A process evaluation of a complex health systems intervention to improve the payment and distribution of health workers: the need for systems thinking and an adaptive, politically-informed approach

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EXECUTIVE SUMMARY

Background: In the Democratic Republic of Congo, only a minority of public sector health workers receive a government salary due to an outdated payroll system, and workers are inefficiently distributed in facilities. A complex intervention to update information on human resources for health has been piloted in the two Kasai provinces in order to address these two issues. This paper aims to investigate the implementation process, exploring the degree to which the planned intervention was adhered to, and any contextual factors which may have moderated implementation.

Methods: The process evaluation took place between October 2014 and March 2018, and examined implementation fidelity of the complex intervention using an adapted conceptual framework. A theory of change was also developed for the intervention which informed data collection. Data were collected through document reviews and in-depth interviews with key informants at different periods during the intervention.

Results: Despite the challenges associated with working in a fragile state, full coverage of the intervention was achieved. Most of the component interventions described in the initial theory of change were carried out as intended although some adaptations had to be made. Participant responsiveness and context were key moderators of the intervention, with many activities being significantly delayed as international health partners had not taken into account the wider public institutional system and the influence of certain key government stakeholders.

Conclusions: This study has highlighted the need to apply a politically-informed systems thinking approach to evaluating complex health systems strengthening interventions. Such interventions necessitate an adaptive approach given the dynamic nature of the system within which they occur. Other approaches such as social network analysis may offer suitable alternatives to evaluating similar complex health systems interventions. There is also a need for more guidance for researchers on how best to assess and measure context for these types of interventions.

Abbreviations used in the document

ASSP Accès Aux Soins de Santé Primaire/Access to Primary Healthcare

DFID Department for International Development

DRC Democratic Republic of Congo

iHRIS Open-source Human Resources Information System

IMA Interchurch Medical Assistance Worldhealth

ToC Theory of Change

WISN Workload Indicators of Staffing Need

INTRODUCTION

Financial compensation significantly influences the motivation and performance of health workers (1-4). However, in fragile and conflict affected states such as the Democratic Republic of Congo (DRC), the government struggles to effectively pay its public sector health providers. A system failure of this kind may have several causes: inadequate budget for salaries, inaccurate payroll information, logistical challenges, corruption, and weak leadership and governance being a few (5). Unreliable salary payments can lead to government health workers depending on other income sources, which may include: user fees, illicit fees, and private practice (6). Another consequence of the unpredictable payment of workers is the inefficient distribution of workers, culminating in a shortage of health professionals in areas where income-earning opportunities are low, but an oversupply in other areas (7).

In an effort to maintain health service delivery, donors have invested heavily in Performance-Based Financing (PBF) (8-10). A key aspect of PBF is that it involves the transfer of funds based on providers attaining a pre-defined level of performance (11). In a context where only a minority of health workers receive a salary from the government, PBF becomes a key source of income for health workers, in part substituting salaries. Yet, as PBF is often externally financed over a limited time period, it can only serve as an interim measure. Ensuring the effective payment of government salaries is the longer term sustainable solution.

Improving the government payroll in a fragile and conflict affected state is challenging for several reasons, including: coordination problems as different ministries are often responsible for managing various aspects of payroll reform; resistance from those benefiting from misdirected public resources; and a lack of a robust information system on public sector workers. With respect to the latter, in the DRC, the government payroll is known to be plagued by "ghost" or fictitious workers, which are people listed on the payroll to receive a salary but who are not currently practicing (9, 12). This occurs due to an inability to regularly update the payroll so many workers registered on it have either left the country, retired or died. Corruption may also permit the proliferation of unofficial appointments. Furthermore, the dearth of information on the distribution of workers not only hinders workforce planning but leads to inefficiencies in health care delivery.

Previous evaluations of interventions to reform civil service pay and the distribution of health workers have been reported as case studies (5, 13) with a focus predominantly on outcomes rather than the processes involved in implementing interventions (14). This "black box" approach fails to explain how and why the intervention had certain effects, and limits understanding on how to successfully replicate such programmes in a different setting (15-17). Process evaluations, on the other hand, can determine to what extent the intervention was implemented as intended and factors affecting implementation, which may inform replication elsewhere (18-20).

