Accelerating Health Service and Data Capturing Trough Community Health Workers in Rural Ethiopia
A Pre-requisite to Progress

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Abstract: Community based health service is escalating in many developing countries as a means to fulfill health related millennium development goals. Community health workers provide primary health care, and collect and compile health data in collaboration with different actors. This collaboration requires knowledge communication. An interpretative case study was conducted in Ethiopia to understand the knowledge communication across boundaries. Using transfer, translation and transformation framework of Carlile, this study discuss how knowledge related to the health extension packages is communicated across syntactic, semantic and pragmatic boundaries among health extension workers, their teachers, supervisors, community volunteers and rural households. The study also describes the knowledge brokering role of health extension workers and voluntary community health workers. They interact and negotiate with rural households to facilitate communication of novel knowledge concerning the health extension packages. The study identified impediments that preclude knowledge communication. In order to improve knowledge communication across boundaries and enhance the implementation of health extension packages, it is essential; to formulate apt target for health services, equip health extension workers training schools with essential resources, offer trainings to community volunteers and make available standardized register and report formats at health posts for proper recording and reporting.

1 INTRODUCTION

Community health workers are best positioned to deliver health services at grass-root level as countries around the globe strive to meet the Millennium Development Goals (MDGs) (WHO and Global Health Workforce Alliance, 2010). In addition to health care provision, community health workers are also playing an important role in capturing and communicating the community health data (Otieno, 2012). Information that is available in most developing countries is derived from health facilities, yet most illness and death occur outside the health system. Presently, community health workers are providing primary health care and collect health status data at the community and household level that helps for informed decisions (ibid). Community health workers have been used to collect health related data in many countries that increases the health coverage, for example, achieving high rates of case detection for

Tuberculosis in Bangladesh (Chowdhury et al, 2009). Although it is emerging, computerization of HIS at all levels in the health care system of most developing countries seems intricate with the existing infrastructure and human resources. Thus, data from the community service sites and primary health care units are currently gathered manually.

This paper draws on empirical findings from Ethiopia, a country striving to improve the health service access and data capturing through salaried community based health workers called health extension workers (HEWs).

In Ethiopia, health extension program is designed to improve the health status of families, with their full participation, using community's skill and wisdom (FMOH, 2005). The main pillars for the health extension program are HEWs. Their primary role is to perform preventive health education to households in their homes. Through close interactions, HEWs improve the implementation of innovative health extension packages by rural

dwellers. HEWs are supported by trained body of voluntary community health workers (VCHWs), who are members of a given community and they volunteer to support HEWs.

Health care is a dynamic discipline whereby new procedures, practices and treatments are introduced very often, which demand in-service training, mentoring and knowledge communication. Nevertheless, providing in-service training for entire HEWs will not be an easy for resource constraint country like Ethiopia. Studies also indicated that knowledge communication among the public health actors is a challenging process. For instance, a study conducted with the premise of target setting procedure for immunization service in Ethiopia has showed the gap between target given for health services from districts to health posts (HEWs) and head counted population by HEWs (Damtew and Kaabøll, 2011). This gap created confusion and lack of common understanding between HEWs and the health authorities. The effort to scale-up the innovative health extension packages requires close interaction and negotiation between HEWs and rural households. Moreover HEWs interact with their colleagues, supervisors, VCHWs and traditional birth attendants (TBAs) that require knowledge communication.

In this study, the knowledge transfer, translation and transformation (the 3-T) framework by Carilie (2002; 2004) was used to understand the knowledge communication across boundaries in day-to-day practices of community health workers. In this framework the author revealed that communicating knowledge across three progressively complex types of boundaries— syntactic (structure), semantic (meaning), and pragmatic (practice) — requires different processes that include transfer, translation and transformation. In this framework, four characteristics, which facilitate effective boundary process and knowledge communication, are specified. These characteristics include---establishes a shared language; provides a concrete means of specifying differences and dependencies; facilitates the way for jointly transformation of knowledge and enable multiple interactions. This framework helps to analyze the knowledge communication process across boundaries in the public health sector. In this case, knowledge communication or sharing refers to the way HEWs along with their teachers, supervisors, colleagues, VCHWs, TBAs, and the community transfer, translate and transform their knowledge while performing their day-to-day activities.

