Journal of Health Informatics in Developing Countries

www.jhidc.org
Vol. 6 No. 2, 2012

Submitted: May 23, 2012 *Accepted: November 3, 2012*

Contradictions in Collecting and Recording Maternal Health Data at the Community Level: A Case study from two Districts in Tanzania

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Abstract. The objective of this study is to improve completeness, accuracy and timely reporting of maternal health data in the health information system. This will improve the availability of reliable data for making appropriate decisions, planning and interventions. We aim at recording new knowledge on how to improve the collection and recording of maternal health data at the community level. To do so we underscore what hinders community health workers from collecting, recording and reporting of maternal health information by drawing on the concept of contradictions from Activity Theory. The results indicate manifestations of contradictions through double binds, dilemmas, critical conflicts and conflicts hindered the activity of data collection and recording. The resolution of these contradictions is perceived to be a springboard for improving reporting of the data.

Keywords. Work practices, activity theory, community health workers, contradictions, maternal health data

Introduction

In sub-Saharan countries, there is under-reporting of maternal health data and poor indicators of maternal and child mortality (1, 2). Under-reporting has been pointed out to be prominent in places where most women deliver at home assisted by traditional birth attendants (3-6). For instance, in Tanzania, 46-60% of births are conducted by traditional birth attendants (7, 8). Like most developing countries, Tanzania is challenged to meet the Millennium Development Goals (MDGs) 4 and 5 which aim at reducing maternal and child mortality. These goals are measured against the number of live births, many of which are not reported. This is where our focus is, to promote reporting of information made on delivery outcomes both for the baby and the mother.

Community health workers will necessarily play a central role in adding community data that is collected outside of the health facilities. By reporting data on

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clients who do not seek services in health facilities, births that take place outside of the health information system could be reported through community health workers.

This study will elaborate the underlying causes of the problem of under-reporting of maternal health data from the community level by focusing on the work practices of community health workers. To do so we draw on the concept of contradictions to elaborate the manifestation of under-reporting. These contradictions are not "observed directly", but they are "identified through their manifestations" (9).

Data Collection and Recording at the Community Level

In their study, (10) indicate that, in Tanzania most of the maternal health data collected at the community level by VHWs and TBAs was not reported to the district level. This under-reporting was led by provision of unreliable support, supervision and feedback from district health managers and health facility workers. Similar studies in Malawi (11) and Ethiopia (12), indicate that most of the data collected at the community level is incompletely reported to the health facility.

In Malawi, through household visits, community health workers collect data on vital events such as deaths, births and other population variables, and disease outbreaks. The collected data is reported to a health facility. The community health workers were challenged by work overload, long distances to travel to households, and large populations to be covered (11). These variables constrained the completeness and accuracy of data.

In Ethiopia, at the community level, data are also collected by community health workers. In this context, community health workers provided services through household visits and at a health post (the lowest health administration unit). Services provided include family planning, provision of anti-malaria drugs and first aid. In Ethiopia, community health workers were also challenged by long distances between the health posts and remote households to collect data and to send reports to the district office. These issues led to questionable reliability of data collected at the community level (12).

In this regard, studies from developing countries' contexts indicate that the completeness and accuracy of data collection and recording at community level has been constrained by factors such as; management issues (10, 13, 14), health policy and politics (11) and infrastructure (12). This study explores the work practices of community health workers in the activity of data collection and recording so as to understand what is hindering them in performing this activity. This knowledge will be useful in designing solutions/practices that will improve reporting of maternal health data from the community level. This knowledge can be useful in addressing the problem of under-reporting in similar contexts.

1. Activity Theory: A Framework to Understand Human Activity

Activity Theory is based on the fact that, the basic unit of analysis is the human activity. According to Engeström (15), a human activity contains components such as *subject, object* and *tools/instruments, rules, community, division of labour* and *outcome*. Between and within these components, there is an ongoing construction, negotiation, tension and there are multiple voices and viewpoints (16).

