Exploring the connectedness of rural auxiliary midwives to social networks in Koutiala, Mali

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\textbf{ABSTRACT}

\textbf{Background:} rural auxiliary midwives are central to clinical maternal care in Mali. However, little is known about their social role within the villages they serve. Exploring the social connectedness of midwives in their communities can reveal areas in which they need additional support, and ways they could benefit their communities beyond their clinical role.

\textbf{Objective:} to examine rural auxiliary midwives’ social connectedness to the communities they serve.

\textbf{Design:} embedded, mixed methods design combining social network case studies with semi-structured interviews.

\textbf{Participants and setting:} midwives were recruited for semi-structured interviews during technical trainings held in Koutiala in southern Mali. Social network analyses were conducted among all adult women in two small villages purposively sampled from the Koutiala region.

\textbf{Methods:} 29 interviews were conducted, transcribed, and coded using NVivo (Version 9) to qualitatively assess social connectedness. In two villages, the complete social networks of women’s friendships were analysed using UCINET Version 6 ($n=142$; 74). Rank-orders of actors according to multiple measures of their centrality within the network were constructed to assess the midwives’ position among village women.

\textbf{Findings:} both local and guest midwives reported feeling high levels of social integration, acceptance, and appreciation from the women in their communities. Specific challenges existed for guest or younger midwives, and in midwives’ negotiations with men. In the two sociometric analyses, both the local and guest midwives ranked among the most influential social actors in their respective villages.

\textbf{Key conclusions and implications for practice:} though they hold a unique position among other rural women, this study suggests that midwives in Koutiala are well connected socially, and may be capable of becoming effective agents of network based-behavioural health interventions. Additional support is warranted to help midwives affirm a credible professional status in a male-dominated society, especially those of local status and younger age. Programme planners and policy-makers should consider the potential of midwives in communication when designing behaviour change interventions for women in similarly underserved areas.

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\section*{Introduction}

Maternal and newborn health conditions in Mali are among the poorest in the world. Women in Mali have a 5\% lifetime risk of maternal death and it is estimated that for every maternal death an additional 20 women will experience childbirth-related illness or injury (WHO, 2005; Samaké et al., 2006). The neonatal mortality rate in Mali, 48/1000 births, is the world’s second highest after Somalia (UNICEF, 2012). Indicators are worst in rural areas, where 67\% of Malians live (Samaké et al., 2006). Improving maternal and newborn health in rural Mali requires an increase in both access to clinical care and adoption of preventative health behaviours, both of which demand a strong health-care workforce. However, the dearth of skilled providers in sub-Saharan Africa is arguably the continent’s greatest obstacle in the pursuit of the Millennium Development goals for health (Anyangwe and Mtonga, 2007). With 0.5 clinicians and three nurses/midwives per 10,000 people, Mali has one of the lowest densities of health-care providers per population in all of

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Africa (Samaké et al., 2006; WHO, 2012). In rural Mali, the density of providers is only one-eighth that of urban areas (Lodenstein and Dao, 2011). Compounding the problem are Mali’s low population density and limited infrastructure, which often translate into long and difficult journeys to reach the few health-care providers available (World Bank, 2012). Training, supporting, and retaining a strong health workforce in rural Mali is an essential priority for maternal and child public health. To achieve effectiveness and efficiency in human resources for health, it is necessary to first examine Mali’s current health workforce, identify areas in need of support, and innovatively capitalise on areas of untapped potential.

The central provider of maternal and neonatal health in most rural Malian communities is the auxiliary midwife1 (heretofore referred to as midwife). The Malian Ministry of Health originally trained midwives to attend home births. During efforts to decentralise health care in the 1990s, government training for rural midwives greatly advanced, and the cadre became an integral part of the formal health-care system. Only women with a basic level of literacy are eligible to complete midwifery training. Recent unpublished data suggest that midwives in this area have an average of seven to nine years of education (Warren, 2013).