Different researchers also mentioned that knowledge brokering can contribute to innovation and knowledge communication (Hargadon, 2003; Howells, 2006) and it is effective in improving the service quality and decision making (Dobbins et al., 2009). Brokering involves process of translation, coordination, and alignment between perspectives and it promotes interaction. The role of knowledge brokers as intermediaries is widely documented. The broker is constantly seeking knowledge opportunities in his/her immediate environment, capable of introducing promising new innovations (ibid). Brokering knowledge thus means far more than simply moving knowledge—it also means transforming knowledge (Myer, 2010). Knowledge brokering tends to happen in particular locations—in spaces that privilege the brokering of knowledge across boundaries. For instance, Ward, V., House (2009) indicated that individuals were employed to act as "knowledge brokers" and their job was to facilitate the transfer of knowledge between researchers and practitioners in order to improve the health outcomes. Within the same vein, this research identifies the role of HEWs and VCHWs as knowledge brokers in the expansion of the innovative health extension packages.

This research addresses the following two questions; what is the role of HEWs and VCHWs as knowledge brokers to facilitate the implementation of the innovative health extension packages by rural households? And, how can knowledge communications regarding the health extension packages is facilitated across boundaries?

A qualitative case study through observation, interviews, focus group discussion and document analysis was conducted to answer the research questions.

The rest of the paper is organized as follow. In section two, I briefly discuss the literature reviewed. In section three, I provide background of the research context. This chapter also summarizes the research methods adopted for the data collection and analysis. Thereafter, in section four, the findings will be presented. I then provide the discussion and conclusion of the study in section five.

2 LITRATURE REVIEW

2.1 Knowledge Boundary and Communication

This paper deals with the notion of knowledge communication across boundaries between communities. These communities consist of public

health actors from different specialized domain that include HEWs, VCHWs, traditional birth attendants (TBAs), health managers and rural dwellers. According to Carlile (2004: 2002), the difference in the knowledge domain, dependence (the degree to which people take each other's views into account to meet their goals) and novelty of domain-specific knowledge among people at the boundary determine the complexity of communicating knowledge. Carlile (2004) used an inverted triangle to show how increases in the difference, dependence, and novelty of knowledge between people create three progressively complex boundaries— syntactic, semantic and pragmatic (See figure1).

As shown in figure1, tip of the inverted triangle represents situations where the syntax/language is shared and sufficient, so knowledge can be transferred across the boundary. Knowledge transfer focuses on one-way movements of knowledge or learning from one place to another or from sender to receiver (Argote, 1999; Szulanski, 1996). The major challenge of knowledge transfer is using a communication medium that is capable of transmitting the richness of the information to be conveyed (Daferdst and Lengel, 1984). However, as novelty increases and the gap grow, new differences and dependencies arise that requires a semantic boundary and translation to create new agreements. This necessitates conversation or discourse to share knowledge between actors. Discourse is needed to create shared meanings as way to address the interpretive differences among actors (Carlile, 2004; 2002). Through collaboration, the participants produce common meanings and coordinate local agreement, for instance when co-authors of a paper simultaneously construct meanings of their work and make sense of their interaction.

On the other hand, under conditions of conflicting interests, creating common meanings (translation) may not be possible: what is required is a process in which participants negotiate and are willing to transform their own knowledge and interests to fit a collective domain (ibid). A pragmatic boundary assumes the conditions of difference, dependence and novelty are all present, and requires transforming the existing knowledge.

