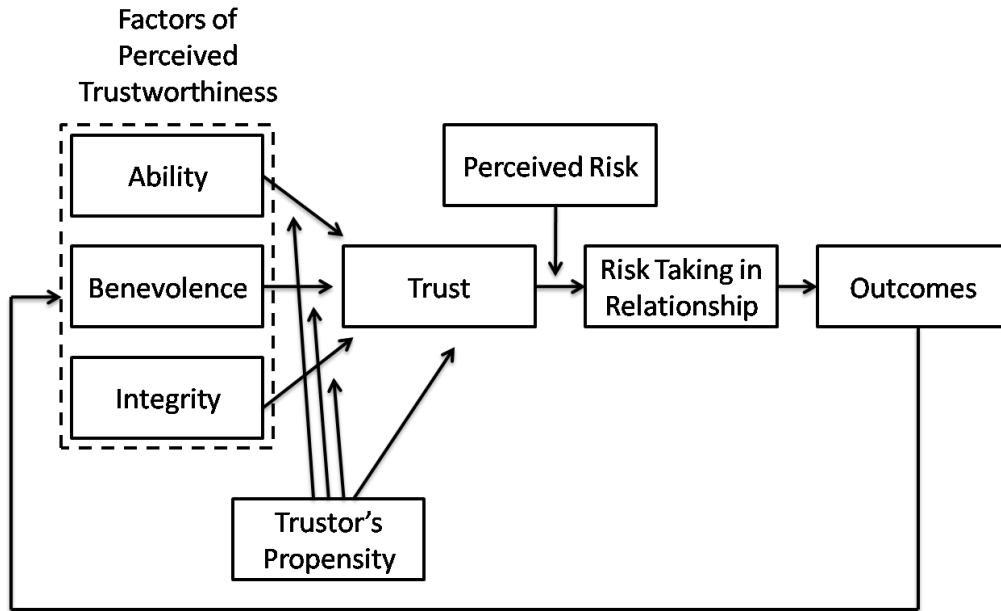
Figure 1. Integrative Model of Organizational Trust (Mayer et al., 1995) (Image

redrawn with permission from the authors).

The Mayer et al. (1995) Integrative Model of Organizational Trust has limitations

in the context of rural community health workers. For example, the Mayer et al. model

does not specify the risk-taking behaviors and outcomes of trusting relationships and does

not consider other factors beyond trust that may influence risk-taking. For the current

research, we apply and build upon Mayer's model in two important ways (Figure 2).

First, teamwork (e.g., knowledge and task-sharing, asking for help) is conceptualized as

the risk-taking behavior of community health workers who trust one another. The

potential downstream outcomes of engaging in teamwork are also identified as follows:

(1) improved health service delivery; (2) increased community trust in health workers and

health seeking behavior; and (3) improved health outcomes.

Second, we hypothesize that trust among community health workers is necessary

but not sufficient for teamwork. Factors thought to be important for teamwork in rural

areas, in addition to trust, are represented in our adapted model—*The Model of Teamwork among Community Health Workers*—and described below. These factors, based on evidence from the literature and on knowledge of the local context, include geographic proximity, health worker motivations, past group work/training, the social, cultural, and political context, demographic characteristics, and competing demands on time. The potential mediating role of trust and the outcomes of teamwork (depicted by dotted lines/arrows) are included in the model, though they are beyond the scope of the current research.
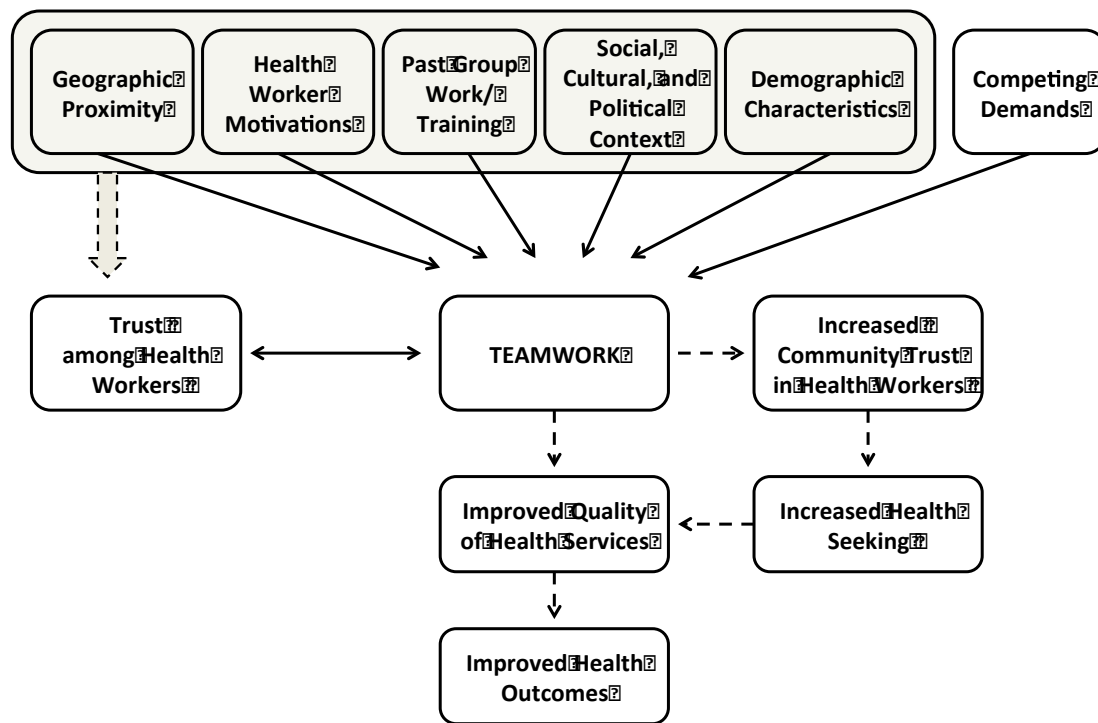
Figure 2. Conceptual *Model of Teamwork among Community Health Workers*.

Additional factors predicted to influence teamwork

   Geographic proximity. Close proximity is thought to facilitate communication among working colleagues because (1) it takes less effort to communicate; (2) increases planned and spontaneous face-to-face communication among team members; (3) allows first-hand observation of team members' progress; and (4) promotes awareness of team members' knowledge and skills to allow the team to draw on strengths of each member (Hoegl & Proserpio, 2004). Research has demonstrated that proximity of team members enhances information transaction (Cook, Gerrish, & Clarke, 2001), communication (Hoegl & Proserpio, 2004), coordination (Hoegl & Proserpio, 2004), mutual support (Cook et al., 2001; Hoegl & Proserpio, 2004), effort (Hoegl & Proserpio, 2004), and cohesion (Hoegl & Proserpio, 2004), while reduced proximity decreases the probability of communication (Allen, 1970) and results in less integration with the team (Xyrichis & Lowton, 2008). Proximity takes on particular significance in the context of rural communities, and in the absence of access to motorized transportation, where health workers may have to negotiate difficult terrain on foot to engage in teamwork.

   Health worker motivations. Brief and Motowidlo (1986) define *pro-social behaviors* as "positive social acts carried out to produce and maintain the well-being and integrity of others". While health worker motivation is not a novel topic in the health literature (Franco, Bennett, & Kanfer, 2002; Maes, 2012; Willis-Shattuck et al., 2008), the relationships between personal motivations, perception of fellow health workers' motivations, and the willingness to engage in teamwork has been comparatively ignored. Health workers may be less inclined to initiate or sustain interactions with fellow health workers perceived to be motivated to do health work by self-serving reasons as compared

to those perceived to be motivated by "pro-social" reasons. Health worker motivations may have particular relevance for teamwork among paid and volunteer health workers at the local health system level.

Previous training/group work. Team building exercises and training using various strategies have demonstrated effectiveness in increasing teamwork among health professionals in western settings (Capella et al., 2010; Hobgood et al., 2010; Nadler, Sanderson, Van Dyken, Davis, & Liley, 2011; Shapiro et al., 2004; Siassakos et al., 2011). Common experiences gained through training and group work help to strengthen interpersonal relationships and foster trust. Moreover, training likely increases confidence in fellow health worker's ability, which may increase their willingness to share knowledge and skills in the future. Inter-cadre training and group work may be especially salient for teamwork in rural contexts where health workers may have limited knowledge of the roles and responsibilities of other cadres.

Social, cultural, and political context. Hofstede (1980) describes culture not as a characteristic of individuals, but rather the collective mental programming that is shared by groups of people and sets them apart from other groups. Culture is formed and reinforced within the institutions in which people live, spanning gender, economic, and familial structures and religious, political, and voluntary organizations, among others (Hofstede, 1980). For example, groups of people from individualistic traditions tend to display competitive behavior, while groups from collectivist cultural traditions display more cooperative behavior (Cox, Lobel and McLeod, 1991). The development of professional culture within the organization of healthcare institutions can similarly create barriers to teamwork resulting from class differences, gender issues, and the need to

define group identity and values (Hall, 2005). Moreover, culture is thought to influence the propensity of individuals to trust strangers (Sully de Luque & Javidan, 2004) and people unlike themselves (Bjørnskov, 2006), to engage in voluntary associations (Uslaner & Conley, 2003), level of 'uncertainty avoidance' (Hofstede, 1980; Sully de Luque & Javidan, 2004), and one's perception of characteristics of trustworthiness (Doney, Cannon, & Mullen, 1998).

Social and demographic characteristics. Based on the principle of homophily, social and demographic similarities strengthen social relations (Ibarra, 1992; Marsden, 1988; McPherson, Smith-Lovin, & Cook, 2001). Ibarra (1993) writes that "interpersonal similarity increases ease of communication, improves predictability of behavior, and fosters relationships of trust and reciprocity" (p. 61). McPherson and colleagues (2001) describe the potential negative implications of homophily, stating, "homophily limits people's social worlds in a way that has powerful implications for the information they receive, the attitudes they form, and the interactions they experience" (p. 415). These consequences may have added significance for rural health workers where collective knowledge is limited to within-group information and interaction between cadres is minimal.

Although the principle of homophily appears to be the norm in many social situations, evidence in the literature also suggests counter examples. Research has demonstrated that team members have a greater tendency to retrieve and allocate information across organizational positions than through peer-to-peer interactions (Su, Huang, & Contractor, 2010), and ethnic minorities have more heterogeneous networks with respect to instrumental ties associated with mentoring and advice seeking (Ibarra,

1995). Furthermore, in many cultures, both men and women tend to access males more frequently than females when trying to accomplish tasks and gather new information (Bernard, Killworth, Evans, McCarty, & Shelley, 1998). Based on the concept of the strength of weak ties (Granovetter, 1973), health workers may be able to access a wider range of resources by interacting with members of cadres at different social structural positions than their own.

Competing demands. Competing demands on time are thought to prevent health workers from carrying out health worker duties and/or engaging in teamwork because they limit one's ability to interact or to interact effectively, regardless of levels of trust. When task demand is high, two individuals may be unable to form a cooperative team simply because they lack the time to do so. For example, Nagpal and colleagues (2011) found that fragmentation of information processes was explained by competing demands on recovery room nurses. In a qualitative study of pharmacists in the United Kingdom, respondents reported the need to balance values and competing obligations when interacting with fellow health providers (Benson, Cribb, & Barber, 2009). Moreover, interference of work with family life among physicians in Germany was significantly correlated with higher rates of burnout, stress, and intention to leave the job (Fuss, Nübling, Hasselhorn, Schwappach, & Rieger, 2008). In rural, low-resource settings, agricultural work and daily household tasks may interfere with health worker's ability to engage in teamwork, particularly among volunteer health workers who must rely on non-health related work for income.

Current research on trust and teamwork among community health workers in rural Ethiopia

Our review of the literature in the organizational, social, and health sciences points to the importance of trust and teamwork in workplace settings across mid- and high-income countries. Gaps exist, however, in the application of trust theory and empirical research on teamwork, particularly as it relates to healthcare providers in low-income, rural settings. Little is known about how trust is conceptualized among health workers in non-Western settings, and there is not a gold standard by which to measure trust in these locations. To advance the theoretical study and measurement of trust, we address these gaps by asking the following questions:

> *Question 1: How do health workers in rural Ethiopia conceptualize trust in the context of community maternal and newborn healthcare delivery?*
>
> *Question 2: Can trust be reliably and validly measured among diverse cadres of health workers in rural Ethiopia?*

There is also a clear lack of application of the Mayer et al. (1995) Integrative Model of Organizational Trust to the study of trust in groups, in different cultural contexts, and in the realm of healthcare delivery (Schoorman, Mayer, & Davis, 2007). To further advance the theoretical study of trust and teamwork, we adapted the Mayer et al. model through (1) identification of teamwork as the risk-taking behavior of community health workers who trust each other; and (2) incorporation of additional factors, beyond trust, that are relevant to teamwork in rural settings. Furthermore, there is a paucity of research on the determinants of teamwork among community health workers in low-resource, rural settings. Through the application of our adapted *Model of Teamwork*

among Community Health Workers to health worker relations in rural Ethiopia, we address this empirical gap in the literature by raising the following questions:

> ***Question 3: What are the factors that influence teamwork within and between diverse community health worker cadres in rural Ethiopia?***
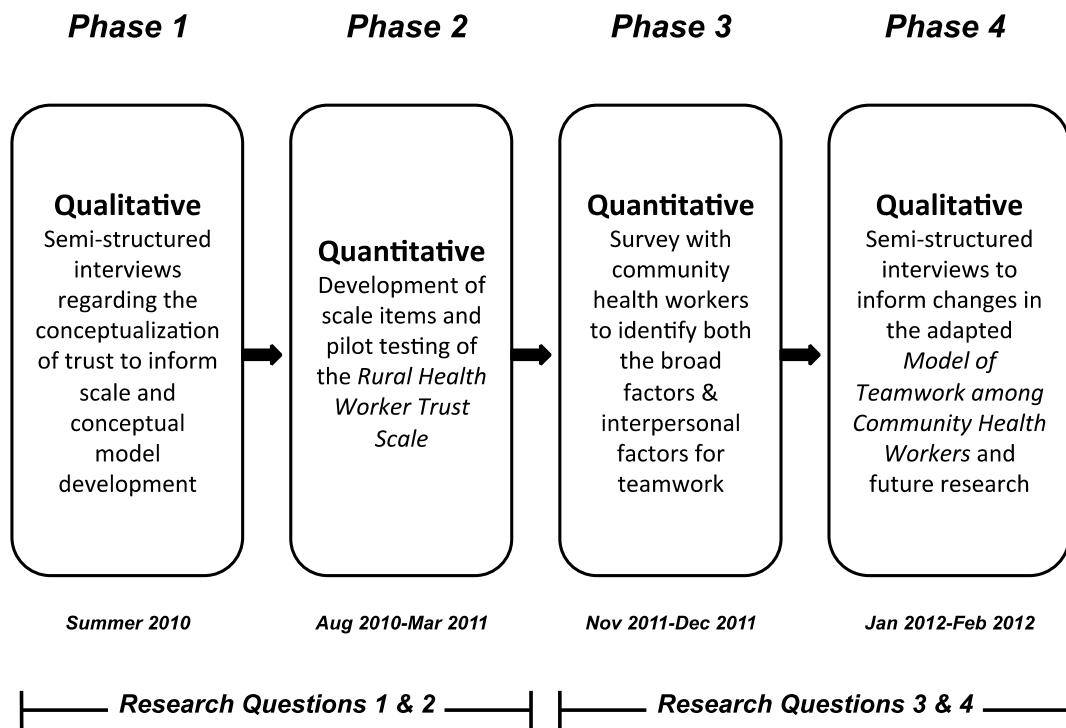>
> ***Question 4: What are the interpersonal factors that influence teamwork among diverse community health worker dyads in rural Ethiopia?***

Study design of the current research

We answer these four questions using of a mixed methods research approach over four phases (Figure 3). **Phase 1** began with collection of qualitative data on the local conceptualization of trust among community maternal and newborn health workers in rural Ethiopia. In **Phase 2**, these qualitative data were used to construct and pilot-test a quantitative, culturally grounded instrument to measure trust. In **Phase 3**, this scale was incorporated into a survey of community health workers using a novel combination of potential antecedents of teamwork that have not been previously studied. Finally, in **Phase 4**, semi-structured interviews were carried out with community health workers to identify additional factors for teamwork not considered in the survey in order to inform our model and future research.

Understanding the influential factors for teamwork is critical in areas of the world characterized by high disease burden, such as maternal and newborn death and disability, coupled with the challenges of task shifting in the face of the health workforce shortage. Rural Ethiopia is one such context where high maternal mortality and a shortage of skilled birth attendants exist within the landscape of a changing local health system.

Phase 1	Phase 2	Phase 3	Phase 4

Qualitative Semi-structured interviews regarding the conceptualization of trust to inform scale and conceptual model development	**Quantitative** Development of scale items and pilot testing of the *Rural Health Worker Trust Scale*	**Quantitative** Survey with community health workers to identify both the broad factors & interpersonal factors for teamwork	**Qualitative** Semi-structured interviews to inform changes in the adapted *Model of Teamwork among Community Health Workers* and future research
Summer 2010	*Aug 2010-Mar 2011*	*Nov 2011-Dec 2011*	*Jan 2012-Feb 2012*

Research Questions 1 & 2 *Research Questions 3 & 4*

Figure 3. Mixed Methods Phased Study Approach.

Context of the current research

The maternal mortality ratio in Ethiopia is 673 maternal deaths per 100,000 live births, resulting in a lifetime risk of maternal death of one in forty (Central Statistical Agency [CSA] [Ethiopia] & ORC Macro, 2006). The primary direct causes of maternal deaths in Ethiopia include hypertension, hemorrhage, obstructed labor, abortion, and sepsis (Abdella, 2010). With more than 80 percent of the population living in rural or remote areas (Federal Democratic Republic of Ethiopia Population Census Commission, 2008), less than five percent of women in these areas receive skilled birth attendance (CSA [Ethiopia] & ICF International, 2012). Among 54 countries recently reviewed in the Lancet, Ethiopia was found to have the greatest inequality in skilled birth attendance

when comparing women in the lowest and highest wealth quintiles (Barros, et al., 2012). Lack of access to a skilled birth attendant is a likely contributing factor to maternal deaths in Ethiopia where there is an estimated deficit of 20,000 midwives required to meet the countries MNH care needs (United Nations Population Fund [UNFPA], 2011).

Ethiopia's health workforce is growing, but remains limited and poorly distributed, especially in rural areas. The Federal Ministry of Health's Health Sector Development Program launched the flagship Health Extension Program (HEP) in 2003 to bring primary care to rural areas (Federal Democratic Republic of Ethiopia Ministry of Health, 2003; Federal Ministry of Health [FMOH], 2005). In the HEP, young women are recruited from their *kebeles* (sub district administration units) and given one year of health training in primary healthcare. They are then placed, two per *kebele*, to provide health outreach to their communities, including MNH services. By 2009, the program had trained and deployed 33,819 Health Extension Workers (HEW) into its health system (Federal Democratic Republic of Ethiopia Ministry of Health, 2010).

Despite these efforts, the HEP has not yet met its goal of increasing MNH care to childbearing women through HEWs (FMOH & Regional Health Bureaus, 2008). Research suggests that this is due, in part, to the large number of preventive care tasks for which HEWs are responsible, their limited training in MNH care, and a community preference for experienced family members and traditional birth attendants (TBAs) who have long provided this care to women (Hadley, Handley, & Stevenson, 2010; Stephenson et al., 2011). Women, families and other community health workers, such as volunteer Community Health Development Agents (CHDA) and TBAs may not know about, value, or trust the HEW's ability to provide MNH care.

In 2010, the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) project—a three-and-a-half-year initiative funded by Bill and Melinda Gates Foundation—was initiated in six rural districts of Amhara and Oromiya regions in Ethiopia with the aim of improving community MNH care (Sibley, 2009). MaNHEP was implemented by Emory University under the leadership of the Ministry of Health, in collaboration with Addis Ababa University, John Snow Research and Training, Inc., and University Research Company, LLC. MaNHEP start-up activities included Community Maternal and Newborn Health training which commenced in August of 2010, training of Quality Improvement Teams in January 2011, and the establishment of Guide Teams at the community level in May 2011. The current research was carried out in MaNHEP project sites across three districts of West Gojam Zone, Amhara region. Formative work associated with the current research was conducted prior to initiation of substantive MaNHEP activities, while the survey was carried less than one year after initiation of MaNHEP activities.