The *subject* represents "who is involved in the activity?" The *object* answers the question "why is the activity taking place?" The *object* can be tangible (plan, report and recorded data) or intangible (idea). *Tools* represent the means used by *subject* to perform the activity. *Tools* can be physical artefacts (register books, computers, mobile phones, and harmer), skills (medical, reading, writing skills), language, culture etc. *Rules* represent a set of conditions that determine how and why individuals may act. *Community* is the environment in which the activity takes place. *Division of labour* is the allocation roles among *subjects* and members of the *community*. O*utcome* represents the desired result for carrying out the activity.

According to Leont'ev an activity has a collection of actions with a shared *object* and each action has a goal/motive (17). Kaptelinin & Nardi define this motive as "the object which stimulates, excites the subject" to attain something, "however, human activities are not directed straight toward their motives" (18). In performing actions, individuals are always directed towards motivating goals (objects that attract them) and directed goals (objects at which their activities are directed for instance by higher authority). *Subject(s)* may develop a complex relationship between different and/or conflicting motives. Eventually, incompatibilities among motives may create tensions that can lead to neglection of all actions to be performed and the "activity may face a breakdown".

1.1. The Concept of Contradictions

Contradictions can be denials, conflicts or inconsistencies that manifest themselves within and between components of an activity system that interfere the flow of work. Understanding contradictions in an activity system is important in pointing out weaknesses/threats and eventually direct possibilities for change/improvement or transformations in work practices (19-21). In analysing contradictions, (9) propose a model of four types of discursive manifestations of contradiction; double bind, dilemma, critical conflict and conflict.

Double binds are "processes in which actors repeatedly face pressing and equally unacceptable alternatives in their activity system, with seemingly no way out". For example, when a *subject* is forced to perform an activity with the absence of necessary *tools*. Dilemma is "an expression or exchange of incompatible evaluations, either between people or within the discourse of a single person". Critical conflicts are "situations in which people face inner doubts that paralyze them in front of contradictory motives unsolvable by the subject alone". And conflict "take the form of resistance, disagreement, argument and criticism". This study will elaborate how the activity of data collections and recording unfolds within these manifestations of contradictions.

The concept of contradictions has been used in different studies as a way of analysing problems/hindrances in the flow of work (20, 22, 23). In their study of health care organisation in Zanzibar, (22) used the concept of contradictions to elucidate complex work practices in activities of designing and implementing information systems. Engeström (20) used the concept of contradictions in re-organising work in children's hospital to uncover things that hindered the flow of work between different parts of the hospital. To understand the role of information sharing in a large-scale implementation of e-learning, (23) also used the concept of contradictions. In these studies, the concept of contradictions has guided them to unpack complexity of ideal systems, which gave way on directing a change.

2. Research Context and Methodology

2.1. Research Context

This is an ongoing study in Kibaha and Bagamoyo districts in the Coastal region of Tanzania. The provision of health care services in Tanzania goes hand in hand with data collection and reporting whereby the health care structure is divided into four levels; the community, district, regional and national level. In the district, region and national levels, services are provided by medical professionals.

At the community level, which is the focus of this study, preventive health care services are provided by non-medical professionals. These are village health workers (VHWs) and traditional birth attendants (TBAs), collectively known as community health workers. Each VHW serves at least 150 to 200 households and they report to the village government and a health facility in their village. TBAs assist women in delivery at home and they are regarded as private practice in the community. One village can have three to ten TBAs. Both TBAs and VHWs provide these services as volunteers.

2.2. Research Methodology

This paper presents a qualitative case study conducted in Tanzania from November 2009 to April 2010. The case aims at understanding the nature and complexity of work practices of TBAs and VHWs around collection, recording and reporting maternal health data. We chose a case study to get closer to TBAs, VHWs, health facility workers and health managers' perspectives in order to get answers on how and why certain events occur (24). This approach has been used in other studies (11, 12, 22) in similar contexts to get deeper understanding of complexities around data collection and reporting.