Differing background and interest of stakeholders who are commonly engaged in similar work may face complex (pragmatic) boundaries to communicate their knowledge that require multiple iterations. This is why the knowledge a group currently uses is such a problematic anchor point when novelty arises across the knowledge boundary. Carlile, (2002; 2004) also identified four

characteristics (see Figure1), which facilitate effective boundary process that include: 1) establishes a shared language to represent knowledge; 2) provides a concrete means of specifying differences and dependencies; 3) facilitates a method in which individuals can jointly transform the knowledge used and 4) the need of multiple interactions. He stated that different combinations of characteristics of a boundary process are required depending on the type of boundary faced.

If a syntactical boundary is faced, only characteristics 1 and 4 are necessary because it is a matter of transferring knowledge through a given syntax. At a semantic boundary, characteristics 1, 2 and 4 are necessary. Here, with some shared syntax and a negotiation on the differences and dependencies, new agreements can be created to reconcile the discrepancies. At a pragmatic boundary, characteristics 1, 2, 3 and 4 are necessary. The current and novel forms of knowledge have to be jointly transformed to create new knowledge. Hence, communicating at more complex boundaries requires the capacity below them. For example, knowledge translation assumes knowledge transfer, and knowledge transformation also requires knowledge transfer and knowledge translation processes.

2.2 Knowledge Brokering

Knowledge brokers can facilitate the knowledge communication by identifying, synthesizing and adapting knowledge for the potential users (Meyer, 2010). Sverrisson (2001) also mentioned that knowledge brokers can be individuals or organizations that facilitate the creation, sharing, and use of knowledge. An important task for the broker is to foster the conditions where the level of acceptance for any action is considerably higher than the level of resistance (Jackson, 2003). This may requires much iteration undertaken over a substantial period of time.

According to Meyer (2010), brokering involves a range of different practices: the identification and localization of knowledge, the redistribution and dissemination of knowledge, and transformation of this knowledge.

The role of knowledge brokers as intermediaries to facilitate knowledge communication is not new (Hargadon, 2003). Over time, this role of knowledge brokers has diversified and has often been adapted to different contexts including the health sector (van Kammen, et al., 2006). The authors discussed the
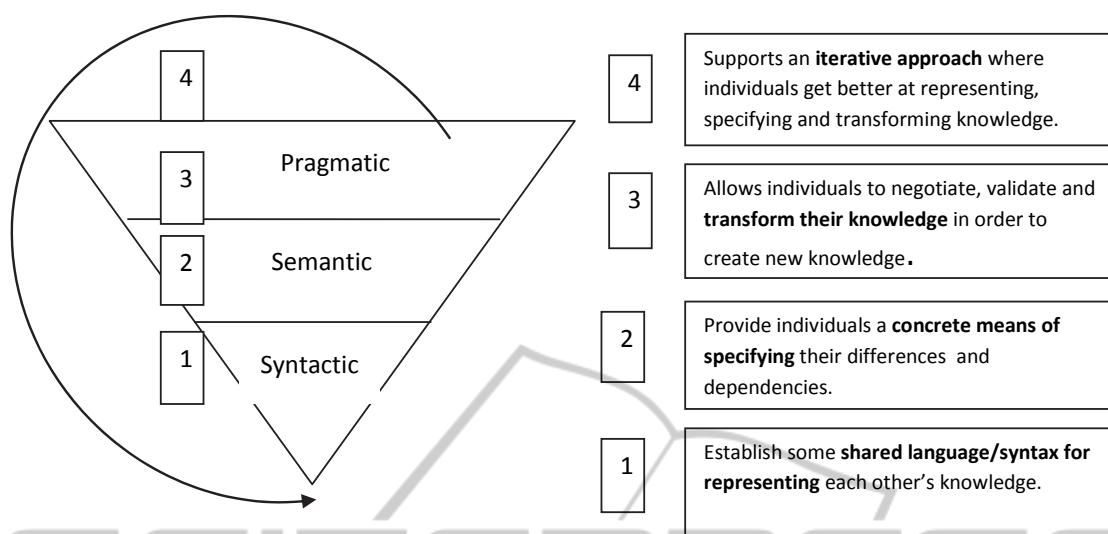
Figure1: 3-T Framework and the four characteristics of a "Boundary Process", adapted from Carlile (2004: 563).