Amhara region has a population of 17.2 million people with 88% of the population living in rural areas (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). Over 90% of the population self-identify as ethnically Amhara, Orthodox Christian, and engage in agricultural work. Key maternal health indicators demonstrate that women in Amhara region have low health seeking behavior in pregnancy and childbirth (CSA [Ethiopia] & ICF International, 2012). For instance, nine of ten women in Amhara region have a homebirth (89%), and the majority of women seek the service of a TBA (29%) or relative/other (60%) during labor and birth (CSA [Ethiopia] & ICF International, 2012). Moreover, two-thirds of women in Amhara region

receive no antenatal care (59%) and only seven percent of women receive a postnatal visit (CSA [Ethiopia] & ICF International, 2012).

Summary of the current research

Trust research has focused primarily on trust as it exists between patients and providers, or trust among Western-based health professionals in traditional healthcare settings. Much less is known about the importance of trust among community health workers in low-resource, rural settings. Furthermore, there are challenges related to the conceptualization and measurement of trust. The measurement of trust often fails to consider the complex nature of trust and that different social groups may have different representations of trust. To our knowledge, a scale to measure trust among health workers in rural, low-resource settings does not exist. In this research, we conducted formative research with community health workers in rural Ethiopia to understand the local conceptualization of trust, and also to answer our first and second research questions by identifying the relevant antecedents of health worker trust. We then developed and validated a scale to measure trust among community health workers in rural Ethiopia (Chapter 2) in order to later link trust with teamwork.

Our trust scale provided the foundation for our next two papers (Chapters 3 and 4) in which we explored factors, including trust, for teamwork among community health workers from two perspectives. These two papers can be distinguished from one another by the level at which the variables were measured. Understanding both the broader factors (e.g., trust in a cadre as a whole, distance to the health post, perceived motivations of a cadre) and the relational factors (e.g., interpersonal trust, distance between two health worker's homes, similarity in the factors that motivate two health workers) for

collaboration provide equally important, yet distinct insights into coworker teamwork. For example, the broader factors for teamwork may be more salient at the onset of a new project or when a new cadre is being introduced into a setting. Group stereotypes and/or misconceptions may exist prior to health workers having meaningful interaction with individuals within those cadres. In contrast, interpersonal factors may be more relevant as health workers become more familiar with each other and with their perspective roles and responsibilities.

In the second paper (Chapter 3), we focused on the factors that influence teamwork with each type of community health worker cadre, including HEWs, CHDAs, and TBAs. To our knowledge, researchers have yet to explore the relationship between perceptions of health worker cadres (e.g., trust in a cadre, perceived motivations of a cadre) and interactions with members of those cadres. We sought to answer our third research question by collecting cross-sectional survey data and employing fractional logit modeling and marginal effects analyses to explore the influence of factors on community health worker interactions within and between each cadre, HEWs, CHDAs, and TBAs.

In our third paper (Chapter 4), we explored the dyad level, or relational, factors that influence teamwork among community health workers. While researchers have studied the relational characteristics of health professionals in Western settings, to our knowledge, our research is the first to examine the role of dyad level factors for teamwork in a rural, community-based setting. To answer our fourth research question, we collected social network data (as part of the survey described in paper two) in seven rural communities of Ethiopia. This allowed for the assessment of network level community health worker characteristics and regression analyses to explore the

individual and collective influence of relational variables on work interaction patterns. Based on our review of the literature on factors that influence teamwork (as depicted in our adapted model), and in consideration of the local context, we hypothesized that homophily, trust, proximity, shared motivations, and past training together would be positively related to frequency of interactions.

These papers contribute to the evidence regarding trust and teamwork among community health workers in rural, low-resource settings. We supplement knowledge gained in the first four chapters through additional analyses including (1) quantitative analyses of our survey data on the influential factors for trust; and (2) qualitative analyses of in-depth interviews concerning health worker perceptions of teamwork. This work was conducted following completion of our survey and provides further insight into the determinants of trust and teamwork among community health workers; results are presented and discussed briefly in Chapter 5. Our work contributes broadly to the body of knowledge on organizational trust and teamwork, and more specifically to the realities of community maternal and newborn health worker relations in Ethiopia. The papers lay the foundation for future research exploring the relationships of trust, health worker heterogeneity, motivations, and teamwork in greater depth in Ethiopia and elsewhere. An understanding of the factors that shape interactions among diverse health workers provides the basis for informing public health policy and the development of interventions to improve the quality and effectiveness of MNH care in areas hit hardest by the health workforce shortage. Furthermore, the insights gained here are applicable to inter-professional health worker relations and teamwork across country settings and health systems levels.

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Chapter 2: Measuring Trust among Frontline Health Workers in Rural Ethiopia

Abstract

Research on the role of trust, and its influence on teamwork among health workers in rural, low-resource settings has been understudied. We therefore undertook a formative study of trust among three diverse cadres of frontline maternal health workers in Amhara region, Ethiopia. We aimed to develop a comprehensive description of trust in this setting and generate a tool to measure levels of trust within and between cadres.

In-depth interviews with 30 frontline workers uncovered a core set of items that seem to define trust in this setting (*character, ability, communication*), including novel ways of thinking about trust (*having 'oneness'*). Twenty-five items developed from formative data were pilot tested with 92 health workers. Items that displayed low item-to-scale correlations or loaded low on the first factor were removed. The resulting 10-item scale exhibited strong internal consistency across cadres (alpha 0.84 or greater). In support of criterion validity, the scale was positively associated with the *sense of team* scale (p<0.001) and accounted for greater variance in health workers' *sense of team* (Adj. R-squared=0.67) than did a composite of single trust items (Adj. R-squared=0.28). For contrasting group validity, respondents had greater within-group agreement compared to between-group agreement on trust items and displayed a higher level of competence in answering questions about their own cadre.

Results demonstrate that the *Rural Health Worker Trust Scale* can be validly and reliably used to measure trust among diverse frontline health workers in rural Ethiopia. Specifically, it may be used to study how trust changes over time and influences the quality of healthcare delivery. As the 2015 deadline for the Millennium Development

Goals fast approaches, strategies that strengthen the capacity of *existing* frontline workers become increasingly important. Trust-building interventions that encourage and sustain collaboration among diverse health worker cadres may be one such approach.

Introduction

"Health systems comprise a complex web of relationships whose overall functioning and performance is influenced by the institutions, particularly trust, that govern human behavior" (Gilson, 2003, p. 1463). Gilson's description draws attention to the relational aspect of health systems where varied healthcare provider groups are expected to work together towards a common goal. Success in achieving this common goal, which is often the provision of quality care, may be affected by asymmetric power relationships among health workers at different levels of the health system (e.g., physician and nurse) (Baer, 1995). These asymmetric power relationships may have the potential to result in interpersonal and intergroup dynamics that negatively influence trust relations. Gilson, Palmer, and Schneider (2005), for instance, in their study of South African doctors and nurses, point out multiple instances where low trust between groups undermines health system responsiveness.

Despite recognition of the potential importance of trust across healthcare settings, trust has been studied almost exclusively in hospitals and clinics in middle- and high-income countries where the primary focus has been on trust between patients and providers. In these settings, trust between patients and physicians predicts continuity of care, adherence to treatment recommendations, and patient satisfaction (Bachinger, Kolk, & Smets, 2009; Hall et al., 2002; Nguyen et al., 2009; Thom, Ribisl, Stewart, Luke, & The Standford Trust Study Physicians, 1999), and greater utilization of preventive health

services (Musa, Schulz, Harris, Silverman, & Thomas, 2009). Much less work has concentrated on trust between healthcare coworkers despite the fact that healthcare professionals interact with each other on a day-to-day basis.

The organizational literature draws links between coworker trust and worker behavior. Coworker trust has been found to be associated with a stronger preference for working in teams, knowledge sharing in the workplace, and increased collaboration leading to higher group performance (Dirks, 1999; Kiffin-Petersen & Cordery, 2003; Wu, Lin, Hsu, & Yeh, 2009). This suggests that trust among healthcare coworkers has the potential to be an important determinant of health service delivery, in part because it increases teamwork, motivation, and knowledge sharing. Research on healthcare coworker trust has been understudied, however, leading Calnan and Rowe (2006) to argue in favor of a research agenda that incorporates questions about how coworker trust might contribute to the effectiveness of health service delivery.

We define trust as the willingness to be vulnerable to another individual/group where risk-taking behaviors within the relationship (e.g., sharing secrets, admitting failure, help-seeking) are the manifestation of that trust (Mayer, Davis, & Schoorman, 1995). The role of trust in interpersonal and inter-group relations and the delivery of healthcare may be particularly salient in lower-income countries that increasingly rely on community health workers to fill the gap in health services resulting from the health worker shortage. Evidence from mid- and high-income settings, anecdotal evidence, and evidence from the gray literature indicate that trust may be an important factor for interactions between diverse cadres of health workers (Hadley, Handley, & Stevenson, 2010; Stephenson et al., 2011). In a study from rural Australia, for example, trust among

multidisciplinary health coworkers was found to be associated with acceptance of each other's roles and communication patterns, while mistrust was related to the uncertainty associated with task-shifting within and between cadres (McDonald, Jayasuriya, & Harris, 2012). If trust is a key determinant of positive interactions between health workers in low-resource settings and results in improved care, then fostering trust among this lower-skilled, heterogeneous health workforce may be one approach to improve the quality and efficiency of health service delivery.

We hypothesized that trust is associated with collaboration between cadres of frontline health workers in rural Ethiopia. In exploring this hypothesis we were struck by the lack of appropriate tools to measure trust in low-resource, rural settings. We therefore undertook a formative study of trust with the aims of developing a comprehensive description of trust in this setting, as well as generating a tool to measure levels of trust within and between healthcare worker cadres.

In 2003, Ethiopia began to train and deploy a new cadre of Health Extension Workers (HEWs) responsible for a wide range of primary healthcare activities, including maternal and newborn healthcare (Federal Ministry of Health [FMOH], 2005; FMOH Family Health Department, 2005). HEWs entered into a socio-ecology that contained two other preexisting groups of health workers, volunteer Community Health Development Agents (CHDAs) and Traditional Birth Attendants (TBAs), who in many ways were charged with a similar set of maternal and newborn healthcare-related tasks. This "complex web of relationships" provided a unique opportunity to examine the role of trust among disparate and potentially competing cadres of health workers in health service delivery.

In this article, we describe the initial process of building, from the ground up, and testing a tool to measure trust among these diverse frontline health workers in West Gojam Zone, Amhara region, Ethiopia. Specifically, we describe an adapted application of Goudge's and Gilson's (2005) recommended step-wise research strategy for investigating trust. These broad steps involve establishing rationale for studying trust among frontline health workers in rural Ethiopia, exploring how trust functions in this setting through qualitative work, and developing and testing a new scale to measure trust among diverse cadres. Our study was nested within the Bill and Melinda Gates Foundation-supported Maternal and Newborn Health in Ethiopia Partnership (MaNHEP).

WHY STUDY TRUST AMONG FRONTLINE WORKERS IN RURAL ETHIOPIA?

The only work on trust among healthcare coworkers in lower-income, African settings that we identified were studies from South Africa; these focused primarily on hospital/clinic-based staff and relied heavily on qualitative approaches to study health coworker relationships. Several key results emerged from this body of work. First, studies identified factors salient to healthcare workplace trust including fair management practices, communication, training, job security, and working conditions (Walker & Gilson, 2004). Second, factors found to erode coworker trust included colleagues not recognizing prior experiences and knowledge, poor communication and consultation during policy implementation, and the supervisor-coworker dynamic (Gilson et al., 2005; Vivian, Marais, McLaughlin, Falkenstein, & Argent, 2009; Walker & Gilson, 2004). Third, a lack of workplace trust was found to reinforce disapproval of new policies and undermine manager's authority (Scott, Mathews, & Gilson, 2012).

We were unable to uncover any studies focused on trust among frontline workers

at the periphery of the health system in Ethiopia.

Trust among frontline maternal health coworkers in rural Ethiopia

Only 4% of births in rural Ethiopia are attended by a skilled birth attendant (Central Statistical Agency [CSA] [Ethiopia] & ICF International, 2012). With a shortage of nearly 20,000 midwives, Ethiopia has one of the largest gaps in the midwifery workforce needed to reach the Millennium Development Goal (MDG) 5 target of skilled birth attendance by 2015 (United Nations Population Fund [UNFPA], 2011). In 2003, the Federal Ministry of Health's Health Sector Development Program launched the Health Extension Program (FMOH, 2005). By 2009, this program had introduced 33,819 young, female HEWs into its health system to provide communities with primary healthcare (Federal Democratic Republic of Ethiopia Ministry of Health, 2010). In the area of maternal and newborn care, there is potential for both cooperation and competition between HEWs and the existing system of TBAs, who are less educated and older, but who have long provided the vast majority of maternal and newborn care in rural Ethiopia (CSA [Ethiopia] & ICF International, 2012). Conflict may also be present between the government-paid, female HEWs and the nearly all-male CHDAs, who are expected to volunteer their time to extend the work of the HEWs.

Teamwork within and between HEW, CHDA, and TBA cadres has great potential when individuals can access the knowledge and skills of fellow health workers to work towards a common goal. Yet, evidence to date suggests that there are limited interactions among these diverse cadres (Stephenson et al., 2011). Prevailing social structures, including class, gender dynamics, and locally embedded cultural norms may all limit the interactions between new and more established health workers. When heterogeneous

health workers are unable to rely on personal similarities (e.g., age, gender, education) to build relationships, understanding the context-specific ways that trust develops can facilitate collaboration between groups (Mayer et al., 1995; Schoorman, Mayer, & Davis, 2007).

Measuring trust

There is not a gold standard to measure trust and existing scales have been designed almost exclusively to explore patient-provider trust in Western settings. In this paper, we describe a phased, mixed methods study to develop and test such an instrument: formative qualitative research, tool development and pretesting, and pilot testing. The research protocols for both the formative and pilot study were approved under the umbrella of the parent project by the Emory University Institutional Review Board and the Amhara Regional Bureau of Health.

Population

Amhara region has a population of 17.2 million people, the vast majority of whom live in rural areas, engage in agricultural work, and self-identify as Orthodox Christian and Amhara ethnicity (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). Key maternal health indicators demonstrate that women in Amhara region have low health-seeking behavior (CSA [Ethiopia] & ICF International, 2012). For example, Amhara has the fourth highest rate of homebirth among Ethiopian regions at 89% and the sixth lowest rate of skilled birth assistance (10.1%). Most women seek the service of a TBA (28.5%) or relative/other (59.5%) during birth. Two-thirds of women in Amhara region receive no antenatal care (59.1%) and only seven percent receive a postnatal visit.

HOW DOES TRUST FUNCTION IN RURAL ETHIOPIA?

Methods of the Formative Study

In order to understand local attributes of trust, we conducted an exploratory qualitative study. We obtained a purposive sample of 30 frontline health workers (nine HEWs, 12 CHDAs, and nine TBAs) in three districts of Amhara region; respondents were recruited from six rural *kebeles* (communities). Inclusion criteria for participation in the formative and pilot study included (1) must be 18 years or older; (2) able to speak and understand Amharic; and (3) performed community-based maternal health work in the past year. Following informed consent according to standard disclosure procedures, face-to-face semi-structured interviews were conducted by two Ethiopian research assistants in Amharic using an interview guide. Research assistants participated in a weeklong training in qualitative research techniques.

The interview guide included basic demographic questions (age, education, ethnicity, gender, cadre, religion, *kebele*, and years of experience) and a series of open-ended questions (Table 1). Open-ended questions were informed by the Integrative Model of Organizational Trust (Mayer et al., 1995) and designed to elicit the respondent's conceptualization of trust, along with their perception of the antecedents and consequences of health workers trusting each other.

[Insert Table 1]

Interviews were audio-recorded, transcribed verbatim, and translated. Data were organized using MAXQDA and analyzed to identify themes using a combination of methods described by Ryan and Bernard (2003). An inductive approach was used to identify an initial set of themes based on a search for repetitions. Transcripts were

reviewed again and verbatim expressions were collected and sorted based on this set of themes. Illustrative quotations were then reevaluated and overlapping themes were condensed, as needed. Finally, a key word list and count was conducted to provide further support for inclusion of themes.

Trustworthiness of the data was safeguarded using several strategies (Shenton, 2004). Credibility was addressed through close consultation with Ethiopian collaborators in the development of the interview guide and throughout the data collection process. We pre-tested the interview guide with members of three different community health worker cadres in order to assess the clarity of questions across groups. At the onset of each interview, respondents were encouraged to be as honest as possible in their responses. Furthermore, the interviewer conducted member checks by summarizing responses provided at the end of each interview in order to assess the accuracy of their interpretation and to clarify points of possible misperception. In addition, we held debriefing sessions with research assistants following each interview and at the end of each data collection day.

Results of the Formative Study

Sample characteristics

All participants self-identified as ethnically Amhara and Orthodox Christian (Table 2). The average age of HEWs was 22 years, while the average age for CHDAs and TBAs was 40 years and 49 years, respectively. All TBAs and HEWs were female, while only 8% of CHDAs were female. Whereas HEWs had significantly more years of education (11.3 years) compared to CHDAs (5.8 years) and TBAs (0.8 years), TBAs had greater experience providing maternal health services (17.4 years) compared to HEWs

and CHDAs (2.8 and 3.4 years, respectively).

[Insert Table 2]

Trust-related themes

Five trust-related themes were identified in the transcripts through frequency analysis including four characteristics of trustworthiness (*character, ability, communication,* and *oneness*) and one outcome of trust (*improved health of the community*). Respondents mentioned character traits (*character*) that are important when deciding to trust other health workers. One TBA said, "I [when deciding to trust another health worker] consider if she is good in general, if she is honest, if she keeps her word, if she does not gossip, [and] does not deny her necklace [religious belief in God reflected by wearing a necklace]." A CHDA described the need for a strong work ethic, stating "We trust them only on their work. It is not by their face [beauty] or any other thing. Because they are committed and hard workers, we respect them."

Formal education/training and experience level (*ability*) were both mentioned as important aspects of trusting fellow coworkers. HEWs occasionally acknowledged the experience level of TBAs, while TBAs noted the formal training and education of HEWs and CHDAs. One HEW stated, "I trust all health workers because they precede me; they are more knowledgeable than me." However, the differential level of training between HEWs and TBAs was reported as a potential conflict. For example, one TBA expressed "They [other health workers] didn't acknowledge my experience and [didn't] call me to participate in the training and teamwork. Had they invited me, I would have educated them the small knowledge I have, and I would have learned from them the much knowledge they have."

Respondents discussed the quality of *communication* as both an important aspect of learning to trust other health workers and as a consequence of trusting relationships. For example, a CHDA stated, "I share ideas and experiences with those I trust. But, with those I don't trust, I simply communicate with them for show. I don't speak with them openly. I don't share with them experiences, and they don't with me. Not trusting someone is an obstacle to work."

Analysis also led to a more nuanced and contextual understanding of trust. For example, health workers mentioned that having '*oneness*' (Amharic: *ande akal ande amsal*; literally one being, one image) was a key element of trust. One TBA said "Trust is being one necked and one hearted, sharing common ideas, keeping secrets, and excusing friends for mistakes. This is how I define trust." Similarly, a CHDA stated plainly "Trust is being one". In the context of health work, *oneness* was described as having shared goals and working with a unified purpose, or as one frontline worker said, "having the same dream".

The consequences of health workers trusting each other included the provision of higher quality healthcare, leading to healthier and more productive families for the betterment of society. Respondents viewed this outcome as occurring through two mechanisms. First, health workers who trust each other will support each other more by sharing experiences and 'filling in the gaps' (covering each other's work). A CHDA reported, "They [health workers] will be fruitful [if there is trust]. One helps the other. If one cannot do something, the other one can help him/her. They share knowledge and experiences. That way they can make a change." In observing improved health worker relations, community members would more fully trust health workers and seek out their

services more often. As described by a HEW, "If we [health workers] trust each other, the community will also trust us. And also, they [community] will cooperate with us when we ask them for help. Therefore, we will create a good environment in the community if we trust each other."