2.2.1. Data Collection

Interviews

Interviews were conducted between January and March 2010 to 6 VHWs, 7 TBAs, 2 health facility workers and 3 district health managers. VHWs were interviewed in groups of two to three using semi-structured questions. Individual interviews were conducted with TBAs where the questions were also semi-structured. These interview sessions took an average of thirty minutes each, they were recorded on a voice recorder, and transcribed thereafter.

Individual interviews were conducted to health facility workers whereby semi-structured questions were used. These interviews were informal because it was difficult to fit in the tight schedule of health facility workers, so we would pop-in during break times or after work and ask a few questions then continue some other day or time. The district health managers were also interviewed informally with semi-structured questions.

Observations

The aim of conducting observations was to understand activities taking place in the everyday setting in collecting and reporting maternal health data. Through observations we captured what people were doing that they did not tell in interviews. We played a

role of outside observers and participant observers. Observations were also made while conducting interviews and attending training sessions.

Document Reviews

To further improve the richness of data collected in interviews and observations, this study reviewed several documents. Documents reviewed at the district were epidemiology reports, country demographic surveys and ministry of health curriculums for training community health workers. In the health centre we reviewed data collection register (5 Reproductive and Child Health registers) and reports (Monthly and Quarterly reports from January to December 2009). In the community, data collection tools used by TBAs and VHWs, and village register were reviewed.

2.2.2. Data Analysis

In this study data were analysed through data reduction, data displays and verifications as described by (25). Using this method, the voice recorded information was transcribed into written transcripts together with information gathered during observations. From the transcripts, different categories on the data were identified. Then themes and trends emerging from categories were identified using the activity theory concepts. Using the theoretical concept of activity systems (15), we elaborated its individual components (*subject, tools, object, rules, division of labour and community*). The concept of contradictions (9) was also used to analyse manifestations of contradictions within components of the activity systems. Then data displays that elaborated the activity of data collection and recording, and manifestations of contradictions therein were created. Finally the data displays helped us to draw conclusions from the data collected.

3. Work Practices at the Community Level

3.1. TBAs' Activity System

TBAs conducted deliveries and they were supposed to record the outcomes of the delivery, and condition of the mother and the baby. Table 1 presents a description of the TBAs' activity system.

Table 1: TBAs' Activity system

Component	Description	
Subject	A group of TBAs	3 to 10 in one village
Object	Record of delivery information for supervision/investigation	Motivating goal - to gain income and reputation from their society
		Directed goal - to have records on deliveries conducted
Tools	Delivery Registers	2 out of 20 did not have the register
	Reading and writing skills	6 out of 7 could neither read nor write
	Medical skills	- Modern skills – acquired through training - Traditional skills- acquired through apprenticeship
Community	VHWs	Helped TBAs to record deliveries and perform further follow-up
	Health facility workers	Trained TBAs when they brought women with complications to the health centre
	TBAs' Coordinator	Never collected data from TBAs delivery registers
Rules	TBAs conduct emergency deliveries, must record all deliveries conducted, and must report these deliveries immediately to a health centre	Most TBAs did not adhere to these rules
	TBAs' Coordinator must provide support and supervision at least once every quarter	Provided support and supervision at least once in a year or in two years. This was due to shortage of budget to travel long distances from the district to the TBAs' homes
Division of labour	-TBAs record deliveries they conduct, inform health facility workers on deliveries conducted and share observations with VHWs -TBAs' Coordinator collect data from TBAs' delivery registers, and provide support and supervision to TBAs	These roles were either not fulfilled at all or they were incompletely done

TBAs with no reading and writing skills sought help from VHWs, their relatives and children or anyone to help them record deliveries. However, one TBA was skeptical about using health facility workers to record deliveries for them because of the experience she encountered. She said,

> "I never got back my register when I brought it to the health facility worker to record a delivery I conducted"

Health facility workers as members of the *community* were expected to ensure that TBAs did not conduct deliveries at home. However they were not able to control what TBAs can and cannot do. On other occasions, health facility workers blamed the TBAs for bringing women to the health centre when they were in critical conditions to avoid being blamed for either the death of the mother, the baby or both. We also observed that TBAs that conducted many deliveries were not collaborating well with health facility workers.