A recent paper described how the establishment of a human resources information system helped to improve the payment of government health workers in the DRC (21). It predominantly focussed on the implementation and outputs relating to the technical elements

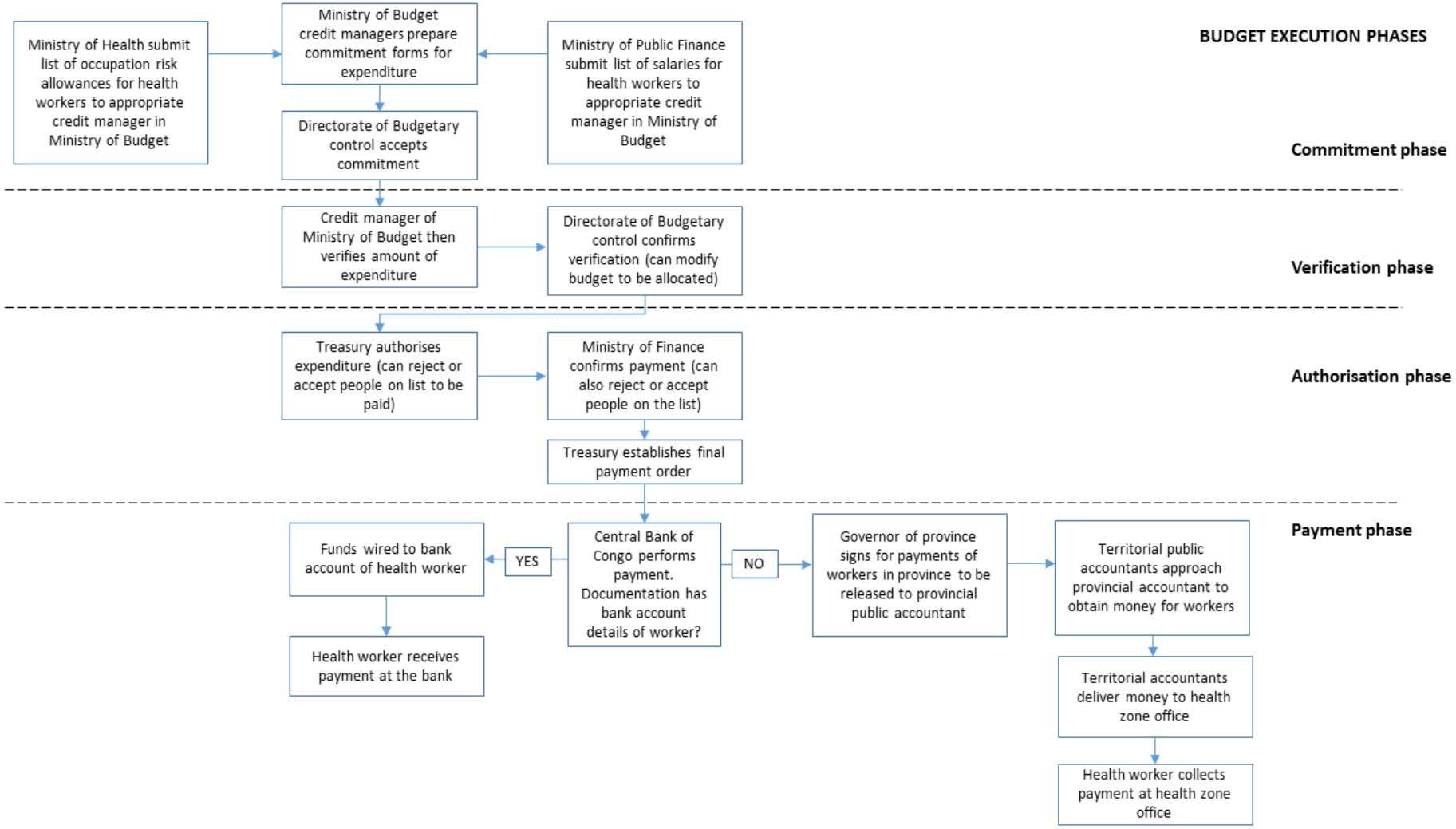
of the information system, which enabled the reallocation of 3412 government payments (worth approximately US$150,000 per month) from ghost workers to legitimate workers. However, the process that led towards the outcomes achieved was as much a political as a technical one. The aim of this study is therefore to build on the paper by Likofata et al.(21) by further elaborating on the experience in implementing the intervention. It applies a framework of implementation fidelity in order to explore the degree to which the planned intervention was adhered to, and any contextual factors which may have moderated implementation. In doing so, the researchers aim to more fully understand the process and how it may have culminated in some of the successful outcomes observed. It is hoped the lessons learnt will inform the implementation of health systems strengthening interventions in other settings.