Today, midwives work out of small maternal health centres (maternities) or community health clinics. In rural villages, midwives may be the only and/or the most highly trained health-care provider available (Samaké et al., 2006). Though midwives work under technical supervision of a district officer of the Ministry of Health, the Malian government does not provide salary for midwives. Instead, local community health management committees redistribute out-of-pocket fees paid by patients to midwives with varying degrees of regularity (Warren, 2013).

Midwives attend approximately 26% of all births in Mali, twice as many as other health-care workers combined (Samaké et al., 2006). Despite the national guidelines recommending all women to give birth in health facilities, approximately one-third of births in rural areas are unattended or attended only by a family member and another third are attended by traditional birth attendants who work outside of the formal health-care system. Pregnant women are also advised to attend three antenatal consultations and one postnatal consultation, both of which are provided by midwives. Midwives are trained to identify and manage life-threatening complications, and to activate emergency evacuation of women in need of higher-level care. In addition to maternal care, midwives often deliver services in infant care, vaccinations, family planning, and integrated management of childhood illness (World Health Organization, 2004; Warren et al., 2012).

Ensuring a strong workforce of auxiliary midwives in rural Mali requires assessing not only their clinical abilities, but also their connectedness to the social networks in rural Malian villages. Although members of dense social networks typically share many similarities, midwives possess unique characteristics that could potentially isolate them from traditional rural women (Warren et al., 2012). In traditional villages where women hold household roles, midwives are often the only salaried women among their peers. In a country where only 8% of women living in rural areas are literate, the higher educational background of midwives makes them unique from the women they live and interact with on a daily basis (Samaké et al., 2006). Further, about half of midwives do not work in the community of their birth or married family (Warren et al., 2012). These non-local or ‘guest’ midwives often come from urban communities and/or from a higher socio-economic status, but can only find work by relocating to rural settings. Little is known about their social situation in their new rural lives. Local midwives, or those whose family or husband’s family are native to the village they serve, may also be in a unique social position, as they are asked to establish professional credibility in a community where they were first known as typical girl or young wife. To date, no one has explored how or if the characteristics of midwives, specifically their locality, are reflected in their communities’ social networks and the impact their social connectedness may have on their work.

**Objective**

The aim of this study was to examine the level and quality of auxiliary midwives’ connectedness to the social networks in rural areas of Koutiala, Mali, and how this connectedness impacts their professional role as a health provider.

**Methods**

This mixed methods study used an embedded design, a methodology in which ‘one data set provides a supportive secondary role in the study’ (Creswell and Plano Clark, 2007). Embedding can be applied across any methodology and is not bound to a particular theory (Braun and Clarke, 2006). In this

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1 Auxiliary midwives are called “matrones” in Mali. They are different than their more highly trained and far less numerous midwifery colleagues called “sage-femmes”. In this article, we discuss auxiliary midwives exclusively.
study, we embedded a thematic analysis of data from semi-structured interviews to support and provide context for network analyses of social-relational data.

Semi-structured interviews

Between August 2010 and January 2012, approximately 80% of the midwives in the Koutiala region attended technical training courses at the health centre. While there, attendees were introduced to the study and its goals during one of the training's introductory sessions. Midwives who volunteered to participate in semi-structured interviews in conjunction with the training provided written informed consent. The interview was conducted by the first or second author with a male research assistant in a private room. Both the first and second author had previously lived in Mali for more than two years; the research assistant was native to the Koutiala Region and fluent in the local languages used during the course of data collection as well as in English. Interviews began with questions related to a parent study, and concluded with four questions designed to address the participants' social relationships with their communities:

Can you tell me about a time when you felt you were a part of the village?
Can you tell me about a time when you felt you were rejected by the village?
Can you tell me about a time when you helped another woman with your advice?
Can you tell me about a time when a woman did not accept your advice?

An additional question from the parent study was included in the data analysis due to the social nature of the responses: How is the work of guest midwives different from the work of local midwives?