In summary, health workers explicitly identified trust as a critical issue for frontline workers. They delineated characteristics of trustworthiness including a strong character, ability to carry out health work, transparent communication, and having 'oneness' related to health worker goals. Finally, respondents outlined several ways trust may improve healthcare performance through increased knowledge- and task-sharing and improved coverage through gap-filling. Better communication and collaboration was thought to both improve the quality of health service deliver and build community trust in health workers, resulting in increased health-seeking behavior.

DEVELOPING AND TESTING A SCALE TO MEASURE TRUST

For content validity, statements taken directly from the formative interview transcripts were used to build an initial pool of 57 trust items (Brewis & Gartin, 2006; Weller, 2007). Twenty-five items (Table 3) that met one or more of the following conditions were chosen for pre- and pilot testing: (1) the item represented one of the commonly described themes; (2) the item reflected a novel aspect of trust that may have local relevance; or (3) the item reflected an aspect of trust commonly found in the trust literature. Items were formed into declarative statements, half of which were stated in the positive and half in the negative and used to develop a Likert-type scale for pre-testing.

[Insert Table 3]

Pretesting

Three Ethiopian maternal health experts rated each item on the scale, based on the extent they felt the items fit within the domain of trust; a high inter-rater agreement of 0.96 was found among experts. Next, the 25-items were pretested using cognitive interviewing techniques in which a small sample from each cadre was asked about their understanding of the meaning of each item (Bernard, 2006). These exercises resulted in the rephrasing of scale items to improve comprehension.

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Methods of the Pilot Study

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Following pretesting, we pilot-tested the 25-item scale with the aim of developing a single parsimonious trust scale that worked in the same way for all three cadres. This is not to say that all respondents gave the same answers, but rather to say that there was no evidence that the items were working differently by cadre (e.g., certain items were more easily endorsed by members of one cadre over another). Pilot testing was conducted with a purposive sample of 92 health workers (HEWs N=20; CHDAs N=33; TBAs N=39) in 22 *kebeles* in three districts of Amhara region; CHDAs and TBAs were over-sampled due to greater variance of responses noted in pre-testing. Face-to-face structured interviews were conducted in Amharic by four Ethiopian research assistants who received training in quantitative data collection.

The structured interview questionnaire included sociodemographic questions similar to those asked in the formative research. Respondents were presented with all 25 trust item statements for each frontline worker cadre in their *kebele*. Response options included 4=strongly agree, 3=agree, 2=disagree, and 1=strongly disagree; negatively phrased questions were reverse-coded. Responses were obtained in two steps to reduce

cognitive burden on respondents. For example, HEWs were asked, "The TBAs in your *kebele* have oneness with you—do you agree or disagree?" (step 1); "Do you agree/disagree strongly or just a little?" (step 2). The questionnaire also included a *global trust* item for trust in each cadre (e.g., "Do you have trust in the TBAs in your *kebele*?") and a separate 25-item scale to measure *sense of team* among health workers (developed concurrently with this project); these variables were used in analyses to test for criterion validity.

Separate trust scores were calculated (*trust in HEWs*, *trust in CHDAs*, and *trust in TBAs*) by summing the scored items about each cadre. Additionally, a *total trust score* was calculated by summing the three cadre-specific trust scores to reflect trust in *kebele*-level health workers as a whole.

The analyses proceeded in multiple steps. First, we calculated descriptive statistics for sociodemographic characteristics, *trust scores* for the 25-item scale by cadre, and the *total trust score* for overall trust in *kebele* coworkers.

Second, we conducted reliability analyses to determine the scales' internal consistency and set 0.70 as the minimal alpha level (Nunnally, 1978). Items were dropped if they were negatively associated with the scale, exhibited inter-item correlations of 0.80 or higher (i.e., redundancies), displayed item-to-total correlations below 0.30, or reduced the alpha level.

Third, we constructed a set of hypotheses for establishing criterion and contrasting group validity. For criterion validity, we hypothesized that health worker's overall trust in each other would be positively associated with health worker's sense of team (**H1**), health worker trust in each cadre would be positively associated with a single

trust question about each cadre (**H2**), and the trust scale would account for greater variance in sense of team as compared to the single global trust questions (**H3**). To test these hypotheses, we conducted a correlation analysis, comparing the relationship between the *trust scale* for each cadre and the *global trust* question for each cadre, and between the *total trust score* and the *sense of team scale*. We also fit a linear regression model for the *sense of team scale* using the *total trust score* as the primary covariate of interest, while controlling for potential confounding variables (age, cadre, education, gender, religion, and years of experience). We fit a nearly identical linear regression model for the *sense of team scale* with the same control variables, but using a composite of the three *global trust* questions, instead of the *total trust score*, as the primary covariate of interest, allowing us to compare the amount of variance accounted for in each model.

For contrasting group validity, we hypothesized that health workers would have higher within-group agreement on trust items as compared to between-group agreement (**H4**) and that health workers would have higher cultural competence in answering questions about their own cadre compared to answering trust questions about other cadres (**H5**). To test these hypotheses, we conducted cultural consensus analysis (CCA) in UCINET 6 (Borgatti, Everett, & Freeman, 2002) and regression analyses using Quadratic Assignment Procedure (QAP) (Weller, 2007; Weller & Baer, 2002). CCA estimates "culturally correct" answers to a series of related questions (e.g., trust items); average responses are used to estimate group beliefs (Weller, 2007). CCA also generates a "cultural competence" score for each respondent based on how much their responses correspond with the sample; competence scores can then be used to estimate the

percentage of shared knowledge within and between groups.

Fourth, we fit general linear regression models for the *answer* to scale items to assess whether items had different properties depending on *who was asked*, *which question was asked*, and *who the question was asked about*. This allowed us to examine patterns in responses to items based on which cadre they were answering about. It also enabled us to identify if certain items were more or less difficult for respondents to answer, thus displaying differential item functioning (DIF) by cadre (Holland & Wainer, 1993). The models included the following covariates and interaction terms: (1) the *question* being asked; (2) which cadre the question was being asked about (*aboutHEWs*, *aboutCHDAs*, *aboutTBAs*); (3) which *cadre* the respondent was a member of; (4) *about cadre*cadre*; (5) *about cadre*question*; (6) *question*cadre*. We used Tukey-Kramer adjusted (Adj) p-values for unbalanced designs to reduce the probability of making Type I errors related to conducting multiple pairwise comparisons.

Fifth, we conducted factor extraction using Principal Components Factor analysis (PCF) in Stata 11 (StataCorp, 2009) to establish the dimensionality of the scale and to reduce the number of items. Items that loaded low (<0.50) on the first component were removed. To justify use of PCF, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was conducted to test the communality of the scale, where communality refers to the strength of the correlation among scale items (MacCallum, Widaman, Zhang, & Hong, 1999). KMO measures for individual items greater than 0.6 and a mean level greater than 0.7 were considered adequate (MacCallum et al., 1999).

Finally, we repeated reliability and validity testing of the final, reduced item *Rural Health Worker Trust Scale*.

Results of the Pilot Study

Sample characteristics

Nearly all health workers self-identified as ethnically Amhara and Orthodox Christian (Table 4). TBAs were 17 years older, on average, than HEWs. All HEWs and nearly all TBAs (92%) were female, whereas only 15% of CHDAs were female. HEWs reported 11 years of formal education, while CHDAs (2.9 years) and TBAs (0.6 years) reported far fewer years. TBAs reported nearly three times as many years providing maternal health services (11.5 years) compared to HEWs (4.0 years) and CHDAS (4.7 years).

[Insert Table 4]

All cadres reported the highest level of trust (possible range 25-100) in HEWs compared to trust in CHDAs or TBAs. CHDAs reported the lowest level of trust in TBAs (71.8), while HEWs and TBAs reported the lowest trust in CHDAs (75.1 and 72.8, respectively). Overall, HEWs held the highest total trust (aggregate of trust scores: range 75-300) in health workers (235.3).

Initial scale reliability

No items were found to be redundant or negatively associated with the scale. Four items with low item-to-scale correlations were dropped. The remaining 21-item scale displayed strong measures of internal consistency (Table 5). As expected, mean inter-item correlations fell on the lower end of acceptable which is consistent with broad constructs such as trust (Clark & Watson, 1995). Across the sample, mean trust scores were as follows: *trust in HEWs* score 78.0±10.9; *trust in CHDAs* score 73.5±8.6; and *trust in TBAs* score 74.0±8.8.

[Insert Table 5]

Initial scale validity

As hypothesized (**H1**), the *total trust score* was positively associated with the *sense of team scale* (*r*=0.40, p=0.008), suggesting that higher trust was associated with a stronger feeling of team, and the potential for greater collaboration. Moreover, in regression analyses, *total trust* maintained a significant positive relationship with *sense of team* (p=0.005), while all other variables in the model were non-significant (p>0.05). As hypothesized (**H2**), each *trust score* was significantly associated with the *global trust* item for each cadre (*trust in HEWs*: *r*=0.42, p=0.001; *trust in CHDAs*: *r*=0.45, p<0.001; *trust in TBAs*: *r*=0.58, p<0.001). As hypothesized (**H3**), the regression model using the *total trust score* accounted for far greater variance in *sense of team* (Adj R-squared=0.71) than the model using a composite of the *global trust* questions (Adj R-squared=0.28).

As hypothesized (**H4**), in answering the *trust scale* about each cadre, respondents had greater within-group agreement compared to between-group agreement (*aboutHEWs*: 0.41 vs. 0.37; *aboutCHDAs* 0.45 vs. 0.38; *aboutTBAs*: 0.45 vs. 0.41) (Table 6). For example, only 38% of health worker beliefs about trust in CHDAs were shared between health workers across groups, while 45% of beliefs were shared within groups. As hypothesized (**H5**), respondents also displayed a higher level of competence in answering questions about their own cadre (HEWs *aboutHEWs*: 0.54; CHDAs *aboutCHDAs*: 0.47; TBAs *aboutTBAs*: 0.50) than in answering questions about other cadres (HEWs *aboutCHDAs* 0.49 and *aboutTBAs* 0.48; CHDAs aboutHEWs 0.34 and *aboutTBAs* 0.37; TBAs *aboutHEWs* 0.43 and *aboutCHDAs* 0.43). For example, TBAs shared 50% of beliefs when answering trust questions about TBAs, but only shared 43% of beliefs when

responding about HEWs and CHDAs.

[Insert Table 6]

Response patterns by cadre and differential item functioning

Health workers responded more favorably to items about HEWs than to items about CHDAs and TBAs (t=8.98, Adj p<0.001; t=8.02, Adj p<0.001, respectively). A significant difference was not noted between responses about CHDAs and about TBAs (t=-1.00, Adj p=0.574). Overall, the *cadre* of the respondent was not found to be a significant predictor of the *answer* to items in general (Adj p>0.05).

Turning to interaction terms, health workers were more likely to agree that they have "loss of confidence in" and "do not believe in the ability" of CHDAs compared to HEWs (t=4.54, Adj p=0.012; t=4.90, Adj p=0.002, respectively). Similarly, respondents were more likely to agree with the item "have good health knowledge" when answering about HEWs as compared to answering about CHDAs (t=6.54, Adj p<0.001) and about TBAs (t=6.64, Adj p<0.001). Health workers were also more likely to agree with the item "are not committed" when answering about CHDAs and TBAs as compared to answering about HEWs (t=4.18, Adj p=0.049; t=4.49, Adj p=0.015, respectively).

One item was found to display DIF where HEWs were more likely than TBAs to agree with the statement "you know the HEWs/CHDAs/TBAs in your *kebele* very well" (t=4.38, Adj p=0.023). This scale item was dropped, resulting in a 20-item trust scale.

Scale dimensionality

Next, using exploratory factor analysis, we explored whether the 20-item scale tapped a single dimension. KMO measures of communality indicate there are strong relationships among scale items (*trust in HEWs*: 0.82; *trust in CHDAs*: 0.77; *trust in*

TBAs: 0.78). Using PCF, multiple factors loaded for the 20-item scale, suggesting it does not capture a single domain. Ten items that loaded low on the first component were dropped and PCF was repeated using the resulting 10-item *Trust Scale*. Two factors loaded for each scale, though the first component accounted for far greater variance than the second component (*trust in HEWs*: 49% vs. 11%; *trust in CHDAs*: 41% vs. 13%; *trust in TBAs*: 44% vs. 13%). Visualization of scree plots supported a one-factor solution for each frontline worker cadre trust scale.

Final scale reliability and validity

Reliability testing of the final 10-item *Rural Health Worker Trust Scale* showed high internal consistency and resulted in stronger mean inter-item correlations than the 21-item scale (Table 5). The parsimonious scale maintained a statistically significant relationship with *sense of team* (p<0.001), even when controlling for potential confounders. The scale remained moderately associated with the *global trust* question about each cadre (*trust in HEWs*: r=0.40, p=0.001; *trust in CHDAs*: r=0.48, p<0.001; *trust in TBAs*: r=0.57, p<0.001). Moreover, the 10-item scale accounted for far greater variance in health workers' *sense of team* (Adj. R-squared=0.67) than did a composite of the single global trust questions (Adj. R-squared=0.28).

Discussion

Findings from formative work provide preliminary support for two assumptions made at the onset of our study. First, respondents were unified in their belief that trust is an important element of health worker relationships; this supports our assertion that trust is highly relevant in the context of community-based, rural healthcare settings. Second, we uncovered a core set of items that seemed to define trust in this setting, which

included novel ways of thinking about trust (e.g., having 'oneness'). This supports our assertion that trust scales developed in mid- and high-income settings may not have uniform relevance in non-Western settings. Formative work also revealed unexpected, yet important results that we have not encountered in the trust literature to date. Frontline workers described an important consequence of health workers trusting each other—that through observing improved relations among health workers, community members would gain trust in health workers and seek out their services more frequently. In other words, trust promotion among health worker groups may influence both the supply and demand side of healthcare delivery.

The reduced 21- and 10-item scales maintained strong internal consistency and the hypotheses to test for criterion and contrasting group validity were upheld. Health workers with high trust in fellow health worker cadres were more likely to report a strong feeling of being part of a team. In addition, trust levels were moderately, yet significantly, associated with the single global trust questions. Furthermore, the scale accounted for greater variability in sense of team than the global trust question, which reflects that our multi-item trust scale better captures the inherent complexity that exists in a construct such as trust compared to the single question, and is therefore, a more suitable measure of trust (Spector, 1992).

As hypothesized, frontline health workers displayed greater shared cultural knowledge of trust within cadres than between cadres and exhibited greater cultural competence in responding to questions about their own cadre than to questions about other cadres. We must point out, however, that each cadre's unique way of understanding trust in health worker cadres (independent from other cadre's understanding) was

relatively small (3.5-7.3%). These data suggest that while health workers within cadres have greater agreement with each other than with workers outside of their cadre, there exists a collective way of thinking about trust that crosses cadres; in other words, there is a shared cultural model of trust among rural health workers, regardless of cadre affiliation. This finding also permits us to use a single scale to measure trust among diverse cadres. Both this shared, foundational understanding of trust, and the unique, cadre-specific ways of thinking about trust, are critical to consider when measuring trust and designing public health interventions aimed at improving cross-cadre trust and teamwork.

In our analysis of patterns of trust by cadre, we noted that health workers scored HEWs higher on three items that relate closely to the concept of *competence trust*. Research has demonstrated that competence-based trust is particularly salient for transfer of tacit knowledge between coworkers (Levin & Cross, 2004). Based on this finding, public health organizations should consider training diverse health worker cadres together, at least in part, so that individuals can observe members of other cadres gaining the knowledge and skills needed to provide quality care. This gain in confidence in each other may lead to improved interactions and knowledge sharing that are critical for successful teamwork.

Factor analysis did not support that the trust scale measures a single domain, though visualization of scree plots provided evidence for uni-dimensionality. Future research with a larger sample is needed to further explore the dimensionality of the scale. Forthcoming work may consider weighting scale items based on their relative contribution to the first factor or using a composite score of sub-scales based on items

that load highest on each factor. It is also worth noting that six items behaved differently in reliability and PCF analyses across scales. For example, *'have good experiences with'* loaded low only on the *Trust in CHDAs Scale*. Such items were dropped on all three scales in order to preserve scale comparability across cadres.

The final 10-item scale had three negatively phrased items (e.g., *'talk falsely of their accomplishments'*). Negatively phrased items were potentially more difficult for respondents to understand perhaps because endorsement of these *affirms* the presence of the undesirable characteristic. Six negatively phrased items use the word *not* as the mechanism to make the behavior undesirable (e.g., *'do not respect'*), a practice that Bernard (2006) warns against. These items were originally phrased this way to maintain consistency with how respondents of the formative interviews described a lack of trust.

Several limitations of our study need to be addressed. First, we recruited frontline workers in only three districts of Ethiopia using purposive sampling; our sample is unlikely to be representative across the wider frontline workforce in Ethiopia, which is culturally diverse. Second, cross-cultural research presents unique challenges, especially when trying to uncover novel conceptualizations of complex constructs. It is possible that the underlying meaning of dialogue around trust was, at times, lost in translation. We attempted to minimize this by forming a strong on-site Ethiopian research team, employing measures to assure content validity, and through open discussion around local idioms. Finally, our sample size was small, due to logistical and financial limitations, given the number of items we were testing in the scale. Guidelines for factor analysis range from a minimum sample size of 50 (Arrindell & van der Ende, 1985) to 500 (Comrey & Lee, 1992). Other criteria, however, have been used to determine sample

adequacy (MacCallum et al., 1999). Based on high communalities among scale items and moderately high loading of items on the first component, it is likely that we recovered factors in our sample that are consistent with those found in the population.

Clark and Watson (1995) endorse treating scale development as an iterative process comprising multiple stages of item writing, conceptualization, and analyses. As such, this work represents the early stages of cross cultural scale development. We have provided evidence that our *Rural Health Worker Trust Scale* is reliable and valid, but we also recognize that more work is needed to modify items that may be unclear (e.g., rephrase and retest a modified subset of the negatively phrased items).

Future research involves establishing linkages between health coworker trust and interactions/teamwork. Once this relationship is established, we can begin to meet Calnan and Rowe's (2006) call for research on how coworker trust might contribute to the effectiveness of health service deliver and outcomes. Specifically, the *Rural Health Worker Trust Scale* may be used to study how trust among health workers changes over time and how this relates to healthcare delivery and actual and perceived quality of care. The scale may be particularly relevant for baseline and endline evaluation of public health interventions aimed at improving teamwork.

We have demonstrated that respondents' views of trust can be captured in formative work and used to design a context-specific scale in a short time and on a limited budget. Our scale is practical, having been applied successfully in 20-minute face-to-face interviews with a low-literate population. The scale can be used to measure trust between health cadres across Amharic-speaking areas of Ethiopia. The process can also be replicated in new contexts using the characteristics of trustworthiness identified

here, and those commonly found in the trust literature, as the basis for a scale. The scale can then be supplemented with formative work to identify local idioms for trust and context-specific ways of conceptualizing trust. Adaptions of the *Rural Health Worker Trust Scale* can be used at all levels of the health system to identify cross-cadre or inter-organization trust issues and to develop targeted team-building interventions.

Conclusion

This work demonstrates that researchers and public health professionals need not rely on Western-based measures that may have limited local relevance. Given the importance of workplace trust in Western settings, trust investigation in developing countries may have significant implications for recruitment and retention as well as task-shifting of health workers in areas hit hardest by the health worker shortage. As the 2015 deadline for MDGs fast approaches, strategies that strengthen the capacity of *existing* frontline workers become increasingly important. Trust-building interventions that encourage and sustain collaboration among health worker cadres with diverse training, experience, and community embeddedness, may be one such approach.

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Table 1. Summary Interview Guide for Formative Research on Trust

Attributes of Trust	Think about all the people whom you really trust. What is it about these people that causes you to trust them? Think about all the people whom you really don't trust. What is it about these people that causes you not to trust them?
Consequences of Trust	You mentioned earlier that there are [types of health workers] in your village. If these groups in your village trust each other, what are all the good things that can happen? What are the benefits of having trust among these groups when it comes to doing the work? What good things can happen for the community? Think about the health workers whom you trust. How is your relationship different with them than it is with those health workers whom you do not trust?
Conceptualization of Trust	You have talked about [summarize discussion]. In your own words, how would you describe the idea of trust in other people?