3.2. VHWs' Activity System

VHWs, provided services such as; family planning, integrated management of childhood illness, home based care, mobilisation and monitoring immunisation, reporting maternal and child deaths to the health facility, and reporting disease outbreaks. Table 2 presents an illustration of the VHWs' activity system.

Table 2: VHWs' Activity System

Component	Description	
Subject	A group of VHWs	2 in each village
Object	Records for reporting and follow-up	Motivating goal - to gain reputation from their society
		Directed goal - to record and report data
Tools	Note books	Un-standardised – lead to no uniformity on recorded and reported data
	Reading, writing and basic mathematics skills	All VHWs possessed these skills
	Medical skills	Inadequate
	Mobile phones	Each owned one
	Pen, pencil, ruler and calculators	Inadequately supplied
	Bicycles	Not all had a bicycle
Community	TBAs	Share findings with VHWs for the purpose of recording and following-up
	Health facility workers	Collaborated with VHWs on following-up mothers and children
	VHWs' Coordinator	Inadequately coordinated support and supervision of VHWs' activities and provision of resources (transport means, stationeries and financial)
	Village government	Poorly collaborated with VHWs to update the village register
	Vertical programmes	Worked with some VHWs in collecting and reporting data and provided them with necessary resources
Rules	VHWs collect data on women from pregnancy up to 42 days after delivery and on children from birth until 5 years, and must submit monthly and quarterly reports to the health centre	Most VHWs did not adhere to these rules because of a large number of households to visit and no motivation for doing so
	Health facility workers must provide support and supervision at least once every month	Provided support and supervision when necessary
	VHWs' Coordinator must provide support and supervision at least once every quarter	Provide support and supervision at least once in a year or in two years
Division of labour	-VHWs perform households visits, collect ad-hoc data from the village, prepare monthly and quarterly reports and submit them to the health centre, and gather observations from TBAs - VHWs' Coordinator and health facility workers provide feedback, support and supervision to VHWs	These roles were either not fulfilled at all or they were incompletely done

VHWs indicated that medical skills enable them to conduct medical observations on mothers and children, also to understand what is recorded by medical professionals in mothers' and children's clinic cards. However, VHWs claimed to have inadequate medical skills. As a result, they encountered difficulties in collecting medical information from mothers' and children's clinic cards, and interpreting it accurately so as to provide appropriate services.

As depicted in Table 2, VHWs used mobile phones to communicate with the health facility workers on requesting directives for conducting diagnosis on mothers/children when something out of the ordinary was observed, reporting their findings when they could not go physically to the health centre. Health facility workers also distributed tasks to be done over mobile phones, for example a need to follow-up on a certain woman/child. Furthermore, findings indicate that inadequate supply of stationeries and transport means led to portions of necessary data on maternal and child

health to be incompletely collected by VHWs, especially those who did not receive support from vertical programs.

The village government, as a member of the *community,* was supposed to receive quarterly reports from VHWs based on births, deaths and other environmental issues which were recorded in the village register. Findings indicate that the village government did not receive any reports relating to mother and child health from VHWs and the village register was last updated in the year 2003.

The activity system of VHWs indicate that, they did not have the necessary tangible tools, skills, means for travelling to reach remote households and a standard for receiving incentives for providing the services to the community. To collect and report mother and child health data, VHWs felt that their role was not recognised because they hardly received any motivation. However, they felt honored to work for their villages despite of all the neglections. One VHW commented that:

> "The last time I was paid was two months ago when we were distributing mosquito nets for under five children in every household. However, I feel obliged to work for my village"

4. Manifestations of Contradictions in Collecting and Recording Data

In the activity systems of TBAs and VHWs, findings indicate the presence of multiple viewpoints between TBAs, VHWs, health facility workers, district health managers, village government and vertical programs. Findings also indicate that TBAs and VHWs were collecting and recording maternal health data with two conflicting goals, motivated goal and directed goal. These complex relationships created contradictions that were manifested through double binds, dilemmas, critical conflicts and conflicts. This section presents further analysis and discussion of the findings.