The interviews were conducted in Bambara (Bamanankan) and were translated exchange-by-exchange by the local research assistant. Debriefing sessions were held with the research assistant and the authors to clarify any interpretation questions and to discuss preliminary thoughts for thematic analysis. To ensure reliability in the coding of the transcripts, two researchers independently coded and identified major themes using NVivo Version 9 (2010), and later met to compare interpretations. The few disagreements that arose from this analysis were discussed with the senior author until a consensus was reached. The research assistant also provided feedback on the interpretation of qualitative results during the analysis process.

Social network analysis

Among the villages represented in the trainings, two were selected as case studies in social network analyses. Purposive sampling was applied to select the villages. To ensure a manageable size for complete network analyses, we restricted eligibility to villages with 300 or less adult women. We then considered feasibility, and restricted the village criteria to those situated within 50 km of Koutiala, and with whom the research team had previously developed rapport. From villages that met these criteria, we aimed to select one village with a local and one with a guest midwife for comparison. Local midwives were defined as those who were working in their native or their husband's native village, and guest midwives as those who work in a village where neither she nor her husband are native. Among the remaining villages, we selected the two that were most clearly bounded geographically in order to most precisely define the bounds of the network analyses (Wasserman and Faust, 1994).

At each site, verbal consent was obtained from the midwife and village chief before beginning data collection. Over the course of three days, we aimed to reach every adult woman in the confines of the village to ask ‘Who are your closest friends in the village?’ Questions were asked in either Bambara/Bamanankan or Minianka/Minyanka; whichever language the respondent was most comfortable in. With the aid of the same local research assistant used in the qualitative interviews, the first author recorded names and key identifying information for each woman interviewed. We initiated a snowball technique beginning with the midwife and her immediate contacts, maintained a register of names, and actively sought out the women whose names were mentioned but did not report to the site of data collection (Wasserman and Faust, 1994; Scott, 2000). For women who were out of town, we asked a relative to answer on her behalf. After data collection was complete, names of each friend mentioned by respondents were matched with the list of original respondents and replaced throughout with a common numerical code. This was completed before leaving the village so that a committee of village members could clarify any remaining confusion about the names provided (i.e., insight into nicknames or duplicate names). After deciding with the committee that we had accounted for every woman within the village bounds, we destroyed all personal identifying information.

Matrices of relationships of actors were entered into UNICET Version 6 (Borgatti et al., 2002). For each village, we calculated descriptive social network measures to describe the overall connectedness of the network. We used two measures to calculate centrality of individual women in order to identify influential actors across the entirety of the network. Freeman degree measure describes centrality in relation of an actor to the connections in his or her local network, and eigenvector of geodesic distance incorporates all actors in a previously determined bounded group, even if it that group is not connected as a single, complete network (Freeman, 1979; Bonacich, 1987). In each measure, higher numbers reflect greater centrality to the network.

Ethical considerations

All methods were approved by the Institutional Review Boards at Johns Hopkins Bloomberg School of Public Health IRB #0003014 and Comité d’Ethique de l’INRSP du Mali (National Institute for Public Health Research) IRB #00005/10/CE-INRSP. All members of the research team, including local research assistants, were trained and certified in research ethics.

Findings

Semi-structured interviews

Thirty-one rural midwives were interviewed during the trainings. Participants represented four local ethnicities: Minianka/ Minyanka (21), Bambara (3), Peuhl/Fula/Fulani (5) and Senufo/Senoufo (1). Among the rural midwives, 15 were considered local and 16 were guests. The sample had a median age of 36 years, and a median formal education of 8 years. Among the 90% that were married, almost half reported that their husbands do not live in the village where they work. Years of midwifery experience ranged from 1 to 36 years with a mean of 8.3 years. Sixty-five per cent of the participants had only worked at a single post throughout their career. We identified three major themes in analysing the semi-structured interview questions related to midwives’ social

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2 For ethnicity, n = 30, as one participant's ethnicity was missing in the dataset.
connectedness: recognition through in-kind payments, ability to offer advice, and influence of age and ‘guest’ or ‘local’ status.

Recognition through in-kind payments: When asked to recall times when they felt accepted by the community, most participants cited individual acts of appreciation by other women in the village. Many participants recalled receiving cereals, produce, firewood, or other gifts in generous quantities:

Just a few days ago, someone bought me an outfit. These things encourage me and make me feel like I am part of it [the community].