importance of knowledge brokering to develop evidence based health policy. In this context, we want to explore the intermediaries (knowledge brokering) role of HEWs and VCHWs between the source of knowledge (the health extension package) and users of knowledge (the rural community) that may facilitate expansion of the innovative health extension activities.

3 RESEARCH CONTEXT AND METHODS

3.1 Research Setting

The case study site presented in this paper is based in Ethiopia, a developing country located in the horn of Africa. Organizational structure of the health care system of Ethiopia comprises four tiers, primary, secondary and tertiary levels of health care. The first two tiers are the primary health care units consist of health posts where HEWs are deployed and health centers that provide basic curative services. The health extension program in Ethiopia, which this study is focused on, was introduced in 2004. Accordingly, each household is expected to implement sixteen health packages, which could be broadly categorized into four areas--environmental sanitation and hygiene promotion, family health, major diseases prevention and control, and health education and communication (FMOH, 2005). Two HEWs are mostly responsible for a community with about 5,000 populations where about 20 VCHWs

also work in cooperation with HEWs. Households are motivated to practice health extension packages that may lead them to healthy living. According to the HEP national guideline, households graduate within six month after implementing 75% of the sixteen health extension packages.

3.2 Methods

This study employed an interpretive case study approach (Walsham, 2006) with the use of interviews, observations, document analysis and focus group discussion. We have also attended the primary health care unit meeting in one health center. "Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships" (Soy, 2006). A case study was chosen because this approach brings about an understanding of a complex issue hence provide insights in investigating the cooperation and knowledge communication in day-to-day practice of public health actors.

The empirical materials presented in this study were collected during the periods from December 2009 to February 2010 and from June to July 2011. Data gathering was carried out at two HEWs training schools, Amhara region health Bureau, two zonal health departments, four district health offices, and eight health posts. Data were collected by the author and informed consent was sought from each study participant. Interviews were conducted with four HEWs' teachers, nine health managers at regional, zonal and district health offices and 12 HEWs. We also conducted focus group discussions

with HEWs and VCHWs in three villages where each group consisted of five to six participants. Observation helped to get first hand information about the organization of rural health posts, the tools that HEWs using including the registers and health communication support materials. Document analysis was done on various sources such as, working manuscripts, HEWs field note-books and official registers and formats used to collect, analyze, and transmit data.

A research diary was maintained throughout the data collection to document interview notes, observations and ideas raised during the meeting and focus group discussions. Notes taken during data collection were transcribed at the end of the day. The data analysis was interpretative through triangulating data from different sources and some notes were cross-checked with respective respondents. Theoretical concepts that include knowledge boundary, communication and brokering were used to analyze the empirical data. A list of themes were constructed from the data and presented in the finding section as follow;

4 CASE DESCRITION

4.1 The Role of HEWs and VCHWs in Health Service Provision and Data Management

More than 34,000 female HEWs are deployed in rural Ethiopia. They are mainly engaged in creating health awareness and support communities to practice health actions. According to the national guideline of the health extension program, HEWs are supposed to spend 70-75% of their working time on home based and outreach health services provision modalities (FMOH, 2005). This was also confirmed by interviewed HEWs as follow: "*We stay at health posts in the morning and evening...during the day time we go to home visiting and outreach*". Two HEWs are assigned in most visited villages thereby they divided their catchment area into two and conduct their activities. When the number of population exceeds 7500 in a specific village, the district health office deploys three to four HEWs.

