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Original Research

Factors Shaping Interactions Among Community Health Workers in Rural Ethiopia: Rethinking Workplace Trust and Teamwork

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Introduction: Worldwide, a shortage of skilled health workers has prompted a shift toward community-based health workers taking on greater responsibility in the provision of select maternal and newborn health services. 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 community health worker cadres in rural, low-resource settings. The purpose of this study is to examine how sociodemographic and structural factors shape teamwork among community-based maternal and newborn health workers in Ethiopia.

Methods: A cross-sectional survey was conducted with health extension workers, community health development agents, and traditional birth attendants in 3 districts of the West Gojam Zone in the Amhara region of Ethiopia. Communities were randomly selected from Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) sites; health worker participants were recruited using a snowball sampling strategy. Fractional logit modeling and average marginal effects analyses were carried out to identify the influential factors for frequency of work interactions with each cadre.

Results: One hundred and ninety-four health workers participated in the study. A core set of factors—trust in coworkers, gender, and cadre—were influential for teamwork across groups. Greater geographic distance and perception of self-interested motivations were barriers to interactions with health extension workers, while greater food insecurity (a proxy for wealth) was associated with increased interactions with traditional birth attendants.

Discussion: Interventions that promote trust and gender sensitivity and improve perceptions of health worker motivations may help bridge the gap in health services delivery between low- and high-resource settings. Inter-cadre training may be one mechanism to increase trust and respect among diverse health workers, thereby increasing collaboration. Large-scale, longitudinal research is needed to understand how changes in trust, gender norms, and perceptions of motivations influence teamwork over time.
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Keywords: community health workers, Ethiopia, health services, maternal health, motivations, trust, teamwork

INTRODUCTION

An estimated 350,000 women die from complications related to pregnancy and childbirth annually worldwide,[1] and 15 million women suffer severe or long-lasting complications from pregnancy and childbirth that disproportionately affect women in resource-poor countries.[2–4] A shortage of skilled health workers has prompted a shift in the provision of select maternal and newborn health services from facility-based, skilled providers to lower skilled, community-based health workers.[5–7] This shift toward 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.[8] In this article, we contribute to existing research on the utilization of community health workers by examining 2 important questions: Who are the community health workers in rural Ethiopia working in maternal and newborn health? 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,[9,10] while team cohesion is linked with improved organizational performance and learning.[11] Furthermore, evidence exists for the presence of "collective intelligence" within groups that helps explain improved group performance.[12] In health care, collaboration among interdisciplinary teams contributes to improved health outcomes.[13] Taken together, these studies suggest 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 health care at the community level are often a heterogeneous group. For example, large differences by age, gender, and education have been reported among community-based maternal and newborn health worker cadres in rural Ethiopia.[14] Prevailing social structures, including gender and age dynamics, local politics, and cultural norms, may limit

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Quick Points

- Collaboration among health workers has been found to improve quality of care, yet little is known about the factors that promote or erode teamwork among community health workers in low-resource settings.
- Trust in coworkers, gender, and health worker type were found to influence teamwork across health worker cadres.
- Distance, perceived motivations of cadres, and food insecurity were influential for interactions with some, but not all, cadres.

the interactions between diverse health workers, thereby reducing the potential for collaboration and improved quality of care.

In rural areas of Ethiopia, less than 5% of births are attended by a skilled birth attendant.[15] In a recent review of 54 countries, Ethiopia had the highest level of inequality in skilled birth attendance when comparing the lowest and highest wealth quintiles.[16] In 2003, the Ethiopian Health Sector Development Program launched the Health Extension Program in order to bring primary health care to rural areas.[17,18] A new cadre, the health extension worker, is now expected to deliver an array of primary health care services, including maternal and newborn health services, to the community. By 2009, the program had trained and deployed 33,819 health extension workers into its health system.[19] Prior to 2012 to 2013, health extension workers were supported by a network of volunteer community health development agents. Local health systems in Ethiopia are currently undergoing transition with the introduction of the Health Development Army.