Few midwives reported feeling rejected. When asked about times they felt rejected by the community, many midwives were positive about their place in the village and said they could not cite a time when they experienced outward disrespect. Some offered examples of instances when their advice was rejected or they were blamed for not being able to mediate a complaint. A few local midwives cited their inconsistent salary as a sign of disrespect from the community. Salary making decisions, however, usually lie outside of female networks in the hands of the male village leaders (health management committee members, or rural district mayors). One midwife stated that the generous gifts she receives from women are the ‘reason that I can handle the situation’, the ‘situation’ being her lack of a reliable salary.

Ability to offer advice: Midwives reported clinical and non-clinical examples of times they offered advice to women. Midwives recounted how in their communities, women routinely sought them out for health advice related to antenatal consultations, childbirth, family planning and abortion. Resistance to that advice, although rarely noted, most often came from husbands:

Women always listen. It’s the men who oppose the advice. For family planning, especially, people here don’t agree to that. Some women have 15 babies, and the men don’t agree on family planning.

Midwives discussed helping women with marital problems, often in situations when a husband would not support the health care or treatment plan recommended for his wife. Local midwives involved in these situations tended to support and empower women to make care decisions for themselves, by-passing the approval traditionally required from their husbands:

There was a woman who was pregnant and her husband wouldn’t pay for the prenatal consultation (PNC). I told that woman, ‘Take care of yourself, don’t look to your husband. If you have money, take care of it yourself.’ And she followed my advice.

Some midwives spoke of their ability to act as a mediator between a woman and her husband. These midwives, especially those with ‘guest’ status, seemed to have enough social leverage to be able to approach the husband directly and persuade him to comply with the prescribed treatment:

A woman came to see me, she was pregnant and very weak and sick but her husband wouldn’t take her to the center. When she got to the maternity center by walking herself, I checked on her and she explained to me that her husband wasn’t even speaking to her. I wrote the prescription and she said she was going to take it to her older brother. I asked her, ‘Why? Is your husband away from the village?’ And then she explained so I asked her to leave the prescription with me. I went to the husband and talked to him and finally he agreed to buy the prescription.

Further, many midwives reported times when they were sought out by women for general marriage and relationship advice unrelated to health care. Midwives recalled stories of positive outcomes, such as saved marriages and gifts of appreciation, resulting from their involvement and advice.

Influence of age and ‘guest’ or ‘local’ status: Both guest and local midwives suggested that guest midwives elicit more community respect. It is Malian tradition for a village to pay special respect to guests, and this respect is often evident in a consistent salary for guest professionals (Warren, 2013). However, when a local woman moves into a higher status position, it can stir feelings of jealously and resentment. Local midwives rise to their position from the same social background as the other women. They typically live with a husband that can provide support, and thus might not be seen as worthy to earn a salary as compared to a guest:

If you are in your own village, they think you are going to get a salary and they can harm you because of that.

Younger midwives also struggled to establish professional respectability. As compared to traditional birth attendants, midwives are often younger and may lack the status that comes with advanced age in this context. Therefore, midwives may not be seen as appropriate to care for women senior to them. This is especially true for local midwives who state that assisting an older relative in delivery is culturally inappropriate:

They’ll think you were just born. How can you care for people older than you and see them in such a vulnerable position?

Social network analyses

The site of the first case study, Village A, was situated about 15 km outside of Koutiala and only accessible by dirt road. Village A had a population of approximately 550, of which an estimated 200 were adult women. The homogeneity of last names and isolation of the community were indicators of a long generational history of households. Women in Village A named an average of 1.18 close friends (SD: 0.51) (Table 1). The midwife in Village A was one of the most central figures of the network. This is visually apparent by her central position among the actors tied by friendship bonds in Fig. 1a. By measures of degree and eigenvector centrality, she ranked 1st and 6th respectively among the 142 women in the network of Village A (Table 2).