Interviewed HEWs noted that, there are VCHWs in each village (*Got*) who usually help them for their duties. As they are working at health post, household and outreach level, HEWs are mostly over stretched in scattered settlement hence they appreciated the help of VCHWs. At the beginning of their job assignment, HEWs collected the baseline health data from their respective catchment villages and prepared map of their localities. In the visited health posts, they have collected data with the help of VCHWs. HEWs, on the other hand, offer formal and informal trainings for VCHWs. They do have monthly meetings, as well as, informal gatherings, which were found to be good media for knowledge sharing. Besides, some HEWs also share experience with TBAs and develop their skill related to managing normal delivery. TBAs give delivery service as most births occur at home in rural Ethiopia. Some HEWs have gained skill on how to assist delivery with the help of TBAs. However, some TBAs were not interested in establishing close contact with HEWs.

While conducting home visiting, HEWs hold some essential equipments and supplies including their ordinary register book which they call "field note-book". HEWs use their field notes for two purposes; for follow-up of the implementation of health extension packages by households and to copy the data captured in the field to a main register for reporting. While providing health services, they record in the field note-book the services they provided, next appointment date and health actions to be performed for the next visit. Afterwards, during the following visit, they check whether households perform the health extension packages based on the given advice. HEWs gather and compile the community health data continuously.

The main registers serve for data recording and preparing monthly and quarterly reports. However, these registers are not standardized thus the data collected across health posts were not consistent and there is redundancy of data elements. HEWs, even within the same district, use different types of formats for reporting that sometimes affect comparison of health facilities performances and constrain experience sharing. With the compiled data, HEWs prepare minimum wall charts with key health targets and indicators and post them on walls of the health posts. They usually use the data to monitor the progress of their services and one can easily look at the profile of their catchment areas at health posts. HEWs discuss with the VCHWs on the monthly performance report and design strategies to improve the health service coverage.

In practice, there are two population data source for the health sector at lower level. One is the official number of population projected based on the national census and the second is head counted by HEWs and VCHWs in their catchment area. In line with Damtew and Kaasbøll (2011), the findings of

this study show that the target for health services given to health posts from the districts is mostly different and higher than head counted population by HEWs and VCHWs. In some visited villages, however, HEWs and their supervisors made effort to resolve the ambiguity created by the discrepancy between the official target and head counted population. They rather follow the notion such as "There should be not unvaccinated infant, no household without pit latrine, and so forth." than being overwhelmed by the inflated target given from district authorities. For instance, to ensure that every child is vaccinated, HEWs and VCHWs search for defaulters in their vicinity and their supervisors also conduct random revisits in selected villages.

4.2 Knowledge Sharing Mechanisms

4.2.1 The Input from Pre-service Training of HEWs

The pre-service training provides basic knowledge for HEWs which helped them to perform their tasks. For example, community health documentation is one course given during pre-service training. Interviewed HEWs mentioned that this course helped them to sketch village maps manually, and to collect and analyze health data. However, in the HEWs training institutions, the proportion of trainees was higher compared to the number of teachers and teaching facilities that challenged the teaching learning process. Scarcity of supplies, such as demonstration materials and standardized data collection tools, and inadequate practical sessions compromised the quality of pre-service training.

Lecturing was the main method of instruction in HEWs training schools, where the role of teachers was offering lecture to trainees. The language barrier was highlighted as a hindrance for transferring knowledge. HEW teachers mentioned that the instructional media is English and most HEWs appeared to lack English language proficiency that preclude them from being fully engaged. Moreover, all books in HEWs training schools library, as well as, some training, and recording and reporting formats were prepared in English. This caused difficulties to HEWs to absorb them effectively. Interviewed HEWs also commented that the pre-service training does not equip them effectively to implement tasks included in the health extension packages.