To date, the Health Extension Program has fallen short of the goal of increasing coverage of maternal and newborn health services.[20] Research suggests that this is due, in part, to the large number of preventive care tasks for which health extension workers are responsible, their limited training in maternal and newborn health care, and a community preference for birth care from experienced family members and traditional birth attendants (TBAs).[21,22] The presence of health extension workers, community health development agents, and TBAs within the community—and their intersecting roles in the care of mothers and newborns (Table 1)—has the potential to produce both conflict and cooperation in the delivery of maternal and newborn health care. Consistent with the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) theory of action,[23,24] encouraging teamwork between health extension workers and other community health workers may be one approach to increasing health extension worker presence at and around the time of birth. The MaNHEP theory of action posits that engagement in inter-cadre teamwork will increase health worker connectedness, thereby improving community health worker performance resulting from enhanced communication and involvement in activities such as knowledge and task sharing.[23,24]

There is a dearth of research on the exploration of factors that influence collaboration among health workers in rural, low-resource settings. Moreover, health care research on teamwork has taken a somewhat narrow view of the workplace, focusing primarily on conventional settings such as clinics and hospitals. In this article, we examine how sociodemographic characteristics, perceptions of fellow health worker cadres, physical and logistical barriers, and shared experiences influence teamwork—measured by the frequency of workplace interactions among 3 cadres of community-based maternal and newborn health workers in rural Ethiopia. We define *teamwork* as interactions involving collaborative activities that contribute to the quality and effectiveness of health service delivery. Examples of these collaborative activities include advice- and help-seeking, providing honest feedback, sharing sensitive information, openness to criticism, and knowledge sharing.

METHODS

Study Setting

The Amhara region of Ethiopia has a population of 17.2 million people, with 88% of the population living in rural areas.[25] The majority of the population self-identify as ethnically Amhara, are Orthodox Christian, and engage in agricultural work. Key maternal health indicators demonstrate that women in the Amhara region have low health-seeking behavior related to pregnancy and birth.[15] For instance, the Amhara region has the fourth highest rate of home birth among Ethiopian regions at 89% and the sixth lowest rate of skilled birth assistance at 10%. Most women seek the service of a TBA (29%) or relative/other (60%) during birth.[15] Two-thirds of women in the Amhara region receive no antenatal care (59%), and only 7% of women receive a postnatal visit.[15]

Data

The data for analyses were collected between November 2011 and January 2012 from 3 cadres of community maternal and newborn health (CMNH) workers—health extension workers, community health development agents, and TBAs—in 3 districts of the West Gojam Zone in the Amhara region of Ethiopia. Seven *kebeles* (communities in Ethiopia comprised of approximately 5000 people) were randomly selected from 24 MaNHEP project sites. MaNHEP is a 3.5-year project funded by the Bill and Melinda Gates Foundation focused on improving CMNH care in 6 rural districts of Ethiopia. MaNHEP interventions consisted, in part, of studying factors that influence health worker capability and performance; refining a household-level intervention to maximize maternal and newborn health; and implementing and evaluating strategies for training, supervision, mentoring, and continuing

Table 1. Roles of Health Extension Workers, Community Health Development Agents, and Traditional Birth Attendants

Cadre	Maternal and Newborn Health Role
Health extension workers	Provide antenatal care
	Attend births in the health post or at home, as needed
	Conduct postpartum and newborn examinations
	Provide family planning and immunizations
	Provide counseling and education during door-to-door home visits and at the health post
	Refer women and newborns with complications to the health center or hospital
Community health development agents	Identify pregnant women in the community and refer to the health post for antenatal care, notify the health extension worker of the pregnancy
	Identify women in the community who are in labor or who have given birth and refer them to the health post for postnatal care, notify the health extension worker of the labor or birth
	Mobilize the community to participate in health education and health campaigns
	Refer women and newborns with complications to the health post, health center, or hospital
	Conduct community maternal and newborn health meetings with pregnant women and their families
Traditional birth attendants	Identify pregnant women in the community and refer to the health post for antenatal care, notify the health extension worker of the pregnancy
	Identify women in the community who are in labor or who have given birth and refer them to the health post for postnatal care, notify the health extension worker of the labor or birth
	Attend births in the home[a]
	Refer women and newborns with complications to the health post, health center, or hospital
	Conduct community maternal and newborn health meetings with pregnant women and their families

[a] Traditional birth attendants have long provided labor and birth care to women in rural areas, although the Ethiopian Ministry of Health does not support this practice.

education of health worker teams, among others.[23,24] Health extension workers, community health development agents, and TBAs involved in MaNHEP participated in guide teams where they were responsible for conducting CMNH meetings with pregnant women and their families.[24] Select members of each cadre also participated in quality improvement teams where they met regularly with community leaders and others to discuss, monitor, and evaluate strategies for improving maternal and newborn health care delivery and promoting care-seeking.[24]

The data for the present study were collected less than one year after introduction of key MaNHEP project interventions. Participants were purposively recruited using a snowball sampling strategy. Inclusion criteria for participation in the study included aged 18 years or older, able to speak and understand Amharic, and performed CMNH work during the past year. Most, but not all, study participants participated in MaNHEP activities, including guide teams and/or quality improvement teams. Six trained Ethiopian interviewers administered the survey orally in Amharic to up to 30 health extension workers, community health development agents, and TBAs within each *kebele* in order to reach the target sample size of 164 participants. Ethical approval was obtained from the Emory University institutional review board and the Amhara Regional Health Bureau. Informed consent was obtained following a discussion of the risks and benefits of study participation, and participants were reminded that they could decline or discontinue participation in the study at any time without fear of consequences.