Village B was situated 30 km outside of Koutiala and had an estimated population of 350. The village was situated around an agriculture technical school, contained many migrants, and did not have the generational history of a typical Malian village. Women in Village B named an average of 0.38 close friends (SD: 0.74), due the fact that many claimed their close friends were not of the village. The lower coefficients of variation for Freeman degree and eigenvector of geodesic distance suggest that the women in Village

<table>
<thead>
<tr>
<th></th>
<th>Village A</th>
<th>Village B</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>142</td>
<td>74</td>
</tr>
<tr>
<td>Mean number of close friends cited (SD)</td>
<td>1.18 (0.51)</td>
<td>0.38 (0.74)</td>
</tr>
<tr>
<td>Freeman degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>1.11 (0.64)*</td>
<td>0.77 (1.4)*</td>
</tr>
<tr>
<td>Range</td>
<td>0.4, 26</td>
<td>0.6, 85</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>57.67</td>
<td>181.82</td>
</tr>
<tr>
<td>Eigenvector of geodesic distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>4.72 (10.9)</td>
<td>5.57 (15.4)</td>
</tr>
<tr>
<td>Eigenvector range</td>
<td>0.70, 87</td>
<td>0.73, 45</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>230.90</td>
<td>276.48</td>
</tr>
</tbody>
</table>

* t-Test of difference in mean degree between villages A and B significant at the p < 0.05 level
B form a friendship network that is not as densely connected as the network of women in Village A. Difference in mean Freeman degree between villages was significant to the $p < 0.05$ level. The low density is also understood by noticing the many single, disconnected actor nodes in Fig. 1b. Still, the midwife in Village B ranked 1st among women in both centrality measures (as seen in Table 2 and depicted in Fig. 1b). Results from both network analyses supported evidence for the central position of rural auxiliary midwives in women’s networks of varying densities.

**Discussion**

Our findings suggest that despite their unique role compared to other rural women, midwives in Koutiala have a high level of social connectedness to networks of women in their respective communities. Midwives expressed feelings of acceptance and appreciation from the women they serve, felt compelled to advocate for the health of their clients, and at times, even stepped outside their clinical role to counsel women about personal matters. Additional support may be needed to help midwives affirm a credible professional status in a male-dominated society, especially those of local status and younger age. Social network data revealed that both the local and guest midwives ranked high among others in their network centrality measures of degree and eigenvector of geodesic distance, suggesting that both local and guest midwives in the case studies occupy central and influential positions.

**Potential impact**

The central social position of rural auxiliary midwives is a valuable finding for planning maternal and child health interventions in Mali and other similar regions where midwives serve women in small, rural communities. In areas of limited media infrastructure, such as rural Mali, interpersonal communication and social learning through network interactions may be the most influential tools available for health behaviour change (Adams et al., 2006). Women’s friendship networks may be one of most effective means of disseminating behaviours that may be more private, personal or sensitive to women, such as contraception, or behaviour that are best adapted through modelling other women, such as infant feeding practices. Research has suggested that a number of interventions in other rural locations have successfully taken advantage of social networks to promote women’s health behaviours, most notably with the diffusion of contraceptive use through networks of women in Bangladesh and Nepal (Kincaid, 2000; Manandhar et al., 2004; Gayen and Raeside, 2010). These types of diffusion interventions require central, influential figures to activate them, and thus could be particularly effective in cases where these central actors have direct access to and training in health advancements. Training and supporting midwives as leaders in women’s health communication could prove to be a valuable adjunct to community health worker (CHW) models currently used for behavioural health promotion in a number of developing countries.

Involving the midwife in women’s behavioural health interventions would make use of the advantageous social position she
already holds, as well as her education and formal connection to the health system. Regional technical trainings, such as those in which our qualitative data was collected, should consider capitalising on midwives’ apparent influence, trustworthiness, and ability to negotiate with family and household units. Considering the effectiveness of health provider networks in disseminating new information and practices amongst themselves, rural midwives are further positioned to act as a bridge between provider networks and women in their communities (West et al., 1999). Additionally, community connectedness and social network ties can also be the vehicle by which a midwife draws additional human resources within her community to support maternal health activities. For example, a close working relationship between a midwife and her community’s traditional birth attendant has been shown to improve health facility-based delivery (Sangho et al., 2010).