BACKGROUND

Health workers in the DRC

The destructive effects of previous civil wars and ongoing conflict in the East have taken their toll on the DRC's health system and its workforce. In particular, there is a lack of transparency and sound financial management when it comes to the payment of health workers by government (22). Salaries for health workers were nominal following the economic crisis and conflicts during the 1990s, so in order to increase wages, occupational risk allowances or "primes de risque" were introduced (23). The occupational risk allowances are managed by the Ministry of Health while salaries are controlled by the Ministry of Public Sector Reform (Figure 1). Yet, the lists of workers held by these two ministries are not identical; the discordance between these lists has been confirmed by studies which indicate the proportions of workers receiving each payment can be vastly different (6, 12). One of these studies indicated that 31% of nurses in primary care receive a salary, while 54% receive an occupational risk allowance (6). This dysfunction in the payment of personnel remunerations alongside the absence of a standardised and up to date national policy on pay scales has led to much confusion amongst health workers around what they are entitled to receive. The distribution of workers in health facilities in the DRC also indicates that the vast majority of rural facilities lack the basic number of staff required by the current staffing norms (24). This is in contrast to facilities in urban areas, which often employ a high number of personnel.

Figure 1: Role of the different Ministries in the execution of government payments to health workers



Description of the human resources intervention

The United Kingdom's Department for International Development (DFID) has been funding a five-year health systems strengthening programme called Acces Aux Soins de Santé Primaire (Access to Primary Health-care or ASSP) since April 2013. This programme supports health centres and hospitals to deliver a basic package of services in a total of 52 health zones[a] of the DRC in five provinces[b], namely: Kasai, Kasai Central, Nord Ubangi, Maniema, and Tshopo. The non-governmental organization Interchurch Medical Assistance Worldhealth (IMA) is the lead implementing partner of a consortium of sub-contracted partners. One part of this programme involves IMA working with the sub-contracted partner IntraHealth to implement a complex intervention to improve the payment and distribution of health workers.

The intervention was piloted in Kasai Central and Kasai provinces (formerly known together as Kasai Occidental), and consisted of two main components which are outlined below.

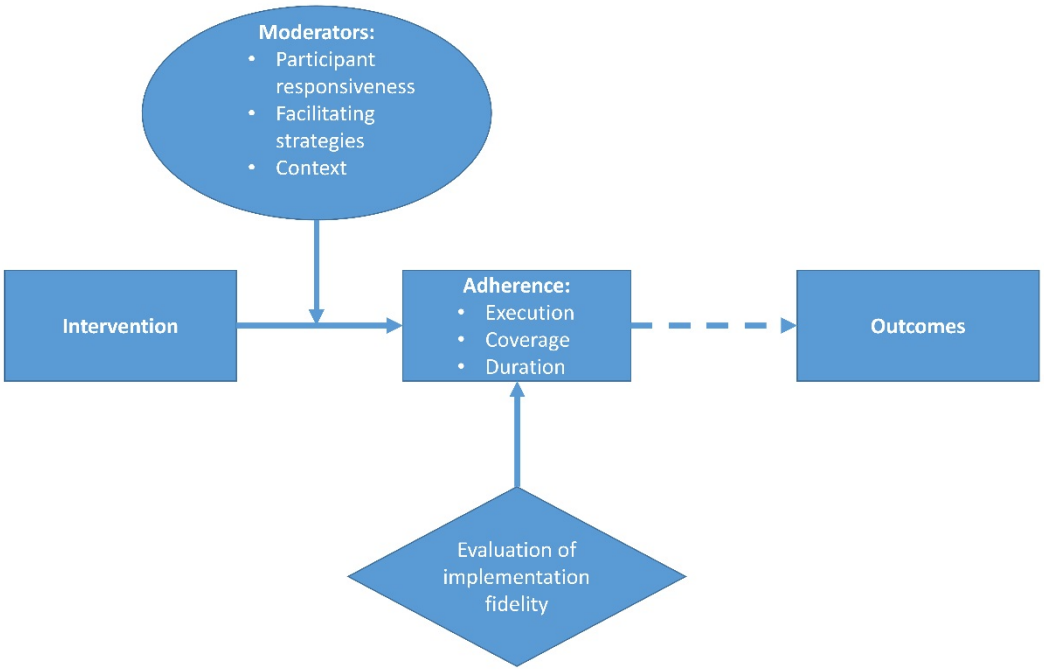
1. *Generation and utilisation of information to improve government payments to workers:* The establishment of a database on government recruited health workers (legitimate) that are currently working. Information on health workers recorded in the database included: qualifications, place of work, and whether they were receiving a salary and/or occupational risk allowance. Biometric data to uniquely identify workers would be recorded in the form of finger-prints and photographs.
2. *Updated staffing norms:* To update the guidelines on staffing norms from 2006 (25) to enable more efficient staffing of facilities.