Dependent Variable

Frequency of interactions with health extension workers, community health development agents, and TBAs were the outcomes of interest in this study. Participants were asked how many days in the past month they had interacted with each of the other health workers (ie, health extension workers, community development agents, and TBAs) in their *kebele*; a full list of names was read to each participant. Noting that the total number of health workers varied by *kebele*, the frequency of interactions was operationalized as the proportion of total possible interactions with each cadre—ranging from zero (no interaction days with any individual in that cadre) to one (interaction every single day with each individual in that cadre). The TBA Interaction Score was calculated by adding together the participants' interactions with each TBA in the *kebele* in the last month and dividing that by the number of TBAs in the *kebele* (not including oneself). For example, a health extension worker would receive a TBA Interaction Score of 0.33 if they interacted 10 days (one-third of the days in the month) with each TBA, or a score of 0.50 if they interacted 15 days (half of the days in the month) with each TBA. The Community Health Development Agent Interaction score and the Health Extension Worker Interaction score were calculated in the same way.

Analytic Approach and Covariates

Data analyses were conducted using Stata 11.[26] The *t* test analyses comparing participants with missing data and those

Table 2. Measurement of Cadre Trust and Propensity to Trust

Rural Health Worker Trust Scale[a]
In your *kebele*[b] the [cadre] do not gossip.
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.
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.[c]
You have good experiences with the [cadre] in your *kebele*.
The [cadre] in your *kebele* have good character.
Propensity to Trust Items
Generally speaking, would you say that you need to be very careful in dealing with people?
Do you think most people would try to take advantage of you if they had the chance, or would they try to be fair?

[a]Participants answered each question on the Rural Health Worker Trust Scale a total of 3 times according to their perception of each cadre, including health extension workers, community health development agents, and traditional birth attendants. Response options included strongly agree, agree, disagree, and strongly disagree.
[b]*Kebele* refers to a community in Ethiopia of approximately 5000 people.
[c]It is common for people in this area of Ethiopia to wear a necklace ("matab") that denotes a religious belief in God; this saying is often linked with the concept of honesty. Thus, "Deny their necklace" refers to lacking a belief in God or dishonesty.

without revealed no discernible pattern of differences across study variables; therefore, multiple imputation was not undertaken. Analyses were only carried out with participants with complete data.

A fractional logit model, using a generalized linear model with a logit link transformation and the binomial family (providing robust standard errors),[27] was fitted for frequency of interactions with each cadre (model 1: interactions with health extension workers; model 2: interactions with community health development agents; and model 3: interactions with TBAs). The covariates of interest included age, education, children, gender, experience, cadre, political party affiliation, group work or training, distance, food insecurity, household assets, competing demands, trust in a cadre as a whole, and perception of a cadre's motivations to engage in health work. Propensity to trust—measured by responses to 2 questions (Table 2)—and *kebele* were controlled for in analyses.

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). The average marginal effects were calculated to indicate the relative change in proportion of total interactions—reported as percent change—with one unit change in the independent variable of interest, holding all continuous variables at their mean and dichotomous variables at zero.[27] For example, if an independent variable such as age was found to have an average marginal effect of 5.0, it would be expected that a one unit—or in this case, a one year of age—change would increase the proportion of interactions by 5%, whereas an average marginal effect of −5.0 would represent a reduction in the proportion of interactions by 5%. To facilitate interpretation of results, continuous variables were centered at their mean, and dummy variables were generated for all categorical variables prior to analyses.

Linear regression was also conducted to determine if participation on either the MaNHEP guide team or the quality improvement team was associated with trust level in each cadre.

Independent Variables

The independent variables were conceptualized into 4 broad domains: sociodemographic characteristics, perceptions of health worker cadres, physical and logistical barriers, and shared experiences.