Programme planners who wish to design behaviour change campaigns in any underserved rural area should take these concepts into consideration, and investigate the potential influence of midwives or other mid-level health-care providers in social networks. The structure of maternal health services in Mali is found all over the world; from auxiliary midwives in Cameroon to trained traditional birth attendants in Cambodia, one woman is often a community’s principal doorway to the health-care system and to innovations in women’s health (Fongwa, 2002; Chatterjee, 2005). In these areas, where health promotion for women is underdeveloped, the social influence of the midwives should be considered and leveraged in network-based interventions.

When developing these interventions, programme planners should also look beyond indicators of network influence and address the specific and unique social situations of midwives. The qualitative interviews in this study suggest that even though midwives in Koutiala appear to have strong social influence and positive connectedness, they are not without problems in their community. Special support may be needed for local or younger midwives to overcome challenges of professional credibility that may affect their ability to advance their clinical or health communication work.

Limitations

Though this study provides insight into the social position of midwives in rural Mali, it also has limitations. A number of factors may have influenced the qualitative data, including reactivity of participants to a male Malian and female American researcher, and translation of questions and responses. It is possible that the women may have revealed different information with interviewers of other demographics, and that the meaning of some phrases were misinterpreted. These limitations, however, are inherent in qualitative research, and we believe the cultural and local language skills of the American researchers as well as the interpersonal skills, language skills, and locality of the research assistant helped mitigate these limitations.

Social network data as well may be inaccurate in instances where individuals could not be located and others spoke on their behalf, or when a judgment had to be made on whether or not a borderline household was considered part of the village. Further, the network results cannot be generalised to communities beyond the two case studies. Future studies are needed to determine if the high social centrality observed in these case studies is common among midwives in small rural villages of varying densities in other locales.

Questions remain about the nature of the relationships examined in this study. The question ‘Who are your closest friends in the village?’ seemed to be interpreted quite seriously by the respondents. Consistent with previous studies on women’s emotional support networks in Mali, we found respondents to be very selective about who they call ‘friends’, and thus only provide one, two, or rarely, three names (Adams et al., 2002). The cultural meaning of ‘friendship’ is important to understand in the context of behavioural health promotion. It may be that the low-density networks of highly selective friendships are appropriate for disseminating health behaviours that are more personal, private, and not commonly spoken about in public, as in reproductive health. Acceptance of new family planning options, for instance, may be more likely to be disseminated through a personal conversation with an individual’s most trusted friend than through an acquaintance or a visit from a CHW. Other, less sensitive behaviours may be disseminated through more casual interactions, and different questions such as ‘Who do you talk to frequently?’ or ‘With whom do you work alongside?’ could have resulted in different sociometrics, network structures, and apparent opportunities for diffusion. This type of analysis may have revealed denser networks that may be more appropriate for promoting behaviours that disseminate through modelling or less intimate interactions, such as nutrition or malaria prevention techniques.

As a whole, the study did not delve deeply into the relationships midwives may occupy within the social community of men. The potential public health impact of women’s social networks cannot be evaluated in isolation in a society where husbands and fathers have great influence over the health decisions of their wives and children. Further investigation into the dynamics between social networks, husbands, and midwives are necessary to determine the mechanisms by which a midwife’s social centrality can be used to advance maternal and child public health.

Future directions

This study provides further evidence of the value and potential capabilities of rural midwives, and thus recommends additional investment in this cadre in order to secure a strong health workforce for maternal and child health. With the right support, it is feasible and potentially highly effective for a midwife in a small village to go beyond her clinical duties and become a central implementer of maternal health communication programmes. This support should consist of training in health communication techniques, health education materials, and efforts to address their specific social challenges, such as those revealed by our qualitative analysis. Future research is needed to better understand the diffusion of innovation processes between midwives, rural social networks, and family units, as well as the effectiveness of training midwives in behavioural health interventions in and beyond Koutiala, Mali.

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