Central to both components was the need to engage closely with government, advocating with them to use the information generated by the intervention to improve government payments to health workers and enforce the revised national standards on the staffing of facilities to ensure the equitable distribution of staff across facility types.

METHODS

The evaluation was conducted between October 2014 and March 2018. Implementation fidelity was examined using a conceptual framework adapted from Carroll et al.(18), and sought to identify the extent to which the intervention had been implemented as planned (implementation adherence) by measuring its coverage, duration, and execution (Figure 2). Potential moderators of implementation of the intervention were also examined, and included: participant responsiveness, which measures to what extent participants respond to, or are engaged by, an intervention; facilitating strategies, which are measures put in place to optimise the level of fidelity achieved, and; contextual factors external to the intervention which may have acted as either barriers or facilitators to implementation. The evaluation also explored potential unintended consequences, such as whether the intervention affected the progress of similar interventions occurring in different sectors.

Figure 2: Conceptual framework to examine implementation fidelity.



Theory of change

A ToC for the intervention was developed during two workshops held in October and November 2014. The workshops were attended by representatives from: IMA WorldHealth, DFID, Intrahealth, and government officials from the DRC Ministries of Health, Public Service, Finance and Budget. Reflections on the process and lessons learned from this experience are described in another paper (26).

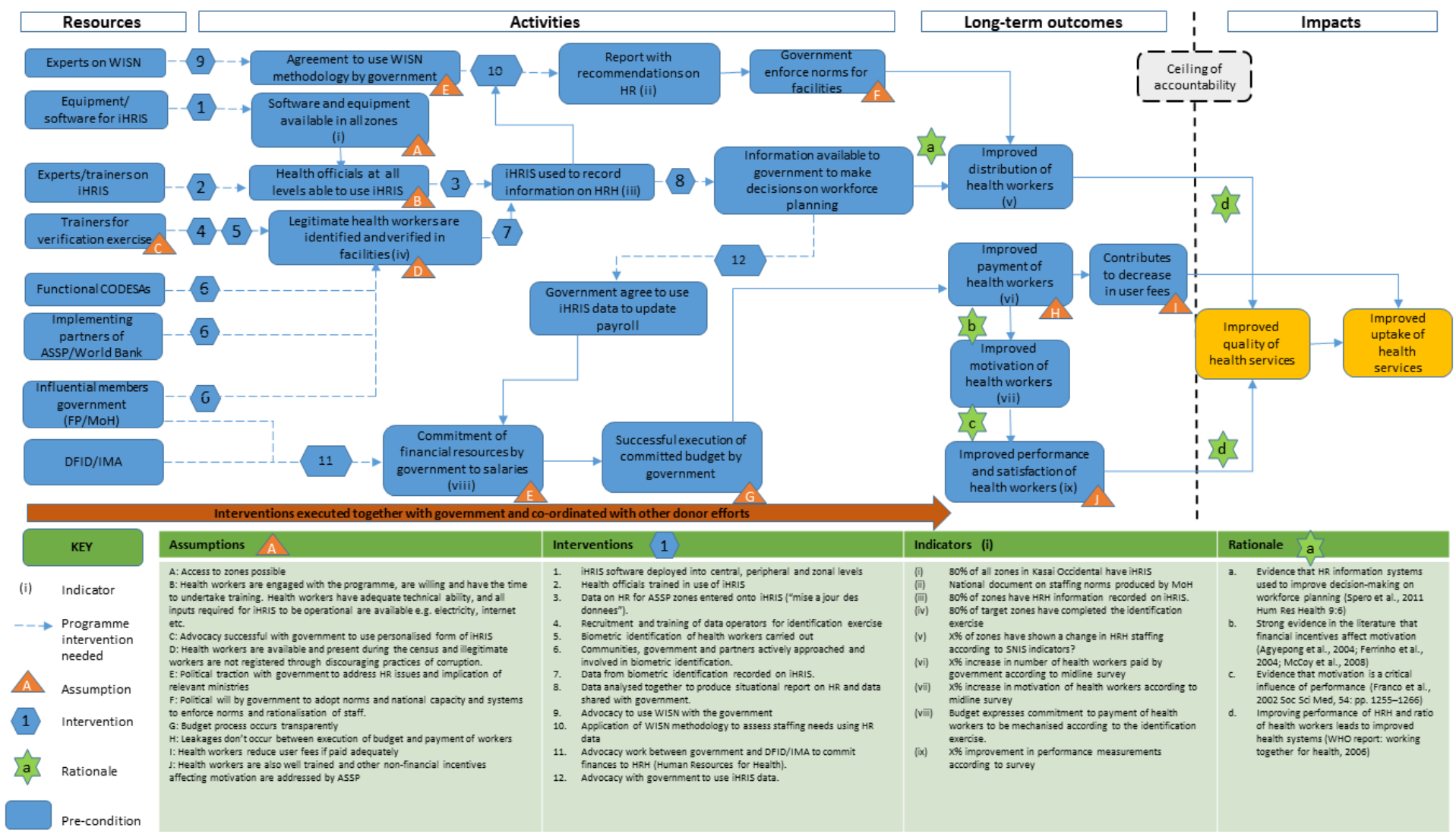
The resulting ToC is shown in Figure 3 and illustrates the implementation steps and hypothesised mechanisms of change expected for the intervention. Component one involves conducting a biometric census of all active health workers in Kasai Central and Kasai provinces. Once the information is independently verified by members of the community as well as provincial and national government, the information is recorded on electronic software called iHRIS (open-source Human Resources Information System) (27). Improvements in information on health workers are then used to clean the payroll and better allocate government payments, which would in turn increase the motivation and performance of workers.