4.2.2 Knowledge Sharing among Peers

Some additional tasks are shifted to health posts

(HEWs) recently that require additional on-the-job trainings. The FMOH with support from partners has tried to organize and offer complimentary on-the-job trainings for HEWs, such as "clean delivery training and integrated refresher training". Clean delivery training is provided for one month. It is skill based training, which enables HEWs to manage normal delivery, recognize danger signs for early referral and to capture the required information across the continuum of care. They get training at relatively well-equipped health centers and district hospitals, which have better set up compared to rural health posts. For instance, health centers have ready-made register books for delivery, albeit HEWs are supposed to modify bare exercise books, draw lines and write titles to prepare delivery register books. According to our observation, the maternity rooms of rural health posts are also ill-equipped. Integrated refresher training, on the other hand, includes all tasks supposed to be performed by HEWs. It is comprehensive training given for one month in three phases. There are also other on-the-job trainings for HEWs organized by the health sector and other stakeholders, especially when the new health service is initiated at the health post level.

HEWs and their supervisors noted that mostly one of the two HEWs from the same health post attends on-the-job trainings alternatively. Then the other one share the knowledge from her friend. In six of the visited health posts, one of the two HEWs working in the same health post trained on providing clean delivery. The training helps them to offer delivery service and register births as ascertained by the following quote; "*After I received clean delivery training, I can able to identify high risk mothers, manage delivery, give newborn and postpartum care, and register data properly. I also showed the procedure to my colleague. We adapted the delivery register and record all the required information.*" HEW who received in-service clean delivery training.

Similarly HEW at one of the visited health posts who was not trained on prevention of mother to child transmission of HIV/AIDS said; *I did not receive formal in-service training on HIV testing. However, I learned from my colleague who had training and currently I am offering the service in her absence.*

In most visited health posts, the two HEWs work together and interact closely, which created an opportunity for knowledge sharing. They mentioned that they keep materials which were provided from trainings in their health post and use them jointly. HEWs stated that they meet on monthly bases at the

nearest health center with their workmates from neighboring health posts and health center (primary health care unit meeting) and they discuss their monthly performances, constraints and future actions to improve performance based on the service statistics. In some health centers, they organize the meeting with special coffee ceremony that may strengthen the social bond among staff and trigger informal discussion that promote knowledge sharing (see picture1).

Picture 1: Staff meeting with coffee ceremony at Chara health center.

There is also quarterly performance review meeting and experience sharing sessions of HEWs with district health office and health center staffs, as well as, biannual review meeting with zonal health office and annual review meeting at the regional and national level. Other partners may also take part in those meetings. Experience sharing sessions take place during these meetings where best performing districts and HEWs communicate their best practices with their colleagues that may improve performance of the health sector. Experience sharing usually takes place through written reports or oral presentation that may illustrate knowledge transfer. Awards also were given for selected HEWs and districts owing to their good performance. However, sometimes the ambiguity of target set for health services cause tense argument to select best performing health posts and HEWs.

4.2.3 Knowledge Sharing with the Community: The Role of HEWs and VCHWs as Knowledge Brokers

In their day-to-day practices, HEWs discuss, converse and negotiate with households thereby help them to practice health actions and enjoy healthy lives. They play a role of knowledge broker by facilitating knowledge communication between the rural community and the new initiative by the health sector (the health extension packages) through continuous interaction with households. During home visiting, HEWs acknowledge, praise and encourage the family that performed the recommended health activities based on their suggestions. If the household didn't perform the recommended actions, they keep on motivating, demonstrating and negotiating with the household to accomplish the intended task for the following visit. This action is continued until a specific family practiced at least 75% of the health extension packages and graduated. HEWs revealed that some households accept the health advice and guidance promptly and some may implement the health action following their friends or neighbors. However, some households may resist changing thereby continuing the usual way of doing. Some others, on the other hand, may revert back and stop executing healthy practices for themselves and their children. For instance, an interviewed HEW stated; *"There are families who consider "having many children as an asset"; it is difficult to convince them to use contraceptive methods for birth spacing and fertility control".*

Some other families may yet consider traditional practices as best for their family health. Hence, HEWs stressed the importance of continuous negotiation, and the exemplary role of VCHWs to bring the requisite progress in health action. The following excerpts from HEWs illuminate the intermediary role of VCHWs; *When there is a defaulter client for a health service, we inform a VCHW then s/he explains the absentee about the advantage of the service.....converse and negotiate thereby help the defaulters to resume the service.*

There are about 18 VCHWs in our vicinity; their presence helped most households to implement the health extension packages.