Table 2. Sample Characteristics of Formative Research Participants by Cadre

	HEWs (N=9)	CHDAs (N=12)	TBAs (N=9)
DEMOGRAPHIC CHARACTERISTICS			
Mean(Range) or %			
Age (years)	21.8(20-24)	39.5(32-48)	48.6(35-60)
Gender (% female)	100.0	8.3	100.0
Ethnicity (% Amhara)	100.0	100.0	100.0
Religion (% Orthodox)	100.0	100.0	100.0
Education (years)	11.3(11-13)	5.8(0-12)	0.9(0-4)
Experience (years)	2.8(1-4)	3.4(2-6)	17.4(5-30)

HEW=Health Extension Worker; CHDA=Community Health Development Agent;
TBA=Traditional Birth Attendant

Table 3. 25-Item Trust Scale

"In your kebele, the [type of health workers]…"

Do not gossip. (character/communication)

Are responsible for their work. (character)

Sense your accomplishments as inferior.[c] (character)

You have good experiences with the [type of health workers].[c] (communication)

Wish your failure.[a] (character)

Do not respect you.[c] (character/communication)

You have loss of confidence in [type of health workers].[c] (ability)

Feel as though they are superior to others.[c] (character)

Make fun of people behind their backs.[c] (character)

Have good health knowledge.[c] (ability)

Do not keep their word.[c] (character)

Are honest. (character)

You know the [type of health workers] very well.[b] (oneness/communication)

Are friendly with you. (communication)

Have oneness with you. (oneness)

Are genuine. (character)

Work for the good of others. (character/oneness)

Talk falsely about their accomplishments. (character/communication)

Do not deny their necklace (belief in God reflected by wearing a necklace). (character)

Do not think positive of you.[c] (character)

You know the character of the [type of health workers].[a] (character)

Are not committed to the work.[c] (character/oneness)

You know their abdomens (knowing their minds) of the [type of health workers].[a] (oneness)

Do not keep your secrets.[a] (character/communication)

You do not believe in the ability of the [type of health workers]. (ability)

NOTE: Dropped items are in italics

[a] Dropped due to low item-to-test correlation (<0.30)

[b] Dropped due to displaying differential item functioning by respondent *cadre*

[c] Dropped due to loading low on the first principal component (<0.50)

Table 4. Sample Characteristics and Trust Scores for Pilot Study by Cadre

	HEWs (N=20)	CHDAs (N=33)	TBAs (N=39)
DEMOGRAPHIC CHARACTERISTICS Mean(Range) or %			
Age (years)	23.3(20-28)	37.5(20-55)	40.3(28-60)
Gender (% female)	100.0	15.2	92.3
Ethnicity (% Amhara)	100.0	100.0	100.0
Religion (% Orthodox)	95.0	100.0	100.0
Education (years)	11.0(11-11)	2.9(0-10)	0.6(0-8)
Experience (years)	4.0(2-5)	4.7(0-30)	11.5(1-40)
TRUST SCORES USING THE FULL SCALE Mean(Range)			
Trust in HEWs	84.7(74-98)	73.9(58-95)	77.1(63-96)
Trust in CHDAs	75.1(63-87)	73.1(60-98)	72.8(61-96)
Trust in TBAs	75.3(65-91)	71.8(61-92)	75.0(60-99)
Total Trust Score	235.0(207-276)	210.4(180-257)	221.3(186-288)

HEW=Health Extension Worker; CHDA=Community Health Development Agent;
TBA=Traditional Birth Attendant

Table 5. Reliability Measures of the Reduced 21- and Final 10-Item Trust Scales

	Trust in HEWs		*Trust in CHDAs*		*Trust in TBAs*	
	21-item	*10-item*	*21-item*	*10-item*	*21-item*	*10-item*
Cronbach's Alpha	0.91	0.87	0.88	0.84	0.89	0.85
Mean Interitem Correlations	0.21	0.26	0.15	0.19	0.15	0.20

HEW=Health Extension Worker; CHDA=Community Health Development Agent; TBA=Traditional Birth Attendant

Table 6. Shared and Unique Components of Trust Models across Frontline Worker Cadres

Trust in Cadres	Total	Within-Cadre Agreement			Average Within-Cadre [a]	Between-Cadre [b]	Unique [c]	Corr [d]
		Within Each Cadre						
		HEW Respondents	CHDA Respondents	TBA Respondents				
About HEWs	0.384	**0.535**	0.337	0.425	0.414	0.368	0.046	0.867
About CHDAs	0.405	0.488	**0.465**	0.433	0.452	0.378	0.073	0.821
About TBAs	0.424	0.479	0.369	**0.504**	0.445	0.414	0.031	0.926

NOTE: Methods used to compute levels of agreement followed processes outlined by Weller & Baer (2002)

HEW=Health Extension Worker; CHDA=Community Health Development Agent; TBA=Traditional Birth Attendant

[a] Average of the within-cadre agreement levels

[b] Average between-cadre agreement levels

[c] Average amount by which the within-cadre agreement exceeds the between-cadre agreement

[d] The square-root of the estimated correlation among samples, using Spearman's method

Chapter 3: Factors Shaping Interactions among Community Health Workers in

Rural Ethiopia: Rethinking "Workplace" Trust and Teamwork

Abstract

The purpose of the study is to examine how socio-demographic and structural factors shape teamwork among community-based maternal and newborn health (MNH) workers. Research in mid- and high-income settings suggests that coworker collaboration increases productivity and performance. A major gap in this research, however, is the exploration of factors that influence teamwork among diverse health worker cadres in rural, low-resource settings. A cross-sectional survey was conducted with community health workers (N=194) in three districts of West Gojam Zone, Amhara region, Ethiopia. Communities were randomly selected from Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) project sites; health worker respondents were recruited using a snowball sampling strategy. A Fractional Logit Model was fitted for frequency of interactions with each health worker cadre. A core set of factors—trust in coworkers, gender, and health worker type—were found to be influential for teamwork across cadres. The variables of distance, perceived motivations of coworkers, and food insecurity (a proxy for wealth) were found to differentially influence teamwork by cadre. The development of interventions that promote trust and gender sensitivity, and improve perceptions of health worker motivations, is an important step in bridging the gap in health services delivery between low- and high-resource settings.

Introduction

An estimated 350,000 women die from complications related to pregnancy and childbirth annually (Hogan et al., 2010), and 15 million women suffer severe or long-

lasting complications that disproportionately affect women in resource poor countries (Hill et al., 2007; Hindin, 2007; Say, Pattinson, & Gülmezoglu, 2004). A shortage of skilled health workers has prompted a shift in the provision of select maternal and newborn health (MNH) services from facility-based, skilled providers to lower skilled, community-based health workers (Hongoro & McPake, 2004; Kinfu, Dal Poz, Mercer & Evans, 2009; World Health Organization [WHO], 2007). This shift towards a community health worker model has occurred across countless communities globally, yet evidence to support the effectiveness of such programs has been mixed depending on the setting and health outcome of interest (Lewin et al., 2010). In this paper, we contribute to existing research on the utilization of community health workers by raising two important questions: Who are the community health workers working in MNH? What factors influence their ability and willingness to work together to improve the health of women and newborns in their community?

Research in mid- and high-income workplace settings suggests that collaboration among coworkers increases productivity. For example, the adoption of teams and teamwork in manufacturing plants increases production (Hamilton, Nickerson, & Owan, 2003; Moses & Stahelski, 1999), while team cohesion is linked with improved organizational performance and learning (Montes, Moreno, & Morales, 2005). Furthermore, evidence exists for the presence of "collective intelligence" within groups that helps explain improved group performance (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). In healthcare, collaboration among interdisciplinary teams contributes to improved health outcomes (Middleton, 2012). Taken together, these studies show that when people work together they can improve performance by tapping collective

knowledge, thus confirming the importance of assessing factors for coworker collaboration.

While teamwork among community health workers is desirable, the reality is that local people engaged in the provision of healthcare at the community level are often a heterogeneous group. For example, Dynes, Hadley, Stephenson and Sibley (2013) reported large differences by age, gender, and education between community-based MNH worker cadres in rural Ethiopia. Prevailing social structures, including gender and age dynamics, local politics, and cultural norms may limit the interactions between diverse health workers, thereby reducing the potential for collaboration and improved quality of care.

In rural areas of Ethiopia, less than five percent of births are attended by a skilled birth attendant (Central Statistical Agency [CSA] [Ethiopia] & ICF International, 2012). In a recent Lancet review of 54 countries, Ethiopia had the highest level of inequality in skilled birth attendance when comparing the lowest and highest wealth quintiles (Barros et al., 2012). In 2003, the Ethiopian Health Sector Development Program launched the Health Extension Program (HEP) in order to bring primary health care to rural areas (Federal Democratic Republic of Ethiopia Ministry of Health, 2003; Federal Ministry of Health [FMOH], 2005). A new cadre, the health extension worker (HEW), is now expected to deliver an array of primary healthcare, including MNH services, to the community. By 2009, the program had trained and deployed 33,819 HEWs into its health system (Federal Democratic Republic of Ethiopia Ministry of Health, 2010). Until recently, HEWs were supported by a network of volunteer Community Health Development Agents (CHDA).

To-date, the HEP has fallen short of the goal of increasing coverage of MNH services (FMOH & Regional Health Bureaus, 2008). Research suggests that this is due, in part, to the large number of preventive care tasks for which HEWs are responsible, their limited training in MNH care, and a community preference for birth care from experienced family members and Traditional Birth Attendants (TBA) (Hadley, Handley, & Stevenson, 2010; Stephenson et al., 2011). Consistent with the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) theory of action, encouraging teamwork between HEWs and other community health workers, such as CHDAs and TBAs, may be one approach to increasing HEW presence at and around the time of birth.

There is a dearth of research on the exploration of factors that influence collaboration among health workers in rural, low-resource settings. Moreover, healthcare research on teamwork has taken a somewhat narrow view of *workplace*, focusing primarily on conventional settings such as clinics and hospitals. In this paper, we examine how socio-demographic characteristics, perceptions of fellow health worker cadres, physical and logistical barriers, and shared experiences influence the frequency of workplace interactions ("teamwork") among community-based MNH workers in rural Ethiopia. We define teamwork as *interactions involving collaborative activities*—such as advice- and help-seeking, providing honest feedback, sharing sensitive information, openness to criticism, and knowledge sharing—*that contribute to the quality and effectiveness of health service delivery*. The knowledge gained here will contribute to the organizational and health sciences research on teamwork, as well as inform MNH public health policy and programming decision-making in Ethiopia and elsewhere.

Study setting

Amhara region of Ethiopia has a population of 17.2 million people with 88% of the population living in rural areas (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). The majority of the population self-identify as ethnically Amhara, Orthodox Christian, and engage in agricultural work. Key maternal health indicators demonstrate that women in Amhara region have low health seeking behavior related to pregnancy and birth (CSA [Ethiopia] & ICF International, 2012). For instance, Amhara region has the fourth highest rate of homebirth among Ethiopian regions at 89 percent and the sixth lowest rate of skilled birth assistance (10%). Most women seek the service of a TBA (29%) or relative/other (60%) during birth. Two-thirds of women in Amhara region receive no antenatal care (59%) and only seven percent receive a postnatal visit.

Methods

Data

The data for the analysis were collected between November, 2011 and January, 2012, from three cadres of community health MNH workers—HEWs, CHDAs, and TBAs—in three districts of West Gojam Zone, Amhara region, Ethiopia. Seven *kebeles* (communities) were randomly selected from 24 MaNHEP project sites; MaNHEP is a three-year project funded by the Bill and Melinda Gates Foundation focused on improving community MNH care in six rural districts of Ethiopia. The data for the present study were collected less than one year after introduction of key MaNHEP project interventions. Respondents were purposively recruited using a snowball sampling strategy. Inclusion criteria for participation in the study included (1) must be 18 years or

older; (2) able to speak and understand Amharic; and (3) performed MNH community work during the past year. Six trained Ethiopian interviewers administered the survey orally in Amharic to up to 30 health workers within each *kebele* in order to reach the target sample size of 164 health workers. Ethical approval was obtained from the Emory University Institutional Review Board and the Amhara Regional Health Bureau; informed consent was obtained from participants according to standard procedures.

The final sample sizes were: 17 HEWs (a census of HEWs in the study *kebeles*); 48 CHDAs; and 129 TBAs. Only surveys with complete data were retained; an average of 1.3% of data for each variable was missing. After respondents with missing data were removed from the analysis, samples included: N=165 for analysis of health worker interactions with HEWs (15 HEWs, 38 CHDAs, 112 TBAs); N=171 for analysis of health worker interactions with CHDAs (16 HEWs, 39 CHDAs, 116 TBAs); and N=164 for analysis of health worker interactions with TBAs (16 HEWs, 40 CHDAs, 108 TBAs).

Dependent variable

Frequency of interactions ("teamwork") with HEWs, CHDAs, and TBAs were the outcomes of interest in this study. Respondents were asked on how many days in the past month that they interacted with each other health worker in his/her *kebele*; a full list of names was read to each respondent. Noting that the total number of health workers varied by *kebele*, frequency of interactions was operationalized as the *proportion of total possible interactions* with each cadre, ranging from zero (no interaction days with any health workers in that cadre) to one (interaction every single day with each health worker in that cadre). The calculation of interaction scores is described below:

$$HEW \ Interaction \ Score = \frac{\sum_{j}^{i} Int_{HEWs}}{N_{HEWs} \times 30}$$

$$CHDA \ Interaction \ Score = \frac{\sum_{j}^{i} Int_{CHDAs}}{N_{CHDAs} \times 30}$$

$$TBA \ Interaction \ Score = \frac{\sum_{j}^{i} Int_{TBAs}}{N_{TBAs} \times 30}$$

, where $\sum_{j}^{i} Int$ is the total number of interactions in the past month with health workers of

that cadre$_{(i...j)}$, and *N* is the total number of health workers of that cadre (not including

oneself) in the *kebele.* For example, a health worker would receive an *HEW Interaction*

Score of 0.33 if they interacted 10 days (one-third of the days in the month) with each

kebele HEW*,* or a score of 0.50 if they interacted 15 days (half of the days in the month)

with each *kebele* HEW.

Analytic approach and covariates

Data analyses were conducted using Stata 11 (StataCorp, 2009). T-test analyses

comparing respondents with missing data and those without revealed no discernible

pattern of differences across study variables; therefore, multiple imputation was not

undertaken. Analyses were carried out with respondents with complete data only.

A Fractional Logit Model, using a Generalized Linear Model with a logit link

transformation and the binomial family (provides robust standard errors) (Papke &

Wooldridge, 1996), was fitted for frequency of interactions with each health worker cadre

(Model 1—health worker interactions with HEWs; Model 2—health worker interactions

with CHDAs; and Model 3—health worker interactions with TBAs). The covariates of

interest included: (1) *age*; (2) *education*; (3) *children*; (4) *gender*; (5) *experience*; (6)

cadre; (7) *political party affiliation*; (8) *group work*; (9) *distance*; (10) *food insecurity*;

(11) *household assets*; (12) *competing demands*; (13) *trust in (HEWs/CHDAs/TBAs)*; and

(14) *perception of (HEWs/CHDAs/TBAs) motivations*. *Propensity to trust*—measured by responses to two questions (table 1)—and *kebele* were controlled for in the analysis.

The selection of covariates was informed by the literature on factors that shape workplace interactions and in consideration of the local context, represented by the conceptual framework for this study (Figure 1). Average marginal effects (AME) were calculated to indicate *the percentage change in proportion of total interactions with one unit change in each independent variable*, holding continuous variables at their mean and dichotomous variables at zero (Papke & Wooldridge, 1996). To facilitate interpretation of results, continuous variables were centered at their mean and dummy variables were generated for all categorical variables prior to analyses.

[Insert Figure 1]

Linear regression was also conducted to determine if participation on either the MaNHEP Guide Team (GT) or Quality Improvement Team (QIT) was associated with trust level in each cadre.

Independent variables

The independent variables are conceptualized into four broad domains:

Sociodemographic characteristics. According to the principle of homophily, social and demographic similarities strengthen social relations (Ibarra, 1992; Marsden, 1988; McPherson, Smith-Lovin, & Cook, 2001), ease communication, and foster trust and reciprocity (Ibarra, 1993). Sociodemographic variables were collected on age (years), gender (female=1, male=0), children, educational attainment (in years), marital status (married=1, widowed/divorced/not married=0), ethnicity (Amhara=1, other=0), religion (Orthodox Christian=1, other=0), and political party affiliation (Ethiopian People's

Revolutionary Democratic Front [EPRDF]=1, other/none=0). As proxies for wealth,

respondents were asked 17 items on household assets (Filmer & Pritchett, 2001) and nine

items related to household food insecurity (Coates, Sindale, & Bilinsky, 2007). A

Household Asset Index was created using Principal Components Factoring (PCF) where

items were weighted based on their contribution to the first principal component and

summed to create an index. Respondents replied to food insecurity items based on the

frequency of occurrence in the past month, rarely (1-2 times=1), sometimes (3-10

times=2), and often (>10 times=3). The *Household Food Insecurity Access Scale*

(HFIAS) was scored by summing items with a range of zero (food secure) to 27 (high

food insecurity); versions of this scale have been found to be reliable in Ethiopia

(Cronbach's alpha 0.92) (Hadley, Lindstrom, Tessema, & Belachew, 2008).

Perceptions of health worker cadres. Research has demonstrated that high trust

among working groups plays a role in increasing performance (Colquitt, Scott, & LePine,

2007; Dirks & Ferrin, 2002), knowledge sharing (Wu, Lin, Hsu, & Yeh, 2009),

citizenship behavior (Colquitt et al., 2007), collaboration (Isaacs, Valaitis, Newbold,

Black, & Sargeant, 2012), and a preference for working in teams (Kiffin-Petersen &

Cordery, 2003). Respondents were asked 13 items about trust in each cadre using the

Rural Health Worker Trust Scale (Table 1), previously pilot tested and found to be

reliable in this population (Cronbach's alpha 0.81-0.91) (Dynes et al., 2013). In a two-

step process, respondents replied to each item based on their level of agreement with the

statement using a circle/square visual analogue. For example, in Step 1, respondents were

asked, "The HEWs in your *kebele* are honest—do you agree (pointing to the circle) or

disagree (pointing to the square)?"; Step 2, "Do you agree/disagree strongly (pointing to

the large circle/square) or just a little (pointing to the small circle/square)?", (strongly disagree=1, disagree=2, agree=3, and strongly agree=4; negatively phrased items were reverse coded). Items were weighted based on their contribution to the first principal component and summed to create an *index for trust in HEWs/CHDAs/TBAs*.

[Insert Table 1]

Perception of fellow health workers' motivations to do health work and the degree to which those motivations are perceived as "pro-social"—for the well-being and integrity of others (Brief & Motowidlo, 1986)—is potentially important for teamwork. A list of common health worker motivations, and the ranking of those motivations from least to most pro-social (Table 2), was obtained in formative work. For the survey, respondents were then asked to compare each motivation pair (e.g., *earn money* vs. *help the community*) according to their perception of which item is a stronger motivation for each cadre to do health work (the more pro-social option=1 and the less pro-social option=0). A *perceived motivation score* was developed by summing each comparison, with a range from zero (perceived least pro-social) to 10 (perceived most pro-social).

[Insert Table 2]

Physical and logistical barriers. Organizational and health sciences research in Western settings has found that geographic proximity (physical barrier) influences communication, coordination, mutual support, effort, cohesion, and information transaction (Cook, Gerrish, & Clarke, 2001; Hoegl & Proserpio, 2004; Xyrichis & Lowton, 2008). Distance was operationalized in the study by using Global Positional System (GPS) coordinates to measure the distance (in km) between each health worker's home and their *kebele* health post.

Competing demands (logistical barrier) have been found to limit healthcare workers ability to interact effectively (Benson, Cribb, & Barber, 2009; Nagpal et al., 2011). A list of competing demands was obtained during MaNHEP formative research (Hadley et al., 2010) and used to create survey items (Table 2). Respondents were asked how much of the day they spend doing non-health work tasks (none of the day=0, a little of the day=1, half the day=2, all day=3). Items were summed to create a *Competing Demands Index* with a range of zero (low competing demands) to 18 (high competing demands).