For the second component, a process called WISN (Workload Indicators of Staffing Need) (28) is employed to determine the optimum number of workers needed to staff facilities. The steps involved in this method, which is essentially a human resources management tool, have been described in detail elsewhere (29, 30). Essentially, data are collected from a sample of health workers on the activities they undertake and the time taken to do these, in order to define

workload components and establish activity standards for cadres. Analysis of these data using the WISN method yields information on the workload pressures of different cadres of staff in different facilities, which can then be used to inform the development of national standards for staffing at facilities. If enforced, these standards would lead to a more efficient distribution of workers between facilities.

Both components would contribute to improving the quality and uptake of services. Political will of the government to address these issues was recognised as a critical assumption which would fundamentally influence the success of the overall intervention. Some of the activities in the ToC were very broadly described (e.g. advocacy with government) to afford implementing partners a degree of flexibility as to how to best adapt the intervention as it progressed.

Figure 3: Theory of change for the human resources intervention



CODESA: Local health committee; FP: Ministry of Public Service; MoH: Ministry of Health; DFID: Department for International Development; IMA: Interchurch Medical Assistance; iHRIS: open source Human Resource Information System; HRH: Human Resources for Health; ASSP: Access to healthcare programme; WISN: Workload Indicators of Staffing Norms; SNIS: National Routine Health Information System.

Key informant interviews

To examine implementation fidelity, we conducted three rounds of semi-structured interviews; one round with 17 stakeholders (January to February 2015, which was before implementation of the census and the WISN process); a second round with 24 stakeholders (April to May 2016) with the higher numbers in this round compared to the first occurring due to snowball sampling; and a third round of more focussed interviews with four stakeholders (March 2018). The first two rounds of interviews occurred during implementation of both components of the intervention while the last round was conducted once most intervention activities had been completed. Interview data were collected at multiple points within the life of the intervention to capture implementation execution over time against the ToC, as well as the influence of moderating factors such as participant responsiveness and context. Each round of interviews also inquired about any wider consequences of the intervention which may not have been foreseen in the initial ToC.

Interview participants included those involved in the initial ToC workshop and others either involved in, able to influence, or benefit from the intervention (Table 1). An experienced local qualitative researcher familiar with the cultural context and thelead author conducted all interviews which were either in French or English according to the language preference of the interviewee. None of the interviewees declined to participate and interviews were undertaken in a private room to maintain confidentiality and audio-recorded subject to consent. Interviews varied between 45 minutes to one and half hours in duration, and audio recordings were transcribed in French or English by the local researcher and primary author respectively (each of the researcher's first languages) to maximise accuracy. The primary author then reviewed all transcripts and managed the data using NVivo 10 software. Qualitative data were analysed using implementation fidelity as the main deductive framework with which to code responses. The ToC provided the basis to compare whether activities planned under the intervention had been executed as intended, and whether any consequences of the intervention had been anticipated or not. Interviews were coded iteratively at each round so that themes emerging in early interviews could also be explored in later ones.