Sociodemographic Characteristics

According to the principle of homophily (ie., love of the same), social and demographic similarities strengthen social relations,[28–30] ease communication, and foster trust and reciprocity.[31] Sociodemographic variables were collected on age, gender, children, educational attainment, marital status, ethnicity, religion, and political party affiliation. As proxies for wealth, participants were asked 17 items on household assets and 9 items related to household food insecurity.[32,33] A Household Asset Index was created using principal components factoring where items were weighted based on their contribution to the first principal component and summed to create an index. Participants replied to food insecurity items based on the frequency of occurrence in the past month, rarely (1–2 times), sometimes (3–10 times), and often (>10 times). The Household Food Insecurity Access Scale 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).[34]

Perceptions of Health Worker Cadres

Research has demonstrated that high trust among working groups plays a role in increasing performance,[35,36] knowledge sharing,[37] citizenship behavior,[35] collaboration,[38] and a preference for working in teams.[39] Participants were asked 13 items about trust in each cadre using the Rural Health Worker Trust Scale (Table 2), previously pilot-tested and found to be reliable in this population (Cronbach's alpha, 0.81–0.91).[14] In a 2-step process, participants replied to each item based on their level of agreement with the statement using a circle and square visual analogue. For example, in step 1, participants were asked, "The health extension workers in your *kebele* are honest—do you agree (pointing to the circle) or disagree (pointing to the square)?" In step 2, they were asked, "Do you agree/disagree strongly (pointing to the large circle/square) or just a little (pointing to the small circle/square)?" Negatively phrased items were reverse coded. Items were weighted based on their contribution to the first principal component and summed to create a separate index of trust in each cadre.

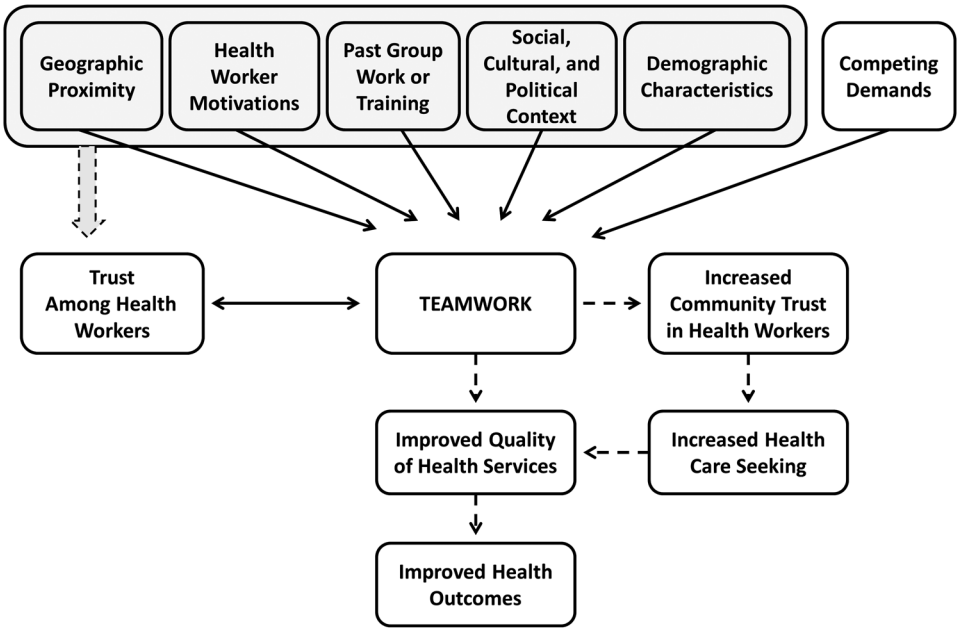

Figure 1. Conceptual Model for Teamwork Among Community Health Workers
The dotted arrow adjoining geographic proximity; health worker motivations; past group work or training; social, cultural, and political context; and demographic characteristics to trust represents the potential mediating role of trust in influencing teamwork. Dotted lines represent relationships not investigated in the present study.

Table 3. Measurement of Health Worker Motivations and Competing Demands

Common Health Worker Motivations[a]
To help the community
For God or St. Mary (spiritual blessing)
To earn respect from the community
To gain nonfinancial incentives (eg, training, gifts)
To earn financial incentives
Index of Competing Demands
How much of the day do you spend farming?
How much of the day do you spend attending livestock?
How much of the day do you spend looking after children?
How much of the day do you spend collecting water?
How much of the day do you spend collecting firewood?
How much of the day do you spend doing housework?

[a]Ordered from most to least prosocial.