Shared experiences. Training and team-building exercises have demonstrated effectiveness in increasing teamwork among health professionals (Capella et al., 2010; Hobgood et al., 2010; Nadler, Sanderson, Van Dyken, Davis, & Liley, 2011; Shapiro et al., 2004; Siassakos et al., 2011). The survey questionnaire contained items that relate to shared experiences including health worker type (HEW/CHDA/TBA), health experience (in years), and group work/training (MaNHEP GT or QIT participation=1, no participation=0).

Results

All participants self-identified as ethnically Amhara and Orthodox Christian. Patterns of gender, education, work experience, and level of food insecurity were particularly differentiated along cadre lines (Table 3). Health workers from all three cadres reported the highest level of trust in HEWs (HEWs/CHDAs/TBAs: 47/48/48; [possible range: 13 to 52]), while TBAs were perceived to have the most pro-social motivations (HEWs/CHDAs/TBAs: 7/8/7; [possible range: zero to 10]). Health workers reported the highest proportion of interactions with HEWs (HEWs/CHDAs/TBAs:

0.64/0.12/0.05) and the lowest proportion of interactions with TBAs (HEWs/CHDAs/TBAs: 0.06/0.05/0.02).

[Insert Table 3]

Factors affecting health workers' interactions with HEWs

For work interactions with HEWs (Table 4), female health workers were less likely than male health workers to report work interactions with HEWs (p=0.023; AME -5%). HEWs were much more likely than CHDAs and TBAs to interact with other HEWs (p<0.001; AME 23%). Health workers who lived farther away from the health post were significantly less likely to interact with HEWs (p=0.032; AME -2%). Furthermore, workers who perceived HEWs to have more pro-social motivations for doing health work interacted more frequently with HEWs than those who perceived HEWs to have less pro-social motivations (p=0.014; AME 0.3%). Finally, health workers in all three cadres who had higher trust in HEWs were significantly more likely to interact with HEWs than workers with lower trust in HEWs (p<0.001; AME 3%).

[Insert Table 4]

Factors affecting health workers' interactions with CHDAs

Turning to work interactions with CHDAs (Table 4), female health workers were less likely than male health workers to interact with CHDAs (p=0.038; AME -6%). HEWs were more likely than CHDAs and TBAs to interact with CHDAs (p=0.017; 11%). Health workers who had higher trust in CHDAs were significantly more likely to interact with CHDAs than workers with lower trust in CHDAs (p=0.007; 2%).

Factors affecting health workers' interactions with TBAs

For work interactions with TBAs (Table 4), gender, cadre type, and trust were again influential. Females were less likely than males to report work interactions with TBAs (p=0.007; AME -4%), and HEWs were more likely than CHDAs and TBAs to interact with TBAs (p=0.005; AME 7%). Health workers who had higher trust in TBAs were significantly more likely to interact with TBAs than workers with lower trust in TBAs (p=0.021; AME 1%). Finally, health workers with greater food insecurity were more likely to interact with TBAs (who as a cadre had the highest level of food insecurity) than were more food secure workers (p=0.004; AME 0.2%).

Relationship between MaNHEP participation and trust in health worker cadres

Participation on the MaNHEP GT and QIT were not found to be associated with trust in HEWs (GT: p=0.896; QIT: p=0.508), trust in CHDAs (GT: p=0.625; QIT: p=0.977), or trust in TBAs (GT: p=0.110; QIT: p=0.862).

Discussion

The provision of healthcare by diverse groups is analogous to a classic commons problem: resources available to community health workers are limited, making cooperation and collaboration necessary for effective service provision. We sought to understand what variables predicted cooperation and collaboration among diverse community health workers in rural Ethiopia. Three key findings emerge from this study. First, comparisons of HEWs, CHDAs, and TBAs point to substantial sociodemographic differences by cadre, which may have significant implications for public health programming with regards to use of community health workers to extend health services. Second, there is a common thread that connects all three of the interaction models; being

a HEW, being a male health worker, and having trust in a cadre are associated with increased interactions with all three cadres. Trust is a modifiable factor, and therefore, is an important point for intervention. While gender is not modifiable, gender sensitivity training may be another potential point for intervention. Finally, distance, perception of motivations, and food insecurity influenced interactions with some, but not all, cadres, highlighting the need for cadre-specific programming, particularly regarding perceptions of health worker motivations.

Community health workers are often considered as a single, homogeneous entity; the data presented here suggest otherwise. We argue for a public health agenda that embraces these differences so that health workers and community members alike come to respect and value the varied perspectives of diverse cadres and to use that diverse expertise to augment performance. Research has demonstrated that heterogeneous teams are more productive than homogeneous teams (Hamilton et al., 2003), and workers may be able to access a wider range of resources by interacting with groups other than their own (Burton, Wu, Prybutok, IEEE member, & Harden, 2012; Hansen, 1999). Health worker teams at the community level, therefore, are likely to benefit from diversity of group membership, as well as strong social sensitivity (e.g., awareness of each other's feelings, taking turns speaking) as described by Woolley and colleagues (2010). Sociocultural heterogeneity has also been linked to lower levels of trust (Ruttan, 2006). Our results, however, suggest that among the stark differences in sociodemographic factors between cadres, few appear to impact on interactions, and that trust does play a central role. These studies paint a complex picture of the relationships between heterogeneity, trust, and collective action that need further investigation.

Across interaction models, male health workers, HEWs, and health workers with higher trust in cadres were more likely to interact with members of those cadres. Gender norms in which men have greater freedom of movement and access to social capital, along with fewer home-based responsibilities, may contribute to the first finding. Interventions incorporating behavioral change communication and gender sensitivity training may modify the influence of gender on interactions, thereby increasing teamwork. That HEWs are the focal point of the local health system structure in rural Ethiopia supports the finding that HEWs interact more often compared to other cadres. Finally, that health workers with greater trust in their own and other cadres interact more often compliments prior work on the importance of workplace trust (Dirks, 1999; Kiffin-Petersen & Cordery, 2003; Wu et al., 2009) for teamwork.

Different predictors of interaction were also noted across the three cadres. Health workers who live closer to the health post were more likely to interact with HEWs compared to workers who lived further away; this finding may reflect that HEWs often live at or near the health post where MaNHEP group meetings are usually held. Second, health workers with greater food insecurity interact with TBAs more frequently than food secure workers; this finding may represent individuals interacting more with people at similar socioeconomic levels than those with dissimilar wealth. Lastly, health workers who perceive HEWs to have more pro-social motivations for doing health work interact with HEWs at a higher rate than those who perceive them to have more selfish motivations. This novel finding extends the current literature on health worker motivations (Franco, Bennett, & Kanfer, 2002; Maes, 2012; Rowe, de Savigny, Lanata, & Victora, 2005; Willis-Shattuck et al. 2008) by considering *perceptions of others'*

motivations as a factor for teamwork. Programs that improve perceptions of health worker motivations may have particular relevance for increasing interactions between volunteer and paid health workers.

This is the first work, to our knowledge, that makes an empirical connection between trust and teamwork among rural, community-based health worker cadres. Trust-building trainings may be an important point of intervention for health workers across educational, experience, and health system levels. It is also noteworthy that the effect size of trust for teamwork varies by cadre—trust is even more influential for interactions with HEWs (AME 3%) as compared to interactions with CHDAs (AME 2%) and TBAs (AME 1%). This finding likely reflects that HEWs are a comparatively new cadre in rural Ethiopia; trust in a particular health worker cadre may be especially salient for teamwork during transitional periods when local health systems are undergoing structural changes. Furthermore, we noted that TBAs had fewer overall interactions with each cadre compared to CHDAs and HEWs. One potential explanation for this finding is that TBAs may display lower generalized trust (trust in all people in general) compared to particularized trust (trust in people similar to oneself), thereby resulting in reduced engagement in volunteer activities (Uslaner & Conley, 2003).

Our results are also surprising. First, CHDA and TBA participation in either the MaNHEP GT and/or QIT was not related to teamwork, however, the relationship between HEW participation and teamwork was positive and approached significance (p=0.071). Second, MaNHEP participation was not associated with higher levels of trust in any of the health worker cadres. These results are unexpected and diverge from previously reported findings. For example, social network data collected concurrently

with the data presented here provide strong evidence that trust and training/group work were both important factors for interactions at the dyad, or relational, level (Dynes, Hadley, Stephenson, & Sibley, forthcoming). Furthermore, Sibley et al. (forthcoming) reported that a large majority of frontline health workers in MaNHEP project sites of Amhara region participated in GT or QIT meetings, and that HEWs and TBAs were significantly more likely to view themselves as part of a team in providing MNH care at project endline compared to baseline (most of the CHDAs already viewed themselves as part of a team at baseline). Additionally, women's trust in each cadre of frontline worker to provide pregnancy, delivery and postnatal care increased significantly over baseline, except for their trust in TBAs to provide pregnancy care (they had a moderate level of trust in TBAs at baseline and endline) (Sibley et al., forthcoming).

It is likely that our study contributes divergent findings, at least in part, because we operationalized teamwork and trust at the cadre level. Inter-cadre training may increase trust and teamwork primarily at the interpersonal level; perhaps over time, training and group work can also bring about change in these factors at the group level. Taken together, these data suggest that while the MaNHEP project made significant strides in fostering trust and collaboration at the individual frontline worker level, and in the promotion of community trust in health workers, regardless of cadre, more work and time may be needed to overcome previously existing health worker perceptions of each cadre as a whole.

Limitations and research implications

Several limitations of this work need to be considered. First, the sample size was small, due to logistical and financial constraints, relative to the number of independent

variables considered; this also precluded (1) inclusion of interaction terms to test for the potential moderating roles of variables within the model, and (2) testing the mediating role of trust. Data were collected at a single point in time, eliminating our ability to make causal inferences. Furthermore, the health workers were recruited from only seven *kebeles*, which reduces the generalizability of findings. Finally, we limited our outcome of interest to the frequency of interactions. The purpose, outcome, and quality of interactions may be important considerations in subsequent work.

Large-scale, longitudinal research is needed to better understand how teamwork changes in response to fluctuations in level of trust, perceptions of motivations, and gender norms over time. Future work would also benefit from inclusion of interaction terms to uncover more complex relationships among variables. Qualitative and quantitative research is needed to further delineate why interactions with varied health worker cadres are differentially influenced by sociocultural and structural factors. Noting the non-significant influence of MaNHEP participation on interactions and on trust level, future research focusing on the determinants of trust and patterns of interaction and information flow from project to non-project members of the community may be particularly insightful. And finally, similar research should be undertaken in other low-resource, rural settings to determine if the factors for teamwork are reproducible in other contexts.

Conclusion

The majority of research on coworker teamwork has focused on conventional workplace settings in Western localities. In this study, we identified a core set of factors that are influential for teamwork across three cadres of health workers in Ethiopia—trust

in coworkers, gender, and health worker type. We also identified a subset of factors that differentially influence teamwork by cadre, including perceived motivations, distance, and food insecurity. This information is critical to informing health systems strengthening efforts and lays the groundwork for a research and public health agenda that aims to improve the quality of MNH care in non-traditional workplace settings.

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TABLE 1. Trust Items

Rural Health Worker Trust Scale	*Propensity to Trust Score*
In your *kebele*, the [cadre] do not gossip.	Generally speaking, would you say that you need to be very careful in dealing with people?
In your *kebele*, the [cadre] are responsible for their work.	
In your *kebele*, the [cadre] do not respect you.	
You have loss of confidence in [cadre] in your *kebele*.	
In your *kebele*, the [cadre] have good health knowledge.	Do you think most people would try to take advantage of you if they had the chance, or would they try to be fair?
In your *kebele*, the [cadre] work for the good of others.	
In your *kebele*, the [cadre] do not think positive of you.	
You do not believe in the ability of the [cadre] in your *kebele*.	
The [cadre] in your *kebele* are honest.	
The [cadre] in your *kebele* have oneness with you.	
The [cadre] in your *kebele* do not deny their necklace.	
You have good experiences with the [cadre] in your *kebele*.	
The [cadre] in your *kebele* have good character.	

TABLE 2. Competing Demands and Health Worker Motivations

Index of Competing Demands (How much of the day do you spend…?)	*Common Health Worker Motivations in order from most pro-social to least pro-social*
farming?	To help the community
attending livestock?	For God or St. Mary (spiritual blessing)
looking after children?	To earn respect from the community
collecting water?	To gain non-financial incentives (e.g., training, gifts)
collecting firewood?	To earn financial incentives
doing housework?	

TABLE 3. Characteristics of Community Health Workers in Amhara Region, Ethiopia by Cadre

Characteristic by Domain	HEWs (N=17)	CHDAs (N=48)	TBAs (N=129)
SOCIO-DEMOGRAPHIC Mean (Range) or %			
Age	25(21-32)	41(28-58)	45(24-78)
Female (%)	100	10	89
Number of Children	1(0-3)	6(0-10)	7(1-16)
Education in Years	11(10-13)	5(0-10)	1(0-7)
Married (%)	71	94	57
Amhara Ethnicity (%)	100	100	100
Orthodox Christian (%)	100	100	100
EPRDF Party Affiliation (%)	100	90	47
Household Assets Index	2(-1-4)	1(-3-3)	-1(-4-3)
Household Food Insecurity Access Scale Score	1(0-5)	2(0-19)	6(0-26)
PERCEPTIONS OF HEALTH WORKER CADRES Mean (Range) or %			
Perceptions of HEW Motivations Index (range 0-10)	4(2-8)	5(1-10)	4(0-10)
Perceptions of VCHP Motivations Index (range 0-10)	7(2-10)	7(1-10)	5(1-10)
Perceptions of TBA Motivations Index (range 0-10)	7(5-9)	8(1-10)	7(0-10)
Trust in HEWs Index (range 13-52)	47(35-51)	48(32-52)	48(29-52)
Trust in VCHPs Index (range 13-52)	45(28-51)	47(32-52)	47(30-52)
Trust in TBAs Index (range 13-52)	45(28-51)	46(32-52)	47(32-52)
PHYSICAL AND LOGISTICAL BARRIERS			
Competing Duties Index (range 0-18)	2(0-5)	6(3-10)	7(1-14)
Distance from Home to Health Post (km)	1(0-5)	2(0-5)	2(0-5)
SHARED EXPERIENCES Mean (Range) or %			
Health Work Experience in Years	6(3-6)	4(1-16)	16(1-43)
MaNHEP Guide or Quality Improvement Team (%)	65	92	33
FREQUENCY OF INTERACTIONS IN THE LAST MONTH Mean (Range)			
Work Interactions with HEWs [a]	0.6(0-1.0)	0.1(0-0.4)	0.1(0-0.8)
Work Interactions with CHDAs [a]	0.1(0-0.4)	0.1(0-0.3)	0.0(0-0.5)
Work Interactions with TBAs [a]	0.1(0-0.4)	0.1(0-0.2)	0.0(0-0.3)

NOTE: HEWs=Health Extension Workers; CHDAs=Community Health Development Agents; TBAs=Traditional Birth Attendants
[a] Work interactions is defined as the proportion of all possible interactions in the past month

TABLE 4. Coefficients and Average Marginal Effects for Fractional Logit Models Assessing the Influence of Individual Characteristics on the Frequency of Interactions with Three Cadres of Community Health Workers in Amhara Region, Ethiopia

Characteristic by Domain	Model of Interactions with HEWs		Model of Interactions with CHDAs		Model of Interactions with TBAs	
	N=165		N=171		N=164	
	Coefficient (SE)	AME [b]	Coefficient (SE)	AME [b]	Coefficient (SE)	AME [b]
SOCIO-DEMOGRAPHIC CHARACTERISTICS						
Age	0.02(0.01)	0.1%	0.01(0.02)	0.0%	0.01(0.02)	0.0%
Gender						
Female (Male ref)	-0.79(0.35)*	-5.5%	-1.07(0.51)*	-5.7%	-1.26(0.43)**	-4.0%
Children	-0.06(0.05)	-0.4%	0.03(0.04)	0.1%	0.06(0.05)	0.2%
Education in Years	0.07(0.05)	0.5%	0.03(0.06)	0.2%	0.01(0.06)	0.0%
Marital Status						
Married (not married ref)	-0.31(0.29)	-2.1%	-0.50(0.33)	-2.6%	-0.44(0.29)	-1.4%
Political Party Affiliation						
EPRDF Affiliated (other or none ref)	0.12(0.37)	0.8%	0.39(0.30)	2.0%	0.53(0.34)	1.7%
Household assets index	0.18(0.15)	1.3%	0.12(0.13)	0.7%	0.02(0.16)	0.1%
Household food insecurity access scale	0.03(0.02)	0.2%	0.03(0.02)	0.2%	0.06(0.02)**	0.2%
Community [a]						
Kebele 1 (non-*Kebele* 1 ref)	-0.59(0.45)	-4.1%	-0.51(0.44)	-2.7%	-0.08(0.34)	-0.3%
Kebele 2 (non-*Kebele* 2 ref)	0.95(0.47)*	6.6%	0.65(0.39)	3.5%	1.49(0.32)***	4.7%
Kebele 3 (non-*Kebele* 3 ref)	0.83(0.46)	5.8%	0.60(0.49)	3.2%	1.13(0.44)*	3.6%
Kebele 4 (non-*Kebele* 4 ref)	-0.96(0.52)	-6.7%	0.42(0.40)	2.2%	0.96(0.36)**	3.0%
Kebele 5 (non-*Kebele* 5 ref)	0.34(0.42)	2.4%	0.93(0.41)*	4.9%	1.55(0.37)***	4.9%
Kebele 6 (non-*Kebele* 6 ref)	0.54(0.38)	3.8%	0.60(0.42)	3.2%	0.59(0.37)	1.9%
Kebele 7 (non-*Kebele* 7 ref)	Omitted		Omitted		Omitted	
Propensity to trust index [a]	-0.22(0.15)	-1.6%	0.02(0.15)	0.1%	-0.19(0.14)	-0.6%
PERCEPTIONS OF HEALTH WORKER CADRES						
Perception of [HEW/CHDA/TBA] motivations index	0.04(0.02)*	0.3%	-0.00(0.02)	-0.0%	-0.00(0.02)	-0.0%
Trust in [HEW/CHDA/TBA] index	0.40(0.11)***	2.8%	0.34(0.13)**	1.8%	0.30(0.12)*	0.9%

|						
PHYSICAL AND LOGISTICAL BARRIERS						
Competing Duties	-0.09(0.06)	-0.7%	0.04(0.05)	0.2%	0.03(0.05)	0.1%
Distance home to health post	-0.21(0.10)*	-1.5%	0.07(0.09)	0.4%	-0.06(0.09)	-0.2%
SHARED EXPERIENCES						
Health worker type						
HEW (non-HEWs ref)	3.29(0.77)***	23.0%	2.08(0.87)*	11.1%	2.27(0.75)**	7.2%
CHDA (non-CHDAs ref)	0.40(0.32)	2.8%	0.42(0.38)	2.2%	0.39(0.37)	1.2%
TBA (non-TBAs ref)	Omitted		Omitted		Omitted	
Experience (yrs)	0.02(0.02)	0.1%	0.01(0.01)	0.0%	1.00(0.99-1.02)	0.0%
Group Work/Training						
MaNHEP Participation (no MaNHEP Participation ref)	0.46(0.26)	3.2%	0.18(0.26)	0.9%	0.17(0.25)	0.5%

NOTE: Ethnicity and Religion were omitted from analyses due to lack of variance in the sample

NOTE: HEWs=Health Extension Workers; CHDAs=Community Health Development Agents; TBAs=Traditional Birth Attendants; MaNHEP=Maternal and Newborn Health in Ethiopia Partnership project

[a] Denotes control variables; [b] AME is the Average Marginal Effects, using the Delta-method dy/dx, of the independent variable on frequency of interactions; displayed in percent change in proportion of total possible interactions in the past month per one-unit change in the independent variable

* Significance level <0.05; ** Significance level <0.01; *** Significance level <0.001

FIGURE 1. Conceptual model for teamwork among community health workers

Model of Teamwork among Community Health Workers
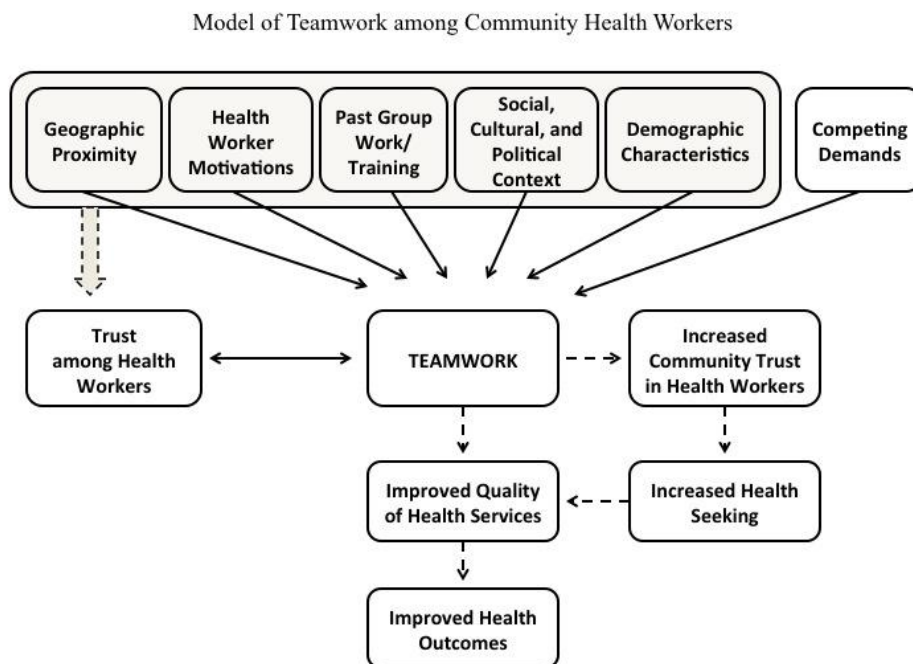
NOTE: Dotted lines represent relationships not investigated in the present study.
NOTE: The dotted arrow adjoining proximity/motivations/group work/training/social/cultural/political context/demographic characteristics to trust represents the potential mediating role of trust in influencing teamwork.