4.1. Double Binds

In this study, double binds as unacceptable alternatives that faced *subjects* (TBAS and VHWs) and left them no way out in collecting and recording data were identified. Analysing the history of the *tools* used, we identified how they led to impossibilities in collecting and recording the data.

TBAs who did not have registers could not collect and record deliveries. Also TBAs who depended on other people around them to record for them, when no one was found, no deliveries were recorded. Although the action of conducting delivery was accomplished, the action of recording deliveries was not done in most cases.

In the VHWs' activity system, the use of un-standardised registers created no coordination of the data collected and reported by VHWs. Even though VHWs had recorded data for reporting, they could not assure its completeness. With the usage of un-standardised registers, VHWs were facing a double bind whereby the *tools* they used made it impossible to accomplish their roles and to attain *object* of the activity.

Findings also indicate that VHWs had little skills on medical data collection and recording and further analysing data so as to make proper follow-up on mothers and children. This made it was impossible to collect complete and accurate information where they were supposed to observe medical conditions. In such cases, the *object* of having recorded data for follow-up was either not attained at all or it was attained

halfway. Also with poor medical skills VHWs encountered difficulties in performing their roles of collecting data and preparing reports.

Furthermore, findings indicate that VHWs did not receive adequate stationery facilities, transport means and necessary incentives to support them in performing household visits. Working in this condition, VHWs constantly faced difficulties in performing their roles in the *division of labour* and attaining the *object* of the activity.

According to (18), when an individual cannot attain a desired motive, "the activity does not have a direction until the object of an activity is defined". In this case, the directed goals could not be attained and eventually the *object* of the activity became ineffective. Even though TBAs and VHWs' own goals were attained, the activity of data collection and recording was facing a break down. According to (9) double binds can be resolved through transformative and collective action and not by an individual alone. Similarly in this case, findings indicate that double binds could not be resolved by TBAs and VHWs alone. There is a need of a collective effort especially from the district managers to provide adequate supply of the *tools* (register books, skills, stationeries, transport means and incentives) necessary to enable data collection and recording.

4.2. Dilemmas

These are situations that faced TBAs and VHWs in moral reasoning about whether to engage in the activity of recording and colleting data or not. Findings indicate that TBAs were forbidden to conduct deliveries unless it was an emergency. This rule contradicted itself given the nature of the context where there are long distances between the women's villages and a nearby health facility, inadequate availability of health facility workers and equipments in health facilities and unpleasant attitudes of overworked health facility workers. These issues forced many women to seek delivery services from TBAs and as a result most TBAs found it intolerable to keep the *rules* because they were helping a woman even though they were breaking the law.

TBAs also considered conducting deliveries as a source of income because they received some form of payment from the mothers after providing their service. At the same time, TBAs were bound by the *rule* of conducting emergency deliveries only then record and report them to the health centre. This *rule* enforced TBAs to be accountable on how many deliveries they recorded in their registers. With the fear of raising an alarm on their reputation when they recorded many deliveries, TBAs were in constant dilemma between helping a woman and gaining income or recording deliveries. This led to neglecting recording of non-emergency deliveries for the sake of helping women and/or gaining some income.

VHWs are voluntary health workers who did not receive a salary. At the same time, VHWs wanted to keep their identity in the community by providing services to the people. Also VHWs were bound by the *rule* of presenting monthly and quarterly reports to the health facilities and village government. In this manner, they faced a dilemma because they were desperate to get salary, which they did not, while there was a *rule* enforcing them to present monthly and quarterly reports.

This study indicates that the manifestation of dilemmas encouraged TBAs and VHWs' to choose to perform actions with motivating goals over the actions with directed goals. According to (9), dilemmas cannot be resolved but rather reproduced through denial or reformulation. This study indicates that dilemmas can be resolved by translating the directed motive for performing actions to a motivating goal. TBAs and

VHWs can be motivated to record deliveries by rewarding them for doing that instead of ordering them to record.