Sometimes, the health sector and other partners organize trainings that include VCHWs, thus they propel clients to seek health service. For instance, one VCHW during focus group discussion mentioned *"We received training about community mobilization for HIV counseling and testing service: afterwards we advise pregnant women in our village to take voluntary counseling and testing for HIV before delivery".*

5 DISCUSSION AND CONCLUSION

Our findings showed that HEWs provide basic preventive, promotive and curative health services to

rural households. Capturing and communicating the community health data is also one of the major tasks of HEWs as good health management highly relies on accurate and relevant information to make health services responsive to the demands of the population. Meanwhile, knowledge sharing was taking place during their day-to-day practices. In the pre-service trainings of HEWs, the main mode of instruction was lecture. It was mainly one way of transferring information from sender to receiver, which may fosters knowledge transfer according to Carlile (2004). However, lack of the common syntax between teachers and HEWs due to a language barrier and shortage of facilities affected knowledge transfer process negatively. Lack of discourse because of the language problem also inhibited the knowledge translation and transformation processes. Interviewed HEWs stated that they did not get sufficient knowledge and skill at their pre-service training.

On the other hand, the experience sharing sessions from best performing districts or HEWs to others can indicate knowledge transfer from sender to receiver through shared syntax. This resonates with the knowledge transfer explanations by Argote (1999) and Szulanski (1996). These authors explained that knowledge transfer can occur when, for example, a unit communicates with another unit about a practice that it has found to improve performance. Carlile (2004) explained how transferring knowledge through shared syntax is unproblematic. In this study, experience sharing sessions among the health staff were found crucial for knowledge sharing. The findings of the study also showed that HEWs and VCHWs discuss, converse and interpret the meaning of performance reports thereby create common syntax. They translate the meaning of performance reports in a sense making way to their specific situation. HEWs and their supervisors also make dialogue during meetings and supportive supervisions, and create common understanding. For example, to reconcile the discrepancy created by the difference between the official target and head counted population by HEWs and VCHWs, they discussed and created common syntax such as "there should be not unvaccinated infant" to ensure every child got vaccines. This process requires creating new agreements through dialogue and collaboration across a semantic boundary.

In their day-to-day practices, the two HEWs assigned in the same health post interact with each other thus share knowledge. They bring new concepts and knowledge from in-service trainings,

and they converse each other and negotiate to create syntactic, semantic and pragmatic understanding among themselves. This may require changing of the knowledge they currently use. For instance, after taking clean delivery training, HEWs disregarded the previous register for delivery and prepared new register based on the new knowledge they acquired from the training.

According to Carlile (2002), the knowledge a group currently use may create problem when novelty arises. In our study, the rural households may have their own knowledge and ways of doing to keep their family health, for instance, they may follow traditional practices. The innovative health extension package is a new initiative designed by the health authorities to improve health status of rural dwellers. The finding of this study showed the knowledge that households used preclude them to practice new actions in the health extension packages. HEWs and households are specialized in different knowledge domains and they have many dependencies in completing a task, hence the boundary is complex (pragmatic). The dependencies between HEWs and households happen from the need of their joint input to implement the health extension packages. HEWs facilitate the implementation of the health extension packages by full participation of the rural households. As (Carlile, 2004; 2002) put it, communicating knowledge between people with different knowledge domain and high dependency face pragmatic boundaries that require close interaction and negotiating of conflicting interests. Therefore, it was not easy to transform the existing knowledge of the rural community to accommodate the new health initiatives.