Chapter 4: A Network Study Exploring Factors that Promote or Erode Interaction among Diverse Community Health Workers in Rural Ethiopia

Abstract

Task shifting in response to the health workforce shortage has resulted in community-based health workers taking on increasing responsibility. Community health workers are expected to work collaboratively, though they are often a heterogeneous group with a wide range of training and experience. Interpersonal relationships are at the very core of effective teamwork, yet relational variables have seldom been the focus of health systems research in low resource, rural settings. This paper helps fill this knowledge gap by exploring the dyadic level, or relational, characteristics of community maternal and newborn health workers, and the individual and collective influence of these characteristics on interaction patterns. Network data was collected from community health workers (N=194) in seven rural *kebeles* of Amhara region, Ethiopia from November, 2011 to January, 2012. Multiple Regression Quadratic Assignment Procedure was used to fit regression models for *frequency of work interactions*. Strong and consistent evidence was found in support of *Trust* and *Past training together* as important relational factors for work interactions; less consistent evidence was found across sites in support of *Homophily, Distance*, and *Shared motivations*. Our findings also point to a typology of network structure across sites, where one set of networks was characterized by denser and stronger health worker ties relative to their counterparts. Our results suggest that the development of interventions that promote trust and incorporate cross-cadre training is an important step in encouraging collective action. Moreover, assessing

the structure of health worker networks may be an effective means of evaluating health systems strengthening efforts in rural, low-resource settings.

Introduction

The health workforce shortage has hit rural areas of low-resource countries hardest (Gerein, Green, & Pearson, 2006; World Health Organization [WHO], 2006), where task shifting has led to community health workers taking on greater responsibility (Chopra, Sharkey, Dalmiya, Anthony, & Binkin, 2012; Fulton et al., 2011; Hoke, et al., 2012; Joseph et al., 2012; WHO, 2012). Community health workers are expected to work collaboratively, though they are a heterogeneous group with a wide range of training and experience (Dynes, Hadley, Stephenson, & Sibley, 2013), and varied perspectives on health. Within any given context, prevailing sociopolitical structures and factors such as gender and age, along with economic, ideological and cultural norms may all influence interactions between diverse health workers, thereby lessening the potential for collective action. Gilson (2003) calls for the recognition of the inherent complexity of health systems as sociopolitical institutions and the "web of relationships" that exist therein.

Organizational research has demonstrated that collaboration among coworkers increases productivity (Moses & Stahelski, 1999) and improves performance (Montes, Moreno, & Morales, 2005). In the health sciences, coordination and collaboration among interdisciplinary teams and team training contribute to improved health outcomes (Gittell et al., 2000; Middleton, 2012), patient satisfaction (Meterko, Mohr, & Young, 2004), and communication patterns (Meyer et al., 2009), and the reduction of adverse events (Manser, 2009).

Despite the importance of collaboration amidst insufficient human resources and capital, little is known about the factors that promote or erode teamwork among health workers at the community level. Moreover, because interpersonal relationships are at the very core of effective teamwork, relational or dyadic variables are likely important but have seldom been the focus of health systems research in low resource, rural areas (Cunningham et al., 2012). In this paper, we aim to help fill these gaps in the literature by exploring the dyadic level, or relational, characteristics of community maternal and newborn health (MNH) workers in rural Ethiopia, and the individual and collective influence of these characteristics on teamwork. The knowledge gained here will guide policy and programming decision-making around task shifting and health systems strengthening efforts in community-based MNH.

Maternal and newborn health in rural Ethiopia

The health worker shortage is readily apparent in Ethiopia where there is an estimated deficit of 20,000 midwives required to meet the countries MNH care needs (United Nations Population Fund [UNFPA], 2011). With more than 80 percent of the population living in rural or remote areas (Federal Democratic Republic of Ethiopia Population Census Commission, 2008), less than five percent of women in these areas receive skilled birth attendance (Central Statistical Agency [CSA] [Ethiopia] & ICF International, 2012). In fact, among 54 countries recently reviewed in the Lancet, Ethiopia was found to have the greatest inequality in skilled birth attendance when comparing women in the lowest and highest wealth quintiles (Barros et al., 2012).

Since the launch of the Health Extension Program (HEP) in 2003 by the Ethiopian Health Sector Development Program, more than 33,000 Health Extension Workers

(HEWs) have been trained and deployed to delivery community-based primary healthcare (Federal Ministry of Health [FMOH], 2005; Federal Democratic Republic of Ethiopia Ministry of Health, 2010). Until recently, HEWs were supported in the community by a network of volunteer Community Health Development Agents (CHDA). Despite this effort, the HEP has not reached its goal of increasing coverage of MNH services (FMOH & Regional Health Bureaus [RHB], 2008). Research suggests that this may be due, in part, to the large number of tasks for which HEWs are responsible, limited hands-on MNH training, and a community preference for family members and Traditional Birth Attendants (TBA) to provide birth care (Hadley, Handley, & Stevenson, 2010; Stephenson et al., 2011). Consistent with the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) theory of action for improving MNH outcomes (Sibley, 2009), encouraging teamwork between HEWs and other community health workers, such as volunteer CHDAs and TBAs, may be one approach to increasing HEW presence at and around the time of birth when women and newborns are most vulnerable.

Relational factors influencing work interactions

We hypothesize that work-related interaction ("teamwork") is associated with the extent to which an individual (1) is similar or different by social and demographic characteristics to another; (2) trusts another; (3) is geographically close to another; (4) is similarly motivated to engage in health work to another; and (5) has engaged in past training or group work with another. These variables are described below.

Homophily. According to the principle of homophily, social and demographic similarities reinforce social relations (Marsden, 1988; McPherson, Smith-Lovin, & Cook, 2001), increase ease of communication, and promote reciprocity and trust in part by

lowering the costs of interactions (Ibarra, 1993). In the health sciences, healthcare professionals seek support and advice from others who are professionally similar to themselves (Creswick & Westbrook, 2010; MacPhee & Scott, 2002), while lack of role similarity has been found to result in disparate views related to work activities and reduced communication (Rydenfält, Johansson, Larsson, Åkerman, & Odenrick, 2012).

> **HYPOTHESIS 1.** *The extent to which actor i engages in work interactions with actor j is positively associated with the extent to which actor i is similar by social and demographic characteristics to actor j.*

Trust. Organizational research suggests that trust plays a role in increasing group work performance (Dirks, 1999; Dirks & Ferrin, 2002) and increases knowledge sharing (Wu, Lin, Hsu, & Yeh, 2009). In a meta-analysis looking at outcomes of trust in the workplace, trust level was positively associated with risk-taking, task performance, and citizenship behavior, and negatively associated with counterproductive behavior (Colquitt, Scott, & LePine, 2007). In healthcare, trust in fellow provider's ability to deliver culturally appropriate care has been shown to increase collaborative efforts (Isaacs, Valaitis, Newbold, Black, & Sargeant, 2012).

> **HYPOTHESIS 2.** *The extent to which actor i engages in work interactions with actor j is positively associated with the extent to which actor i trusts actor j.*

Distance. Research in Western settings has found that geographic proximity increases communication, coordination, mutual support, effort, cohesion, and information transaction (Cook, Gerrish, & Clarke, 2001; Hoegl & Proserpio, 2004). In a review of teamwork among primary and community care providers, Xyrichis and Lowton (2008) found that members located in separate buildings were less integrated with the team.

HYPOTHESIS 3. *The extent to which actor i engages in work interactions with actor j is negatively associated with the distance between the homes of actor i and actor j.*

Shared motivations. The degree to which health workers' motivations are "pro-social" and similar to one's own motivations—is another potentially important factor for teamwork. Brief and Motowidlo (1986) define *pro-social behaviors* as "positive social acts carried out to produce and maintain the well-being and integrity of others". Health worker motivation is not a novel topic in the literature (Franco, Bennett, & Kanfer, 2002; Maes, 2012; Willis-Shattuck et al., 2008), yet the role of how the *difference in motivations* influences teamwork has been overlooked.

HYPOTHESIS 4. *The extent to which actor i engages in work interactions with actor j is positively associated with the extent to which actor i is similarly motivated to do health work with actor j.*

Past training together. Team building and other training interventions have demonstrated effectiveness in improving teamwork among health professionals (Capella et al., 2010; Hobgood et al., 2010; Nadler, Sanderson, Van Dyken, Davis, & Liley, 2011; Shapiro et al., 2004). The majority of this work, however, has taken place in Western settings. Common experiences help to strengthen interpersonal relationships and training can increase confidence in fellow health workers.

HYPOTHESIS 5. *The extent to which actor i engages in work interactions with actor j is positively associated with actor i reporting past training together or group work with actor j.*

In this paper, we examine these hypothesized factors that may influence the willingness and ability of diverse community-based MNH workers in rural Amhara region, Ethiopia to engage in teamwork. We also explore the structural characteristics of health worker networks in seven *kebeles* (communities) in order to identify and describe similar and disparate patterns of interaction across study sites. For the purpose of this work, teamwork is defined conceptually as *interactions involving collaborative activities*—such as help- and advice-seeking, sharing sensitive information, providing and being open to receiving honest feedback, and knowledge sharing—*that contribute to the quality and effectiveness of health service delivery*. Understanding dyad-level factors that influence teamwork will contribute to the organizational and health sciences research on teamwork, as well as inform public health policy and programming decision-making regarding community-based MNH care in Ethiopia and elsewhere.

Population

The Amhara region of Ethiopia has a population just over 17 million people, most of whom live in rural areas, self-identify as Orthodox Christian and ethnically Amhara, and engage in agricultural work (Federal Democratic Republic of Ethiopia Population Census Commission, 2008). Women in Amhara region have low health-seeking behavior related to pregnancy, birth, and postnatal care (CSA [Ethiopia] & ICF International, 2012). For example, Amhara has the fourth highest rate of homebirth among Ethiopian regions at 89% and the sixth lowest rate of skilled birth assistance (10%). Most women seek the services of a TBA (29%) or relative/other (60%) during birth. Less than half of women in Amhara region receive antenatal care (41%), and less than 10 percent receive a postnatal visit (7%).

Methods

Data

We collected social network data from three cadres of community health workers in West Gojam Zone, Amhara region, Ethiopia from November, 2011 to January, 2012. Seven *kebeles* (communities) were randomly selected from 24 MaNHEP project sites. MaNHEP is a three-and-a-half-year learning project funded by the Bill and Melinda Gates Foundation focused on improving community-based MNH care in six rural districts of Ethiopia. MaNHEP was implemented by Emory University under the leadership of the Ministry of Health, in collaboration with Addis Ababa University, John Snow Research and Training, Inc., and University Research Company, LLC.

Data were collected less than one year after introduction of substantive MaNHEP project interventions. Respondents were purposively recruited from each *kebele* using a snowball sampling strategy. Criteria for participation in the study included (1) must be 18 years or older; (2) able to speak and understand Amharic; and (3) performed community-based MNH work in the past year. Six trained Ethiopian interviewers administered the survey orally in Amharic to up to 30 health workers in each community. Ethical approval was obtained from the Emory University Institutional Review Board and the Amhara Regional Bureau of Health; informed consent was obtained from respondents using standard procedures.

The final sample sizes were as follows: 17 HEWs (a census of HEWs in the study areas); 48 CHDAs; and 129 TBAs.

Dependent variable

Study variables are based on information from all possible health worker dyads (pairs of health workers) in each study *kebele*; this allows for analysis of data at the relationship level. For the dependent variable, we measured the frequency of work interactions ("teamwork") as reported by person *i* with person *j*; a full list of health workers was read to each respondent. Respondents reported on how many days in the past month they had work interactions with each other health worker in their *kebele*, with a possible range from zero (no interactions in the past month) to 30 (an interaction each day of the past month).

Covariates

We asked the extent to which person *i* trusts person *j* using a ladder visual analogue where each rung represented increasing levels of trust, from one (low trust) to 10 (full trust). If the respondent reported not knowing the other individual, trust was coded as zero. In addition, we collected data on whether or not person *i* reports having previous health training with person *j*, coded one for training together and zero for not training together. We also collected Global Positioning System (GPS) coordinates of each of the health workers homes in order to measure the distance (in km) between the homes of each dyad in the network.

In addition, sociodemographic data was collected on each respondent (age, gender, religion, ethnicity, children, educational attainment, health worker cadre, food insecurity, level of pro-social motivations to do health work, and political party affiliation). This allowed the creation of dyadic attribute variables to represent the degree to which individuals within the dyad are similar or different by these characteristics. For

example, variable X_{ij}=0 if person *i* and *j* have a different value for the variable (e.g.,

female/male) and X_{ij}=1 if person *i* and person *j* have the same value for the variable (e.g.,

female/female). For health worker cadre and political party affiliation, dyads were coded

one if they were both HEWs, both CHDAs, both TBAs, and one if they were both

Ethiopian People's Revolutionary Democratic Front party (EPRDF; the dominant

political party in Ethiopia) affiliated, and coded zero if only one or neither of the

individuals within the dyad held these characteristics.

Dyadic attribute variables based on continuous sociodemographic variables (e.g.,

age; level of food insecurity; educational attainment; level of pro-social motivations)

represented the *difference in variable values* for individuals within each dyadic pair. For

household food insecurity, respondents replied to each item based on the frequency of

occurrence in the past month, rarely (1-2 times=1), sometimes (3-10 times=2), and often

(>10 times=3). The *Household Food Insecurity Access Scale* (HFIAS) was scored by

summing items, with a range of zero (low food insecurity) to 27 (high food insecurity)

(Coates, Sindale, & Bilinsky, 2007); versions of this scale have been found to be reliable

in Ethiopia (Hadley, Lindstrom, Tessema, & Belachew, 2008).

For construction of the motivation variable, prior formative work was conducted

with community health workers to identify the most common motivations for MNH

workers and to rank those motivations from most to least pro-social. For the survey,

respondents were then asked to compare each motivation pair (Table 1) (e.g., *help the

community* vs. *gain respect of the community*) according to which item is a stronger

motivation for them to do health work (the more pro-social option=1 and the less pro-

social option=0). A *self-motivation score* was developed for each respondent by summing

each comparison, with a range from zero (least pro-social) to 10 (most pro-social).

[Insert Table 1]

Analytic strategy

In UCINET 6 (Borgatti, Everett, & Freeman, 2002), the variable *work*

interactions was used to measure and compare network level characteristics (density,

reciprocity, centralization, mean distance, and fragmentation) across study sites, and to

create graphs. The definition and measurement of network structural characteristics are

described in detail in Table 2. Social network graphs allow for the visualization of

relationships within the network, where nodes represent the social units (the actors in the

network) and arcs represent the ties between pairs (Faust, 2006).

[Insert Table 2]

For regression analyses in UCINET (Borgatti et al., 2002), the Double Dekker

Semi-Partialing Multiple Regression Quadratic Assignment Procedure (MRQAP) was

used to fit regression models for frequency of *work interactions* in each of the seven

study *kebeles*. The same independent and control variables were used across models: (1)

both HEWs; (2) *both CHDAs*; (3) *both TBAs*; (4) *difference in health work experience*;

(5) *both EPRDF political party affiliation*; (6) *training together*; (7) *distance between*

homes; (8) *difference in level of food insecurity*; (9) *trust*; (10) *difference in level of pro-*

social motivations to do health work; and (11) *knowing each other* (control). *Religion* and

ethnicity were excluded from the analysis due to lack of variation in the sample; *number*

of children, *age*, and *educational attainment* were excluded due to collinearity with other

study variables.

MRQAP was chosen for analyses because data collected from networks display structural autocorrelation, or interdependence among observations in the rows and columns of data (Dekker, Krackhardt, & Snijders, 2007; Krackhardt, 1987; Krackhardt, 1988). Application of the double semi-partialing MQRAP test retains the interdependency among dyads, while minimizing Type I error (Dekker, Krackhardt, & Snijders, 2007). Significance levels for regression analyses are based on distributions generated from 2,000 random permutations.

Results

Individual characteristics by *kebele*

Health workers self-identified as ethnically Amhara and Orthodox Christian (100%), and varied little by age, education, and number of children across sites (41-47 years of age; 2-4 years of education; and 5-7 children) (Table 3). Moderate to large differences were noted across sites in the patterns of gender, food insecurity, and political party affiliation. For example, 89 percent of health workers in *kebele* 6 were female, while only 57 percent of health workers in *kebele* 2 were female. A high rate of health workers in *kebele* 2 (81%) reported affiliation with the EPRDF political party, while less than half of health workers in *kebele* 3 reported this affiliation (46%). Moreover, nearly twice as many health workers in *kebele* 6 experienced moderate to severe food insecurity (59%) compared to health workers in *kebele* 3 (31%).

[Insert Table 3]

Health workers also varied widely by work characteristics across study sites (Table 3). Health workers in *kebeles* 3 and 5 reported twice as many years of MNH experience (16 years) compared to workers in *kebele* 1 (8 years). *Kebele* 1 and 3 health

workers lived one and a half kilometers closer to each other than health workers in *kebele*

7. *Kebele* 2, 4, and 5 health workers reported both the highest level of trust in each other

(6.6, 5.6, 6.1, respectively) and the highest average number of interaction days (1.9, 1.5,

and 2.4, respectively).

Network characteristics

Findings point to a typology of network structure across study sites. One set of

kebeles (2, 4, and 5—hereafter referred to as the *strong ties group*) displayed high density

(*strong ties group*: 0.3-0.5 vs. *weak ties group*: 0.2-0.2), short geodesic distance (1.5-1.6

vs. 1.7-2.1), and low fragmentation (0.3-0.5 vs. 0.5-0.7) relative to the remaining

communities (1, 3, 6, and 7—hereafter referred to as the *weak ties group*). The

differences in these two groups can be visualized in Figure 1 where the networks in the

strong ties group appear denser, have stronger ties, and fewer isolated nodes or nodes

with only a single tie. The *kebeles* in the strong ties group also had more CHDAs and

fewer TBAs, a higher rate of male members, and more members affiliated with the

MaNHEP project and EPRDF political party, compared to *kebeles* in the weak ties group.

[Insert Figure 1]

Relational factors for dyadic-level interactions

Results of MRQAP regression analyses demonstrated consistent, positive

associations with interactions across sites for a core set of factors (Table 4). Dyads in

which both health workers were HEWs reported more interactions with each other than

dyads in which only one or neither of the individuals was an HEW (p<0.01 or stronger).