Perception of fellow health workers' motivations to do health work and the degree to which those motivations are perceived as *prosocial*—for the well-being and integrity of others[40]—is potentially important for teamwork. A list of common health worker motivations, and the ranking of those motivations from most to least prosocial (Table 3), was obtained in formative work. For the survey, participants were then asked to compare each motivation pair (eg, earn money vs help the community) according to their perception of which item is a stronger motivation for each cadre to do health work. A perceived motivation score was developed by summing each comparison, with a range from zero (perceived least prosocial) to 10 (perceived most prosocial).

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.[41–43] Distance was operationalized in the study by using Global Positional System coordinates to measure the distance (in km) between each participant's home and their *kebele* health post. Competing demands (logistical barrier) have been found to limit health care workers' ability to interact effectively.[44,45] A list of competing demands was obtained during MaNHEP formative research[21] and used to create survey items (Table 3). Participants were asked how much of the day they spend doing non-health work tasks (none of the day, a little of the day, half the day, all day). 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.[46–50] The survey questionnaire contained items that relate to shared experiences, including cadre (health extension worker, community health development agent, or TBA), health experience (in years), and group work or training (operationalized as participation on the MaNHEP guide team or quality improvement team).

Table 4. Characteristics of Participants by Cadre

Characteristic by Domain	Health Extension Workers (n = 17)	Community Health Development Agents (n = 48)	Traditional Birth Attendants (n = 129)
Sociodemographic			
Age, mean (range), y	25 (21-32)	41 (28-58)	45 (24-78)
Female,%	100	10	89
Number of children, mean (range)	1 (0-3)	6 (0-10)	7 (1-16)
Education, mean (range), y	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, mean (range)[a]	7 (5-10)	7 (2-10)	5 (0-9)
Household Food Insecurity Access Scale Score, mean (range)[b]	1 (0-5)	2 (0-19)	6 (0-26)
Perceptions of Health Worker Cadres			
Perceptions of HEW Motivations Index, mean (range)[c]	4 (2-8)	5 (1-10)	4 (0-10)
Perceptions of CHDA Motivations Index, mean (range)[c]	7 (2-10)	7 (1-10)	5 (1-10)
Perceptions of TBA Motivations Index, mean (range)[c]	7 (5-9)	8 (1-10)	7 (0-10)
Trust in HEWs, mean (range)[d]	47 (35-51)	48 (32-52)	48 (29-52)
Trust in CHDAs, mean (range)[d]	45 (28-51)	47 (32-52)	47 (30-52)
Trust in TBAs, mean (range)[d]	45 (28-51)	46 (32-52)	47 (32-52)
Physical and Logistical Barriers			
Competing Duties Index, mean (range)[e]	2 (0-5)	6 (3-10)	7 (1-14)
Distance from home to health post, mean (range), km	1 (0-5)	2 (0-5)	2 (0-5)
Shared Experiences			
Health work experience, mean (range), y	6 (3-6)	4 (1-16)	16 (1-43)
MaNHEP guide team or quality improvement team,%	65	92	33
Frequency of Interactions in the Last Month			
Work interactions with HEWs, mean (range)[f]	0.6 (0-1.0)	0.1 (0-0.4)	0.1 (0-0.8)
Work interactions with CHDAs, mean (range)[f]	0.1 (0-0.4)	0.1 (0-0.3)	0.0 (0-0.5)
Work interactions with TBAs, mean (range)[f]	0.1 (0-0.4)	0.1 (0-0.2)	0.0 (0-0.3)

Abbreviations: CHDA, community health development agent; EPRDF, Ethiopian People's Revolutionary Democratic Front (the ruling party in Ethiopia in 2011 and 2012); HEW, health extension worker; MaNHEP, Maternal and Newborn Health in Ethiopia Partnership; TBA, traditional birth attendant.
[a]Household Assets Index, range 0-13.
[b]Household Food Insecurity Access Scale Score, range 0-27.
[c]Perceptions of Motivations Index, range 0-10.
[d]Rural Health Worker Trust Score, range 13-52.
[e]Competing Duties Index, range 0-18.
[f]Work interactions is defined as the proportion of all possible interactions in the past month, range 0-1.

RESULTS

Participants included 17 health extension workers (all of the health extension workers in the study *kebeles*), 48 community health development agents (a sample of community health development agents in the study *kebeles*), and 129 TBAs (a sample of TBAs in the study *kebeles*). After participants with missing data were removed from the analysis, final sample sizes were 165 for the analysis of interactions with health extension workers (15 health extension workers, 38 community health development agents, 112 TBAs); 171 for the analysis of interactions with community health development agents (16 health extension workers, 39 community health development agents, 116 TBAs); and 164 for the analysis of interactions with TBAs (16 health extension workers, 40 community health development agents, 108 TBAs).