4.3. Critical Conflict

These are reactions that emerge when a *subject* creates a feeling of being neglected. Findings indicate that when TBAs and VHWs felt that they were neglected and no one cared about what they were doing for their society, critical conflicts emerged and the activity of collecting and recording data paralysed. Findings indicate that the health managers and health facility workers provided TBAs and VHWs inadequate and irregular support and supervision, and little meaningful feedback. According to (26), it is important to provide meaningful feedback to data collectors because "they will begin to appreciate the value of data and will therefore take appropriate steps to improve the quality and timeliness of the data".

According to (9), critical conflicts can be resolved by "finding new personal sense and negotiating a new meaning". This study suggests that a new meaning for improving recording and collecting maternal health data can be created among health managers, TBAs, VHWs and health facility workers. Health managers and health facility workers have to realise the contribution of TBAs and VHWs in both reducing maternal and child mortality and improving reporting of maternal health data. This realisation will encourage them to provide support, supervision and feedback to TBAs and VHWs and thus improve reporting as also suggested by (26).

4.4. Conflict

Conflicts are interferences of actions among *subjects* and /or *community* members that create contradictions. Findings of this study indicate manifestation of conflicts between health facility workers and TBAs when TBAs brought women to the health facility for delivery with critical conditions. In this situation health facility workers described that TBAs failed to help the women and were afraid to be blamed for their death or the death of the baby so they refer the women in critical condition which could be too late to be handled by health facility workers. In such situations a TBA's register was taken by a health facility worker and never handled back to the TBA. This conflict led to further neglecting of reporting deliveries from the TBA.

In the manifestation of conflict, this study indicates that the motivated goal in the TBAs actions took preference over the directed goal. The consequences may have not only jeopardised recording of the data but also the lives of women and children attended by the neglected TBAs. Findings suggest that this conflict can be resolved by finding a compromise that will open up communication among TBAs, VHWs, health facility workers, women and village members. Health facility workers need to strengthen their communication ties with TBAs on what should be done, when and how in order to save lives of women and children. Also opening up communication between VHWs, TBAs and mothers together with other members in the village on handling emergency deliveries by defining who should be notified, when and how.

Complementing with the work of (6) who argue that, the use of mobile phones will enhance communication between community health workers and health facility workers and improve collection and reporting of maternal health data. There is a need of first understanding contradictions that hinder data collection and recording. This study has shown that they are intertwined in the daily practices of community health

workers. This understanding can guide creation of solutions that will re-orchestrate multiple voices in the activity of data collection and recording as a way of improving under-reporting of the data. Whereby introducing the use of mobile phones is part of the solution.

5. Conclusion

This study has indicated a need for redefining *object* of the activity systems of TBAs and VHWs in collecting and recording maternal health data. We therefore recommend that, to improve reporting of maternal health data at the community level, one needs to understand how the data are collected and recorded through the identification of contradictions that manifest therein. These can be identified through understanding the history of the *tools* used, *rules* enforced and organisation of roles in the *division of labour*.

The acknowledgement and hence resolution of contradictions can lead as a stepping stone in designing a solution for identified weakness in the system. This study has indicated that the manifestation of double binds can be resolved by a collective effort between the district managers, and TBAs and VHWs whereby district managers should ensure provision of adequate supply of tools necessary for data collection and recording. Dilemmas can be resolved through reformulating motives of TBAs and VHWs by rewarding them to record deliveries instead of ordering them to record. Critical conflicts that crippled the activity systems can be resolved when health managers and health facility workers appreciate the contribution of TBAs and VHWs in improving recording and collecting maternal health data. Conflict can be resolved by strengthening communication ties among TBAs, VHWs, health facility workers, women and village members on how to disseminate information, who to be contacted, when and how.

This work is relevant for developing countries because it addresses issues of under-reporting of data which are critical in the health information systems as stated in previous studies (3-6, 11, 12). In addition we propose another way of understanding the problem by exploring conditions that lead to the presence of double binds, dilemmas, critical conflicts and conflicts that are contextually grounded in the work practices of community health workers. We also propose ways of resolving these contradictions as a collective effort between the community health workers, health facility workers and health managers.

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