Similarly, dyads where the health workers reported training together interacted more

frequently than dyads where they had not trained together (p<0.01). Finally, health

worker dyads in six of seven study *kebeles* interacted more frequently when they had higher trust in each other compared to dyads with lower trust (p<0.05).

[Insert Table 4]

Results also demonstrated weak and/or inconsistent associations across sites (Table 4). In *kebele* 1, for example, dyads where individuals had similar levels of health experience interacted more frequently compared to dyads where health experience was less similar (p<0.01); the opposite relationship was found in *kebele* 3 (p<0.05). In *kebeles* 2 and 3, dyads where both individuals reported EPRDF party affiliation were more likely to interact compared to dyads where only one or neither health worker had EPRDF affiliation (p<0.05). Health worker dyads in *kebele*s 1, 2, and 7 whose homes were farther apart were less likely to interact with each other (p<0.01 or stronger). Dyads in *kebeles* 4 and 6 were more likely to interact when they were both CHDAs (p<0.05). Finally, in *kebeles* 1 and 4, the greater the difference in level of pro-social motivations between the pair, the more frequent interactions they engaged in together (p<0.01).

Discussion

To date, little is known about structural characteristics of community health worker networks in rural, low resource settings, or the relational factors that promote or erode teamwork. Our study provides novel insight into the realities of health worker interactions in rural Ethiopia. We found strong and consistent evidence across study sites in support of *Hypothesis 2 (Trust)* and *Hypothesis 5 (Past training together)*. There is strong, but less consistent evidence in support of Hypothesis 3 (*Distance*), and weak evidence to support *Hypothesis 4 (Shared Motivations)*. *Hypothesis 1 (Homophily)* was partially supported based on the findings related to *Both HEWs*, but weakly and

inconsistently supported for all other sociodemographic variables. A summary of these results is displayed in Table 5.

[Insert Table 5]

Our study also provides support for three relational characteristics that are predictive of work interactions among diverse community health workers: (1) past training together; (2) trust; and (3) both health workers being HEWs. The variable, *Both HEWs*, is not a surprising factor given that HEWs frequently live and work near each other, providing greater opportunity for daily interaction. This finding supplements the existing evidence that health professionals interact more frequently with their own cadre, as demonstrated in work by Creswick, Westbrook, and Braithwaite (2009). Results are also consistent with findings from a review by O'Leary, Sehgal, Terrell, and Williams (2012) that identified trust as a critical element of interdisciplinary teamwork. Moreover, our findings complement work by Siassakos et al. (2011) and others that demonstrates that multi-professional clinical training results in positive attitudes toward teamwork.

Inconsistent support was found for the remaining relational characteristics: (1) distance; (2) shared motivations; and (3) sociodemographic similarity (with the exception of *Both HEWs*). For example, distance was a strong barrier for interactions among health workers in some, but not all *kebeles*. This finding suggests that the relationship between location/distance and interdisciplinary teamwork is likely mediated by additional factors not represented in our analyses, such as respect for and understanding of professional roles (Dieleman et al., 2004). Contrary to our expectations, similarity by sociodemographic characteristics was not consistently predictive of interactions. In select communities, health workers were more likely to interact with each other when they had

greater variation in work experience, food insecurity, and motivations. These findings may represent an attempt to gain status and social capital through interactions with health workers they perceive to be better off than they are. Results contribute to a growing body of evidence that suggests social heterogeneity may not be a barrier to teamwork and may even promote collaboration in some settings (Hamilton, Nickerson, & Owan, 2003).

Network structure results revealed that the *Strong Ties Group kebeles* had more CHDAs, fewer TBAs, and more males and EPRDF-affiliated members. These findings make sense in the context of Amhara region where HEWs and CHDAs (mostly males) have been the focus of prior government training programs (though it is unlikely that members of the two cadres trained together). The *Strong Ties Group* also had more MaNHEP affiliated members; this contributes to existing evidence that MaNHEP program interventions are effective in the promotion of cross cadre teamwork. For example, data from the MaNHEP 2012 endline survey shows that 91% of HEWs, 87% of CHDAs, and 100% of TBAs in the Amhara project area had participated in the project's mixed cadre trainings—MNH and/or collaborative quality improvement—and many had participated in the subsequent mixed cadre GT and QIT activities (Sibley et al., forthcoming).

Our study was limited in several ways. First, we used a cross-sectional research design thereby eliminating our ability to make causal inferences. Also, community health worker interaction patterns may vary greatly depending on the time of the year, particularly in rural areas dominated by farming as the principal means of income (e.g., rainy season, harvest). The number of *kebeles* included in our sample was quite small, due to financial and logistical constraints, making statistical analysis of community-level

factors—beyond descriptive structural statistics—unreasonable. Furthermore, the generalizability of findings is limited given that study participants were recruited in the context of MNH care in rural Ethiopia. The incorporation of interaction terms may have provided insight into complex relationships (e.g., mediation and moderation) between variables, however, this was beyond the scope of our paper. Finally, we limited our outcome of interest to the frequency of dyadic interactions, though the purpose, outcome, and quality of interactions may be equally important for health service delivery.

To our knowledge, this was the first study to explore the influence of relational characteristics of teamwork among community level health workers in a low-resource setting. Larger scale longitudinal research is warranted, however, given the inconsistency of some variables as predictors of interaction across study sites. Future investigations would benefit from more complex analyses; we feel the role of trust in mediating the relationship between other independent variables and teamwork may be particularly insightful. Subsequent work should also consider multi-level analyses to better understand how characteristics of the community, such as wealth, cultural and gender norms, and governmental and nongovernmental organization (NGO) support, shape interaction patterns. Qualitative research may be particularly valuable for better understanding the social and cultural nuances of local contexts and how these differences shape teamwork. Finally, research is needed that begins to establish the link between health worker collaboration and the provision of quality health services at the community level.

Our findings have clear implications for public health policy and programming. Understanding health worker network structure can assist district and regional health

officials to funnel funds and programming efforts into areas predominated by weak ties. Social network studies such as this also provide a clear indication of central figures who may be particularly effective in effecting change through behavioral change communication programs. We recommend developing interprofessional training programs that aim to increase health worker's understanding of the unique role that each cadre plays in the health system, and encourage the development of trust and shared goals among them. Based on the concept of "the strength of weak ties" as described by Granovetter (1973), health workers may be able to access a wider range of resources and information by interacting with cadres other than their own.

Conclusion

The vast majority of research on interprofessional teamwork in healthcare has focused on clinic and hospital settings in mid- and high-resource settings. In this study, however, we described the structural characteristics of seven health worker networks in rural Ethiopia, and identified relational factors that promote or erode teamwork. Health systems research should consider the local sociopolitical context, as factors for collaboration vary across sites. Inter-cadre group training that incorporates trust-building exercises may be particularly effective in improving teamwork. The information gathered here will inform health systems strengthening efforts and provide the foundation for future research linking relational factors for trust and teamwork, and the effectiveness of health services delivery in rural, low-resource settings.

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Table 1. *Survey items used in the creation of the motivation and food insecurity variables*

Health Worker Motivations [a]
(Listed from most to least pro-social)
To help the community
For God or St. Mary (spiritual blessing)
To earn respect from the community
To gain non-financial incentives (e.g., training, gifts)
To earn financial incentives

Household Food Insecurity Index
(In the past four weeks…)
Did you worry that your household would not have enough food?

Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?

Did you or any household member have to eat a limited variety of foods due to a lack of resources?

Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

Did you or any other household member have to eat fewer meals in a day because there was not enough food?

Was there ever no food to eat of any kind in your household because of lack of resources to get food?

Did you or any household member go to sleep at night hungry because there was not enough food?

Did you or any household member go a whole day and night without eating anything because there was not enough food?

[a] Common motivations and their ranking from most to least "pro-social" were identified through prior formative work with community health workers in rural Ethiopia

Table 2. *Definition and calculation of network characteristics*

	Definition	Calculation
STRUCTURAL NETWORK CHARACTERISTICS		
Network Density	The level of connection in a network.	The total number of actual ties in the network divided by the total number of possible ties in the network (dyad method).
Network Reciprocity	The extent to which ties in a network are mutual (reciprocated).	The number of reciprocated dyads (actor i reports interacting with actor j and actor j reports interacting with actor i) divided by both the number of reciprocated AND non-reciprocated dyads (actor i reports interacting with actor j, but actor j does not report interacting with actor i).
Network Centralization	The extent to which a network is organized around particular focal points.	$\square(c_{max} - c_i)$ divided by $\square(X_{max} - X_i)$, where c_{max} is centrality of the most central node in the observe graph; c_i is the degree centrality of ith node; X_{max} is the centrality of the most central node in the star graph; and X_i is the centrality of the ith node in the star graph [a]
Mean Distance	The average shortest path among connected pairs in the network.	The average geodesic distance—length of the shortest path calculated based on the number of edges it contains—among reachable nodes in the network. [b]
Distance-Weighted Fragmentation, "Breadth"	The extent to which actors in a network are disconnected from each other	One minus the average reciprocal distance (harmonic mean) between all pairs of nodes, with a range from 0 to 1, where larger values indicate greater fragmentation within the network

[a] (Freeman, 1978/79); [b] (Doreian, 1974; Burt, 1976)

Table 3. Select individual and network characteristics of community-based health workers in rural Ethiopia by kebele (community)

	Kebele1 (N=27)	Kebele2 (N=28)	Kebele3 (N=26)	Kebele4 (N=29)	Kebele5 (N=29)	Kebele6 (N=27)	Kebele7 (N=28)
RESPONDENT CHARACTERISTICS							
Age (yrs)	41.7	40.5	41.6	41.8	41.9	40.5	46.5
% Female	70.4	57.1	84.6	58.6	58.6	88.9	78.6
% Married	59.3	78.6	73.1	72.4	69.0	55.6	60.7
Number of children	5.3	5.8	6.8	6.5	5.3	5.8	6.4
Education (years)	2.9	2.7	2.0	3.8	4.1	1.9	1.6
% Amhara ethnicity	100	100	100	100	100	100	100
% Orthodox Christian	100	100	100	100	100	100	100
% EPRDF affiliation	59.3	81.2	46.2	69.0	65.5	59.3	53.6
% Moderate to Severe Food Insecurity	40.7	42.9	30.8	37.9	41.4	59.3	46.4
WORK CHARACTERISTICS							
Health work experience (years)	8.1	10.8	15.7	10.9	15.7	11.9	14.2
% MaNHEP participation	55.6	67.9	30.8	62.1	55.2	29.6	50.0
Mean distance between health worker homes (km)	2.2	2.7	2.2	2.9	2.9	2.8	3.7
Mean level of pro-social motivations (range 0-10)	6.9	6.4	6.5	7.3	7.1	6.0	7.3
Mean trust in health workers [a] (range 0-10)	7.1	7.9	8.0	7.7	7.9	7.5	8.1
Mean number of work interaction days with each health worker in last month	0.6	1.9	1.0	1.5	2.4	0.8	0.8
STRUCTURAL NETWORK CHARACTERISTICS							
Number of HEWs/CHDAs [b]/TBAs [b]	3/8/16	1/11/16	3/1/22	3/10/16	3/9/17	2/3/22	2/6/20
Network Density	0.23	0.45	0.19	0.32	0.45	0.24	0.23
Network Reciprocity	0.33	0.40	0.30	0.39	0.51	0.40	0.51
Network Centralization							
% OutDegree Centralization	51.6	56.7	14.2	63.3	38.6	66.9	37.2
% InDegree Centralization	27.7	29.8	9.5	22.6	20.2	26.9	29.5
Mean Distance	1.71	1.55	2.05	1.60	1.46	1.75	1.81
Distance-weighted Fragmentation	0.61	0.34	0.67	0.54	0.43	0.54	0.62

HEW=Health Extension Workers; CHDA= Community Health Development Agent; TBA=Traditional Birth Attendant;
EPRDF=Ethiopian People's Revolutionary Democratic Front; MaNHEP=Maternal and Newborn Health in Ethiopia Partnership;
QI=Quality Improvement
NOTE: Unless otherwise stipulated, network characteristics were calculated based on directed, dichotomous data where
1=interaction and 0=no interaction in the past month
[a] Trust level was calculated based on average trust in each *kebele* health worker; this included only trust scores of health workers
who reported knowing each other; [b] Does not necessarily represent a census of this type of health worker in the *kebele*

Table 4. *Factors for work interactions among community-based health workers in seven rural Ethiopian kebeles (communities)*

	Kebele 1 Model	Kebele 2 Model	Kebele 3 Model	Kebele 4 Model	Kebele 5 Model	Kebele 6 Model	Kebele 7 Model
Difference in experience	-0.084*	0.101	0.043*	0.004	-0.064	0.045	-0.036
Difference in HFIAS score	0.050	0.031	-0.022	0.131*	-0.010	0.010	-0.024
Both EPRDF affiliation	0.084	0.183*	0.059*	0.091	0.084	-0.037	-0.023
Distance between homes	-0.134**	-0.208***	-0.042	-0.100	-0.076	0.017	-0.109***
Both HEWs	0.462**	-	0.737***	0.195**	0.403***	-	0.515**
Both CHDAs	-0.002	0.104	-0.000	0.125*	0.017	0.079*	-0.028
Both TBAs	-0.051	-0.046	0.033	0.024	-0.109	-0.010	-0.013
Trust	0.070*	0.272**	0.034	0.298***	0.296***	0.301***	0.161**
Past training together	0.217**	0.232***	0.366***	0.233**	0.227**	0.588***	0.410***
Difference in motivations	0.080*	0.033	-0.020	0.107*	-0.055	-0.014	-0.002
Know each other (control)	-0.086	-0.236**	-0.036	-0.214**	-0.184**	-0.173**	-0.154**
N (number of pairs)	N=649	N=505	N=506	N=756	N=600	N=552	N=702
Adj. R-Squared	0.358***	0.218***	0.779***	0.221***	0.411***	0.505***	0.517***

HEW=Health Extension Worker; CHDA= Community Health Development Agent; TBA=Traditional Birth Attendant; EPRDF=Ethiopian People's Revolutionary Democratic Front; HFIAS=Household Food Insecurity Access Scale

*$p<0.05$; **$p<0.01$; ***$p<0.001$; All significance levels are based on 2,000 permutations.

- Only one HEW working in the kebele, so variable not included in the analysis

NOTE: Shaded variables represent the most consistently influential factors for work interactions across study sites

Table 5. *Summary of hypotheses and findings*

Hypotheses	Level of Support/ Consistency across Sites
HYPOTHESIS 1 (Homophily): The extent to which actor *i* engages in work interactions with actor *j* is positively associated with the extent to which actor *i* is similar by social and demographic characteristics to actor *j*.	Partial [a] Weak/Inconsistent
HYPOTHESIS 2 (Trust): The extent to which actor *i* engages in work interactions with actor *j* is positively associated with the extent to which actor *i* trusts actor *j*.	Strong/Consistent
HYPOTHESIS 3 (Distance): The extent to which actor *i* engages in work interactions with actor *j* is negatively associated with the distance between the homes of actor *i* and actor *j*.	Strong/Inconsistent
HYPOTHESIS 4 (Shared Motivations): The extent to which actor *i* engages in work interactions with actor *j* is positively associated with the extent to which actor *i* is similarly motivated to do health work with actor *j*.	Weak/Inconsistent
HYPOTHESIS 5 (Past training together): The extent to which actor *i* engages in work interactions with actor *j* is positively associated with actor *i* reporting past training together or group work with actor *j*.	Strong/Consistent

[a] Evidence supported a strong consistent relationship between the variable *both HEWs* and interactions, but weak and inconsistent relationships between *age, food insecurity, EPRDF party affiliation, both CHDAs,* or *both TBAs* and work interactions

Figure 1. Work interaction networks among community health workers in seven rural kebeles in rural *Ethiopia* [a]
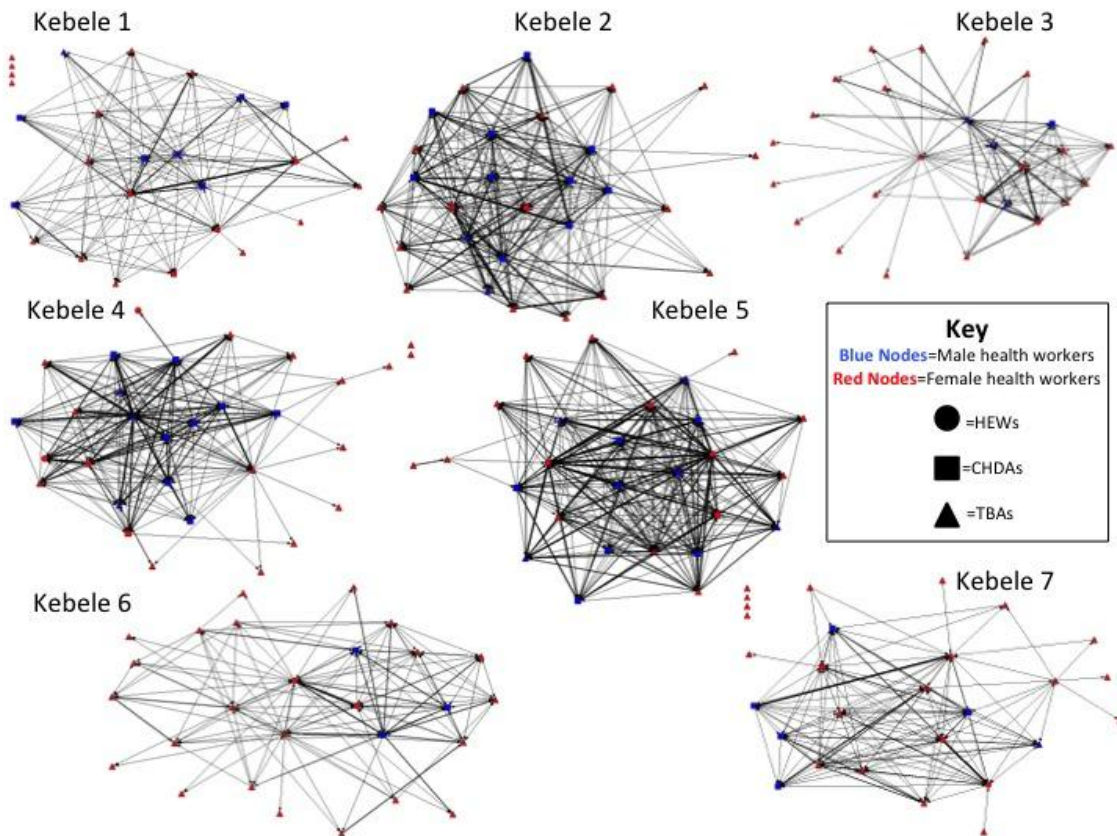
NOTE: HEWs=Health Extension Workers; CHDAs=Community Health Development Agents; TBAs=Traditional Birth Attendants.
[a] We identified a typology of network structure which includes the *Strong Ties Group* consisting of Kebele 2, Kebele 4, and Kebele 5 and the *Weak Ties Group* consisting of Kebele 1, Kebele 3, Kebele 6, and Kebele 7.

Chapter 5: Discussion and Conclusion

Organizational and health services research point to the importance of trust and teamwork among coworkers in mid- and high-income country settings (Bachinger, Kolk, & Smets, 2009; Colquitt, Scott, & LePine, 2007; Dirks, 1999; Dirks & Ferrin, 2002; Hall et al., 2002; Hamilton, Nickerson, & Owan, 2003; Kiffin-Petersen & Cordery, 2003; Middleton, 2012; Montes, Moreno, & Morales, 2005; Moses & Stahelski, 1999; Thom Ribisl, Stewart, Luke, & The Stanford Trust Study Physicians, 1999; Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Gaps are evident, however, in the application of trust theory and empirical research on trust and teamwork in low-resource, rural settings (Gilson, 2003; Goudge & Gilson, 2005). First, little is known about how trust is conceptualized among health workers in non-Western settings, and there is not a gold standard to measure trust in these locations (Goudge & Gilson, 2005). Second, the Mayer, Davis, and Schoorman (1995) Integrative Model of Organizational Trust has not been applied to the study of trust in groups, in different cultural contexts, and in the realm of healthcare delivery (Schoorman, Mayer, & Davis, 2007). Furthermore, there is a paucity of research on the determinants of teamwork among health workers in low-resource, rural settings.