All participants self-identified as ethnically Amhara and Orthodox Christian. Patterns of gender, education, work experience, and level of food insecurity were particularly differentiated by cadre (Table 4). Participants from all 3 cadres reported the highest level of trust in health extension workers, while TBAs were perceived to have the most prosocial motivations. The highest proportion of interactions was reported with health extension workers, and the lowest proportion of interactions was reported with TBAs.

Table 5. Influence of Individual Characteristics on the Frequency of Interactions with Health Extension Workers, Community Health Development Agents, and Traditional Birth Attendants in the Amhara Region, Ethiopia

	Model of Interactions With Health Extension Workers		Model of Interactions With Community Health Development Agents		Model of Interactions With Traditional Birth Attendants	
	n = 165		n = 171		n = 164	
Characteristic by Domain	Coefficient (SE)/ *P* value	AME[a]	Coefficient (SE)/ *P* value	AME[a]	Coefficient (SE)/ *P* value	AME[a]
Sociodemographic Characteristics[b]						
Age	0.02 (0.01)/*P* = .29	0.1%	0.01 (0.02)/*P* = .59	0.0%	0.01 (0.02)/*P* = .58	0.0%
Gender						
Female (male ref)	− 0.79 (0.35)/*P* = .02	− 5.5%	− 1.07 (0.51)/*P* = .04	− 5.7%	− 1.26 (0.43)/*P* = .004	− 4.0%
Children	− 0.06 (0.05)/*P* = .30	− 0.4%	0.03 (0.04)/*P* = .53	0.1%	0.06 (0.05)/*P* = .17	0.2%
Education, y	0.07 (0.05)/*P* = .17	0.5%	0.03 (0.06)/*P* = .54	0.2%	0.01 (0.06)/*P* = .89	0.0%
Marital status						
Married (not married ref)	− 0.31 (0.29)/*P* = .30	− 2.1%	− 0.50 (0.33)/*P* = .13	− 2.6%	− 0.44 (0.29)/*P* = .13	− 1.4%
Political party affiliation						
EPRDF-affiliated (other or none ref)	0.12 (0.37)/*P* = .75	0.8%	0.39 (0.30)/*P* = .20	2.0%	0.53 (0.34)/*P* = .12	1.7%
Household Assets Index	0.18 (0.15)/*P* = .21	1.3%	0.12 (0.13)/*P* = .35	0.7%	0.02 (0.16)/*P* = .89	0.1%
Household Food Insecurity Access Scale	0.03 (0.02)/*P* = .19	0.2%	0.03 (0.02)/*P* = .13	0.2%	0.06 (0.02)/*P* = .002	0.2%
Community[c]						
Kebele[d] 1 (non-*Kebele* 1 ref)	− 0.59 (0.45)/*P* = .19	− 4.1%	− 0.51(0.44)/*P* = .25	− 2.7%	− 0.08 (0.34)/*P* = .81	− 0.3%
Kebele 2 (non-*Kebele* 2 ref)	0.95 (0.47)/*P* = .05	6.6%	0.65 (0.39)/*P* = .09	3.5%	1.49 (0.32)/*P*<.001	4.7%
Kebele 3 (non-*Kebele* 3 ref)	0.83 (0.46)/*P* = .07	5.8%	0.60 (0.49)/*P* = .22	3.2%	1.13 (0.44)/*P* = .01	3.6%
Kebele 4 (non-*Kebele* 4 ref)	− 0.96 (0.52)/*P* = .06	− 6.7%	0.42 (0.40)/*P* = .30	2.2%	0.96 (0.36)/*P* = .008	3.0%
Kebele 5 (non-*Kebele* 5 ref)	0.34 (0.42)/*P* = .42	2.4%	0.93 (0.41)/*P* = .03	4.9%	1.55 (0.37)/*P*<001	4.9%
Kebele 6 (non-*Kebele* 6 ref)	0.54 (0.38)/*P* = .15	3.8%	0.60 (0.42)/*P* = .15	3.2%	0.59 (0.37)/*P* = .11	1.9%
Kebele 7 (non-*Kebele* 7 ref)	Omitted		Omitted		Omitted	
Propensity to Trust Index[c]	− 0.22 (0.15)/*P* = .14	− 1.6%	0.02 (0.15)/*P* = .92	0.1%	− 0.19 (0.14)/*P* = .18	− 0.6%
Perceptions of Health Worker Cadres						
Perception of HEW/CHDA/TBA Motivations Index	0.04 (0.02)/*P* = .01	0.3%	− 0.00 (0.02)/*P* = .90	− 0.0%	− 0.00 (0.02)/*P* = .92	− 0.0%
Trust in HEW/CHDA/TBA Index	0.40 (0.11)/*P* <.001	2.8%	0.34 (0.13)/*P* = .007	1.8%	0.30 (0.12)/*P* = .01	0.9%
Physical and Logistical Barriers						
Competing duties	− 0.09 (0.06)/*P* = .14	− 0.7%	0.04 (0.05)/*P* = .47	0.2%	0.03 (0.05)/*P* = .62	0.1%
Distance from home to health post	− 0.21 (0.10)/*P* = .03	− 1.5%	0.07 (0.09)/*P* = .40	0.4%	− 0.06 (0.09)/*P* = .48	− 0.2%
Shared Experiences						
Health worker type						
HEW (non-HEWs ref)	3.29 (0.77)/*P* < .001	23.0%	2.08 (0.87)/*P* = .02	11.1%	2.27 (0.75)/*P* = .002	7.2%
CHDA (non-CHDAs ref)	0.40 (0.32)/*P* = .21	2.8%	0.42 (0.38)/*P* = .27	2.2%	0.39 (0.37)/*P* = .29	1.2%
TBA (non-TBAs ref)	Omitted		Omitted		Omitted	
Experience, y	0.02 (0.02)/*P* = .31	0.1%	0.01 (0.01)/*P* = .31	0.0%	0.00 (0.01)/*P* = .73	0.0%
Group work/training						
MaNHEP Participation (no MaNHEP Participation ref)	0.46 (0.26)/*P* = .07	3.2%	0.18 (0.26)/*P* = .50	0.9%	0.17 (0.25)/*P* = .50	0.5%