In summary this paper has addressed processes of communicating knowledge related to the health extension packages and the community health data, across syntactic, semantic and pragmatic boundaries among public health actors in the context of a developing country. From the case description, it can be concluded that knowledge communication of HEWs with their teachers, peers, VCHWs, TBAs, supervisors and the community needed different processes. For example, experience sharing sessions during meetings denoted knowledge transfer through shared syntax. HEWs made dialogue with VCHWs and their district supervisors thereby created shared meanings across semantic boundaries. Pragmatic boundaries were faced between HEWs and rural households because of the difference in their domain specific knowledge and high dependency to accomplish the task related to the health extension

packages. This needed close interaction and negotiation to transform the current knowledge of rural households.

The findings also showed that some households slip-back from implementing new ways underlining the need of further research to identify the reasons to sustain the required change and improve the health of the community.

The research questions outlined in the introduction section are addressed as follow;

1. What is the role of HEWs and VCHWs as knowledge brokers to facilitate the implementation of the innovative health extension packages by rural households?

HEWs continuously communicate the new knowledge (health extension packages) with households. They repeatedly converse, negotiate and renegotiate with households to influence them to transform their current knowledge and practice. Their efforts continue until the families accept the advice and implement the health initiative. Meanwhile, the undertaking of HEWs to advance knowledge communication across pragmatic boundary was intensified by the efforts of VCHWs. Both HEWs and VCHWs can take the role of knowledge brokers who are facilitating the communication and use of knowledge regarding the health extension packages. As to Sverrisson (2001), they facilitate knowledge communication and use between the source of knowledge (health extension packages) and potential users (rural households). New health services are introduced to rural Ethiopia and as novelty increases, the gap at the boundary grows (Carlile, 2002). Meanwhile, the knowledge brokering role of HEWs and VCHWs will continue to close the gap that emerged as a result of novelty.

Theoretically, the study contributes to the 3-T framework (Carlile, 2002; 2004) by identifying the role of HEWs and VCHWs as knowledge brokers that strengthen the four characteristics of a boundary process: establishes a shared language; provides a means of specifying differences and dependencies; facilitates jointly transformation of knowledge and multiple interactions. The knowledge brokering role of HEWs and VCHWs was noticeable throughout the four characteristics of a boundary process. They make dialogue and multiple interactions with households thereby help the families to transform their knowledge and follow the new health initiatives in the health extension package.

2. How can knowledge communication regarding the health extension package be facilitated across boundaries?

The findings of this study have shown the knowledge communication process across boundaries in the efforts of expanding the health extension packages, and capture and compile community health data. The study also identified constraints that preclude knowledge communication across syntactic, semantic and pragmatic boundaries. For instance, shortage of resources and language barriers has affected the knowledge transfer process at HEWs pre-service trainings. The obsolete target also imposed a challenge on sharing and multiplication of good experiences during meetings. The collaboration and social network were also hindered by lack of confidence and interest as seen by absence of communication between HEWs and some TBAs. The following recommendations are proposed to facilitate the implementation of the health extension packages and to make the context more conducive to knowledge communication;

Provide Essential Resources to HEWs Training Schools; HEWs training schools should be equipped with essential teaching facilities to facilitate the teaching-learning process.

Appropriate Target Setting Procedure; there is a need to follow apt target setting procedure for health services to increase understanding among the health staff and other stakeholders.

Availability of Standardized Data Collection Tools; appropriate supplies and standardized data collection tools should be made available at health posts for proper recording and reporting.

Training for Community Volunteers; providing training to community volunteers (VCHWs and TBAs) is required for boosting their confidence and work motivation that increase service coverage.

While the analysis of this study has been drawn from the findings of the public health sector in Ethiopia, the study has also broader implication for other disciplines and contexts where knowledge sharing is crucial. Therefore, more comprehensive studies are recommended in different settings to strengthen the findings of this study.

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