We addressed these gaps in the literature by carrying out a multi-phased, mixed methods study of trust and teamwork among diverse community health workers in three rural districts of West Gojam Zone, Amhara region, Ethiopia. Our work involved conducting qualitative research on the conceptualization of trust among health workers in rural Ethiopia, developing and pilot-testing a novel scale to measure trust in this context, and applying our *Model of Teamwork among Community Health Workers*—adapted from

the Mayer et al. (1995) model—to health worker relations in a survey exploring the influential factors for teamwork among community health workers. This work helped fill important gaps in the literature and provided empirical evidence to help answer our research questions:

> *Question 1: How do health workers in rural Ethiopia conceptualize trust in the context of community maternal and newborn healthcare delivery?*
>
> *Question 2: Can trust be reliably and validly measured among diverse cadres of health workers in rural Ethiopia?*
>
> *Question 3: What are the factors that influence teamwork within and between diverse community health worker cadres in rural Ethiopia?*
>
> *Question 4: What are the interpersonal factors that influence teamwork among diverse community health worker dyads in rural Ethiopia?*

Summary of Research Findings

The three papers (Chapters 2-4) included in this dissertation research make unique contributions to the literature and programmatic knowledge on trust and teamwork among diverse community health workers in rural Ethiopia. Findings from in-depth interviews provided saliency for characteristics of trustworthiness commonly reported in the trust literature and unique insights into the local conceptualization of trust in rural Ethiopia (Chapter 2). The subsequent development and testing of the *Rural Health Worker Trust Scale* (Chapter 2) provided a launching point for studying the determinants of teamwork, which included both the factors for teamwork with health worker cadres in general (Chapter 3) and the dyad-level factors for teamwork (Chapter 4), among three cadres of community health workers in rural Ethiopia.

The formative work (Chapter 2) uncovered a core set of items that appear to

define trust in the context of community health workers in rural Ethiopia—character, communication, and ability—in addition to locally-relevant ways of thinking about trust (e.g., having 'oneness'). During in-depth interviews, health workers described the importance of trust in influencing both the supply side of healthcare (e.g., through strengthening collaboration and the quality of care provision) and the demand side (e.g., increasing community trust in health workers and health seeking as a result of observing improved relations among health workers). The 10-item *Rural Health Worker Trust Scale* was developed from these interviews and pilot tested. The scale maintained strong internal consistency and the hypotheses to test for criterion and contrasting group validity were upheld. Trust scores were positively related to the feeling of being a part of a team and to single item trust questions. As expected, health workers displayed greater shared cultural knowledge of trust within cadres than between cadres and exhibited greater cultural competence in responding to questions about their own cadre.

In this paper (Chapter 2), we demonstrated that through close consultation with in-country research partners, a context-specific and valid measurement scale can be developed in a short timeframe with a modest budget. In comparing our work to the current literature on trust (Colquitt, Scott, & LePine, 2007; Gilson, 2003; Lewicki, Tomlinson, & Gillespie, 2006), we noted the existence of collective ways of thinking about trust that seem to cross cadres and country contexts (e.g., character, ability, patterns of interpersonal communication), in addition to local understandings of trust (e.g., 'oneness'). Our findings support the importance of generating and validating measurement instruments in cross-cultural research; accurate measurement of a phenomenon is contingent upon knowing the culturally relevant ways in which the

construct—and the domain in which it exists—is understood in a given context (Clark & Watson, 1995; Converse & Presser, 1986; Spector, 1992; Weller & Romney, 1988).

In our second paper (Chapter 3), we advanced on this work by exploring the composition of community health worker cadres in rural Ethiopia and the factors—including and in addition to trust—that predict cooperation and collaboration among them. Substantial differences were noted in the sociodemographic characteristics of health worker cadres. This finding provided evidence for the existence of heterogeneity among community health workers, an area of inquiry too often missing in the discourse on community health workers. To identify factors for teamwork and their individual contribution to the frequency of interactions, we employed fractional logit regression modeling and marginal effects analyses. Being a Health Extension Worker (HEW), being a male health worker, and having trust in a cadre (including trust in one's own cadre and other cadres) were important factors for work interactions with all three cadres. In contrast, distance, perception of motivations, and food insecurity influenced interactions with some, but not all, cadres. The finding that HEWs interact more frequently with all three cadres, compared to Community Health Development Agents (CHDA) and Traditional Birth Attendants (TBA), may represent a generational difference between cadres. For example, HEWs are commonly younger than members of other cadres and have grown up with greater access to social media; as such, HEWs may display greater generalized trust (Yamagishi, Cook, & Watabe, 1998) and a higher propensity to engage in cooperative action (Uslaner & Conley, 2003) compared to their community health worker counterparts.

Results from our second paper (Chapter 3) support the findings from formative

work that health worker trust is an important factor for teamwork and that the relative

importance of trust as a factor for collaboration may be cadre-dependent. For example,

trust may be more important for interaction with relatively newer cadres than those well

embedded in the community. We also noted that participation with the Maternal and

Newborn Health in Ethiopia Partnership (MaNHEP) Guide or Quality Improvement

Teams was not associated with level of trust or engagement in teamwork with any of the

three health worker cadres (inclusive of trust and teamwork with one's own cadre and

with other cadres). We concluded that these results likely diverge from other findings

from the MaNHEP project (Sibley et al., forthcoming) and from dyad level analyses

(Chapter 4), at least in part, because we operationalized teamwork and trust at the cadre

level; trust and teamwork may operate primarily at the relational or interpersonal level.

In our third paper (Chapter 4), we looked more closely into the relational factors

that promote or erode work interactions among pairs, or dyads, of community health

workers, irrespective of cadre. While our second paper identified factors for interaction

with specific cadres of health workers, in this paper we asked to what extent interpersonal

factors matter for teamwork. Through collection of social network data, we evaluated the

network characteristics of each community and identified a network typology. One set of

communities was characterized by greater density and stronger ties, and noted to have

more CHDAs, fewer TBAs, and more males, and more EPRDF party- and MaNHEP-

affiliated members compared to their counterparts. We then carried out Multiple

Regression Quadratic Assignment Procedure (MRQAP) to test five hypotheses on the

dyad level influences on interactions. We found strong and consistent evidence across

study sites in support of trust and past training together as important factors for health worker interactions. There was strong, but less consistent evidence in support of distance, and weak and inconsistent evidence in support of shared motivations. Our homophily hypothesis was partially supported when both health workers were HEWs, but weakly and inconsistently supported for all other sociodemographic similarity variables. We concluded that while trust and past training together are important predictors of teamwork, irrespective of cadre, it is necessary for researchers and public health professionals to take the local context into account given differences noted in interpersonal factors for collaboration across sites.

Factors for interpersonal trust

These results supplemented the existing evidence in Western contexts that health worker trust, both at the interpersonal level (Chapter 4) and at the cadre level (Chapter 3), is a key determinant of teamwork among health workers. Given our findings regarding the importance of trust as a factor for teamwork, we carried out additional analyses to identify factors associated with trust at the interpersonal level. MRQAP models were conducted on social network data from each of the seven study sites using interpersonal trust as the outcome of interest, with covariates similar to those included in analyses for our second paper (Chapter 3), with the addition of frequency of interactions as an independent variable.

While analyses revealed variations in the importance of factors across sites, we noted several consistently influential variables, namely frequency of interactions, distance, and past training together. Frequency of interactions was strongly associated with interpersonal trust in six of seven *kebeles* ($p<0.05$) and moderately associated with

trust in the remaining *kebele* (p<0.10). This finding provides evidence for the bidirectional arrow in our conceptual model between trust and teamwork—trust influences teamwork, and engaging in interactions subsequently increases trust. Distance between health worker homes was negatively associated with trust in six of seven *kebeles* (p<0.05); health workers who lived closer to each other reported higher trust in each other. In five of seven *kebeles*, past training together was also a significant factor for trust (p<0.05). Similarity by gender, dominant political party affiliation, food insecurity, and personal motivations was influential in select *kebeles*, though the direction of that influence was inconsistent across sites.

Our dyad level analyses also revealed unexpected findings. In communities where being the same type of health worker (e.g., both HEW, both CHDA, both TBA) was a significant predictor of trust level, the relationship was negative in nearly every case. In other words, being the same type of health worker in these *kebeles* was associated with lower levels of trust. It is possible that health workers within the same cadre experience or perceive competition among members of their own health worker group, thereby producing lower levels of trust in each other. This finding highlights the importance of considering organizational culture and its influence on trust and teamwork. Future work is needed to explicate these relationships.

Support for the *Model of Teamwork among Community Health Workers*

Collectively, the insights gained in this research supported many of the relationships represented in our conceptual model, the *Model of Teamwork among Community Health Workers* (Figure 1). From qualitative work in our first paper (Chapter 2), we learned the perceived importance of trust in the provision of quality care and in the

reinforcement of health seeking behavior among community members. Results from our second paper (Chapter 3) also provided support for the inclusion of selected variables in our conceptual model, specifically the relationships between trust, distance, select sociodemographic characteristics, and motivations, and teamwork. Findings from our dyad-level analyses (Chapter 4) further supported the relationships between trust, past training together, cadre, and to a lesser extent, distance and motivations.
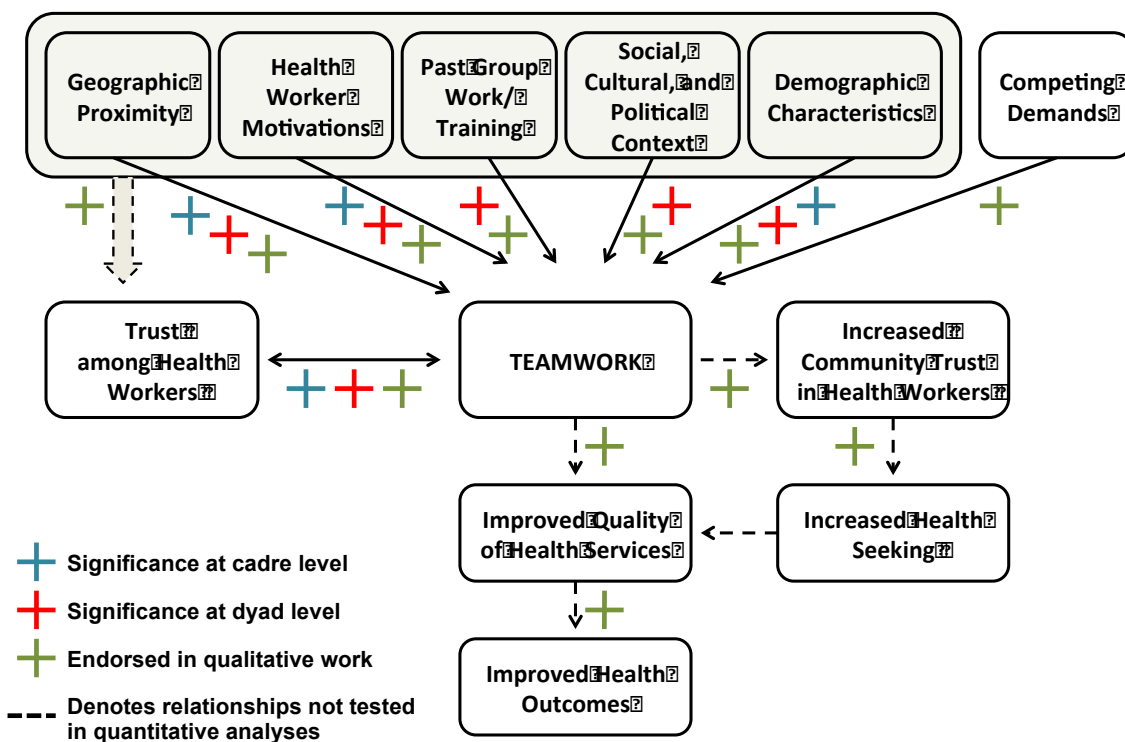
Figure 1. Relationships in the *Model of Teamwork among Community Health Workers* **Supported by the Current Research.**

Analysis of 30 in-depth interviews with community health workers, carried out after the completion of the study survey, contributed additional findings relevant to our conceptual model. For example, while we did not uncover an empirical connection

between competing demands and teamwork in quantitative analyses, the post-survey in-depth interviews revealed consistent endorsement of competing demands as a critical factor for teamwork, particularly as it relates to agricultural work. It is possible that the time of the year in which our survey was conducted was not a demanding time for farming, and therefore the competing demands variable was not significant in quantitative analyses.

Interviews also provided insights into factors for teamwork related to organizational culture that we had not explicitly considered at the onset of our survey. First, health workers reported their perception of unfair treatment by *kebele* and district health leaders as an impediment to teamwork. One HEW said:

> *If one of us is predominantly favored to take the trainings provided by*
> *different stakeholders, this will put us in disagreement and [we will] fail*
> *to do good work...if the incentives are distributed fairly among the*
> *health workers, that could motivate work and enhance group*
> *interaction. The issue of unfair distribution of incentives [e.g., attending*
> *meetings away from the kebele] has led us to unfriendly interaction or*
> *in disagreement many times.*

This finding contributes to existing evidence that management practices and organizational culture can be influential for workplace trust and functioning (Gilson, Palmer, & Schneider, 2005; Yañez-Gallardo & Valenzuela-Suazo, 2012). Second, health workers also spoke about interpersonal relationships and general regard for one another. One TBA said "if we love one another, we will be peaceful, and we will work together and help one another. If we don't love one another, how can we come together to work?" This sentiment was echoed by an HEW who expressed, "One important thing to work together is to have good relationships. Unless we have good relations with each other, it

will be difficult to cover the villages by ourselves". This finding resonates with results of prior research on the importance of strong health worker relationships for well-functioning health systems (Alexander, Lichtenstein, Oh, & Ullman, 1998; Scott, Mathews, & Gilson, 2012).

Limitations and Strengths

Several limitations of this research must to be considered. First, we recruited community health workers in only three districts of Ethiopia—and in the context of MNH care—using a purposive sampling strategy; our sample is therefore not representative of the wider health workforce. Second, we collected data at a single point in time, which eliminates our ability to make causal inferences and precludes capturing the dynamic changes in variables over time. Also, community health worker interaction patterns may vary greatly depending on the time of the year that the research is carried out, particularly in rural areas dominated by agriculture. In cross-cultural qualitative work, it is possible that the underlying meaning of dialogue around trust and teamwork was lost in translation to some degree; we attempted to minimize this by forming a strong on-site Ethiopian research team and employing measures to assure content validity. Furthermore, our sample size was small, due to logistical and budgetary constraints, relative to the number of independent variables considered in quantitative analyses; this also precluded inclusion of interaction terms to test more complex relationships in our model. In the survey questionnaire, we failed to capture and measure the construct of organizational culture as a potentially important factor for teamwork; factors such as perception of management practices and coworker competition may be particularly insightful. Finally, we limited our outcome of interest—teamwork—to the frequency of interactions among

health workers; alternative ways of operationalizing this outcome may have reproduced different results.

The three papers provide unique contributions to the literature on inter-professional trust and teamwork. Through qualitative work in our first paper (Chapter 2), we uncovered a novel conceptualization (e.g., 'oneness') and consequence (e.g., increased trust of the community) of trust not previously reported in the literature. These insights helped to answer our first research question and informed important changes to our conceptual model. Findings from this work also informed the development of a culturally relevant scale that, to our knowledge, is the first of its kind to measure trust among community health workers in a rural, low-resource setting. Moreover, pre- and pilot-testing strategies described in our first paper (Chapter 2) facilitated the validation of our *Rural Health Worker Trust Scale* and helped answer our second research question.

In our second and third papers, we investigated an innovative combination of variables predicted to be important for teamwork from two distinct, yet interrelated perspectives—perceptions of health worker cadres (Chapter 3) and interpersonal factors (Chapter 4). A focus on perceptions of health worker cadres in Chapter 3 allowed the consideration of larger forces that may influence cooperation with groups of people, independent of interpersonal characteristics, and helped answer our third research question. Commonly held stereotypes may be particularly influential in level of teamwork early on when public health programs are first implemented or when new cadres are initially deployed to an area. A focus on dyad level factors in Chapter 4 allowed the consideration of relational factors for teamwork, which have rarely been considered in the context of community health worker collaboration, and helped to

answer our fourth research question. As health workers become more familiar with each other over time and as expectations change, interpersonal factors for teamwork may take precedence over previously held group-level perceptions. Therefore, this dual strategy of uncovering both the broad and interpersonal factors for teamwork provided insights that would not have been gained otherwise. Finally, the *Rural Health Worker Trust Scale* and the *Model for Teamwork among Community Health Workers*—adapted from Mayer et al. (1995)—move the theoretical work on trust and teamwork forward through their direct application to the context of community health workers in a rural setting.

Implications for Future Research

While we have uncovered important knowledge about community health worker relations, this work is only the first step in a research agenda that aims to improve the quality and efficiency of community-based maternal and newborn healthcare. The next steps involved in moving this research agenda forward are outlined below (Figure 2):

Research Agenda for Community Health Workers in MNH Care

- Further qualitative research is needed to better understand the social and cultural nuances of local contexts, and how and why these shape interactions with health worker cadres differently.
- Given the inconsistency of some variables as predictors of interaction across sites, large-scale, longitudinal research is needed. This research will help us better understand how teamwork changes in response to fluctuations in level of trust, perceptions of motivations, and gender sensitivity over time.
- More complex analyses of data from future large-scale, longitudinal research are needed through three mechanisms: (1) inclusion of interaction terms to uncover moderating relationships between other

independent variables and teamwork; (2) clarifying the potential mediating role of trust in influencing teamwork; and (3) multi-level modeling to better understand how characteristics of the community (e.g., wealth, cultural and gender norms) shape interaction patterns.

- As the evidence grows for teamwork at the community level, a locally developed and sustainable intervention—focused on influencing the modifiable factors for teamwork—needs to be developed and pilot tested; this should be followed by qualitative research to ascertain health workers' perceptions of the strengths and weaknesses of the intervention and recommendations for improvement.

- Implementation of a multi-year, matched-pairs cluster design study is needed, where half of the study sites would receive the teamwork intervention and half would not. This study should include multiple measures of teamwork (frequency, quality, outcome of interactions), and the concurrent collection of data on the potential outcomes of teamwork including quality of service provision, community trust in health workers, health-seeking behavior, and health outcomes.

- Similar research should be undertaken in other low-resource, rural settings, and among community health workers working in other health-related areas (e.g., HIV/AIDS, nutrition, immunizations) to determine if the factors for and outcomes of teamwork are reproducible in other contexts and under varied conditions.

- Research findings from different contexts need to be compiled and disseminated in a meta-analysis of the determinants and consequences of teamwork among community health workers.

Figure 2. Community Health Worker Research Agenda for Improved Quality of Maternal and Newborn Health Care Provision.

Implications for Practice

Findings from the current research have implications for public health policy and programming. The *Rural Health Worker Trust Scale* is relevant for baseline and endline evaluation of public health interventions aimed at increasing trust among diverse health workers across Amharic-speaking areas of Ethiopia. The process of building a trust scale can be replicated in other contexts following the methods outlined in our first paper (Chapter 2). Adaptations of the *Rural Health Worker Trust Scale* can also be used by local and regional health officials to identify cross-cadre or inter-organizational trust issues and to develop targeted team-building interventions when needed. Based on findings from our second and third papers, we recommend the development of inter-professional training programs that aim to increase health worker's understanding of the unique role and motivations of health worker cadres, and that promote the development of gender sensitivity, trust, and shared goals among them.

Trust and teamwork provide two ways for the human enterprise to cross the morass of conflict and competition. Within the social structures of healthcare, however, great effort is taken to create cultures of division, wherein healthcare groups are trained, and even work, within professional silos. This culture of division is likely to result in the creation of particularized trust, underscoring a 'we' versus 'them' mentality and potentially hindering future collaborative efforts. Interprofessional teamwork should be introduced at the onset of healthcare training programs and reinforced through engaging in each other's professional customs and traditions. In this way, individuals can learn the valued roles and unique perspectives that each group brings, while simultaneously gaining credibility and conveying trustworthiness. The mutual understanding, respect,

and trust gained through interprofessional training and social interaction become the foundation upon which cooperation and collaboration in healthcare practice are built. As demonstrated in these pages, trust and teamwork is and will continue to be a fruitful area of research that has the potential to produce meaningful insights and practical solutions in the realm of healthcare delivery.

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