Abbreviations: AME, average marginal effects; CHDA, community health development agent; EPRDF, Ethiopian People's Revolutionary Democratic Front (the ruling party in Ethiopia in 2011 and 2012); HEW, health extension worker; MaNHEP, Maternal and Newborn Health in Ethiopia Partnership; SE, standard error; TBA, traditional birth attendant.

[a] AME is the average marginal effects, using the Delta-method dy/dx, of the independent variable on frequency of interactions. AME is displayed in percent change in proportion of total possible interactions in the past month per one-unit change in the independent variable.

[b] Ethnicity and religion were omitted from analyses due to lack of variance in the sample.

[c] Denotes control variables.

[d] *Kebele* refers to a community in Ethiopia of approximately 5000 people.

Factors Influencing Health Worker Interactions with Health Extension Workers

As shown in Table 5, female participants were less likely than male participants to report work interactions with health extension workers ($P = .02$; average marginal effect, −5%). Health extension workers were much more likely than community health development agents and TBAs to interact with other health extension workers ($P < .001$; average marginal effects, 23%). Participants who lived farther away from the health post were significantly less likely to interact with health extension workers ($P = .03$; average marginal effects, −2%). Furthermore, participants who perceived health extension workers to have more prosocial motivations for doing health work interacted more frequently with health extension workers than those who perceived health extension workers to have less prosocial motivations ($P = .01$; average marginal effects, 0.3%). Finally, participants in all 3 cadres who had higher trust in health extension workers were significantly more likely to interact with health extension workers than participants with lower trust in health extension workers ($P < .001$; average marginal effects, 3%).

Factors Influencing Health Worker Interactions with Community Health Development Agents

Turning to work interactions with community health development agents (Table 5), female participants were less likely than male participants to interact with community health development agents ($P = .04$; average marginal effects, −6%). Health extension workers were more likely than community health development agents and TBAs to interact with community health development agents ($P = .02$; average marginal effects, 11%). Participants who had higher trust in community health development agents were significantly more likely to interact with community health development agents than participants with lower trust in community health development agents ($P = .007$; average marginal effects, 2%).

Factors Influencing Health Worker Interactions with Traditional Birth Attendants

For work interactions with TBAs (Table 5), gender, cadre type, and trust were again influential. Females were less likely than males to report work interactions with TBAs ($P = .004$; average marginal effects, −4%), and health extension workers were more likely than community health development agents and TBAs to interact with TBAs ($P = .005$; average marginal effects, 7%). Participants who had higher trust in TBAs were significantly more likely to interact with TBAs than participants with lower trust in TBAs ($P = .02$; average marginal effects, 1%). Finally, participants 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 participants ($P = .004$; average marginal effects, 0.2%).

Relationship between MaNHEP Participation and Trust in Health Extension Workers, Community Health Development Agents, and Traditional Birth Attendants

Participation on a MaNHEP guide team or quality improvement team were not found to be significantly associated with trust in health extension workers, trust in community health development agents, or trust in TBAs.

DISCUSSION

Where resources available to community-based health workers are limited, cooperation and collaboration among diverse health care groups is 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 health extension workers, community health development agents, and TBAs point to substantial sociodemographic differences by cadre, which may have significant implications for public health programming with regard to use of community-based health workers to extend health services. Second, there is a common thread that connects all of the interaction models—being a health extension worker, being a male, and having trust in a cadre are associated with increased interactions with each cadre. Trust is a modifiable factor; therefore, it 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. This highlights the need for cadre-specific programming, particularly related to perceptions of health worker motivations since it is a modifiable factor.

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,[9] and workers may be able to access a wider range of resources by interacting with groups other than their own.[51,52] Thus, health worker teams at the community level are likely to benefit from diversity of group membership as well as strong social sensitivity (eg, awareness of each other's feelings, taking turns speaking).[12] Sociocultural heterogeneity has also been linked to lower levels of trust.[53] However, our results suggest that among the stark differences in sociodemographic factors between cadres, few appear to impact on interactions and 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, health extension workers, and health workers with higher trust in cadres were more likely to interact with members of those cadres. Gender norms in which men have a 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 health extension workers are the focal point of the local health system structure in rural Ethiopia supports the finding that health extension workers interact more often compared to other cadres. Finally, that health workers with greater trust in their own and other cadres interact more often complements prior work on the importance of workplace trust for teamwork.[37,39,54]

Different predictors of interaction were also noted across the 3 cadres. First, health workers who lived closer to the health post were more likely to interact with health extension workers compared to those who lived further away. This finding may reflect that health extension workers 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. Third, health workers who perceive health extension workers to have more prosocial motivations for doing health work interact with health extension workers 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[55–58] 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 health extension workers (average marginal effects, 3%) as compared to interactions with community health development agents (average marginal effects, 2%) and TBAs (average marginal effects, 1%). This finding likely reflects that health extension workers 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 the other cadres. One potential explanation for this finding is that TBAs may display lower generalized trust (trust in people in general) compared to particularized trust (trust in people similar to oneself), thereby resulting in reduced engagement in volunteer activities.[59]

Our results are also surprising. First, participation in the MaNHEP guide team and/or quality improvement team was not related to teamwork. Second, MaNHEP participation was not associated with higher levels of trust in any of the 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 group work/training were important factors for interactions at the dyad—or relational—level (Dynes et al., unpublished data). Furthermore, Sibley et al[24] reported that a large majority of health extension workers, community health development agents, and TBAs in MaNHEP project sites of the Amhara region participated in guide team or quality improvement team meetings, and that health extension workers and TBAs were significantly more likely to view themselves as part of a team in providing CMNH care at project endline compared to baseline. (Most of the community health development agents already viewed themselves as part of a team at baseline).

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, inter-cadre 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 level for all 3 cadres, 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 inclusion of interaction terms to test for the potential moderating roles of variables within the model and testing the mediating role of trust. Data were collected at a single point in time, eliminating our ability to make causal inferences. Furthermore, the participants were recruited from only 7 *kebeles*, which reduces the generalizability of findings. It is also difficult to ascertain whether the influence of cadre on interaction patterns reflects compositional or contextual differences among participants, particularly given the stark differences in cadres by gender, age, and educational attainment. Finally, we limited our outcome of interest to the frequency of interactions. The purpose, outcome, and quality of interactions may be important outcome variables to consider 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 the 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 nonsignificant 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 nonproject 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.

The knowledge gained here has clear implications for midwifery in the United States and abroad. Findings highlight the importance of interprofessional education and social interaction. Within the social structures of health care, great effort is often taken to create cultures of division wherein health care professionals are trained, and even work, within professional silos (eg, midwifery, medicine, nursing). Interprofessional teamwork should be introduced at the onset of health care training programs and reinforced through engaging in each other's professional customs. In this way, individuals can learn the valued roles and unique perspectives that each group brings, while concurrently 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 health care practice are built.

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 3 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 maternal and newborn health care in nontraditional workplace settings.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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