Table 1: List of stakeholders interviewed and rationale for their selection during rounds of qualitative data collection.

Organisation/ Location	Number of respondents per organisation	Rationale for interviewing
Intrahealth	2	Non-governmental organisation responsible for implementing the technical aspects of the intervention.
IMA Worldhealth	3	Lead implementing partner of ASSP
DFID	2	Funding the ASSP programme
World Bank	1	Previous involvement in civil servant censuses, and in implementing governance strengthening programmes in the DRC.
Japanese International Cooperation Agency (JICA)	2	Involved in programmes to strengthen Human Resources for Health in the DRC.
DRC Ministry of Health (central and provincial levels)	3	In charge of administrative management of health personnel and the list of workers receiving occupational risk allowance payments.

DRC Ministry of Public Sector Reform (central and provincial levels)	3	Charged with recruitment and management of civil servants, including the list of workers to receive payment of salaries.
DRC Ministry of Budget (central and provincial levels)	3	In charge of validating any payroll expenditure (both salaries and occupational risk allowances).
DRC Ministry of Finance (central and provincial levels)	3	Ministry responsible for releasing the payment order (for salaries and occupational risk allowances).
Health zone	2	Beneficiaries of the intervention.

Document review

Information on the execution, coverage, duration of activities obtained from relevant project documents was reviewed and recorded in order to accurately profile the implementation of the intervention. Reports included: ASSP quarterly progress reports to DFID, Intrahealth reports and presentations, and meeting minutes.

RESULTS

The results presented below summarise adherence to the intervention (in terms of execution, coverage, and duration). They also describe: participant responsiveness to the intervention; facilitating strategies employed; the role of context in affecting implementation, and; unintended consequences.

Implementation Fidelity

Execution and duration:

For both components of the intervention, a number of planned programme activities were executed as intended and in accordance with the ToC (Table 2). The only activity which did not take place as planned was the fingerprinting of health workers during the census, and there was a delay in the production of a situational report on human resources for government.

However, significant delays were experienced in relation to implementation. For example, the census was not carried out until over one year after it had initially been scheduled. The development of staffing norms also took much longer than anticipated. Reasons behind the delays are further explained under moderating factors of the intervention.

It was also recognised that certain activities, such as the recording of data into the iHRIS system, should not just be conducted as a one-off but would need to be maintained frequently in order to include any new staff recruited to facilities or changes in details of staff over time, thus reflecting staff mobility.

Table 2: Execution and duration of activities described in the Theory of Change

Component interventions	Execution status	Details on execution	Duration	
			Expected time-line (if known)	Actual time-line
Component One				
1. iHRIS software deployed into central, peripheral and zonal levels.	Completed.	Computer equipment was purchased and delivered to key health departments in the central Ministry of Health, as well as the peripheral and zonal levels.	By July 2014	July 2014 **Achieved on time.**
2. Health officials trained in use of Ihris	Completed.	Training in iHRIS was carried out at the central and provincial levels. At the health zone level, a total of 98 data managers in 44 health zones of Kasai Centrale and Kasai were trained. Each health zone, provincial health department and the central health departments were given user accounts for iHRIS.	By July 2014	July 2014 **Achieved on time.**
3. Data on Human Resources for ASSP zones entered onto iHRIS	Completed.	The details of health workers already registered with the health zone office were imported into iHRIS prior to the census.	By July 2014	July 2014 **Achieved on time.**
4. Recruitment and training of data operators for identification exercise (census).	Completed.	Six teams of four people were recruited and trained in iHRIS, before being deployed across the two provinces to interview and collect data on health workers.	By July 2014	July 2014 **Achieved on time.**
5 and 7. Biometric identification of health workers carried out (census) and data recorded on iHRIS	Partially completed and ongoing.	Health workers from each zone were requested to bring documentary evidence on their qualifications and recruitment in health facilities for review by the trained teams. Those workers identified as legitimate had their contact information, identification, photo, current job, and employment and education history onto the iHRIS database. However, biometric finger-printing as planned was not carried out. The full census process has been described in detail by Likofata et al.(21)	By August 2014.	October 2015-December 2015. **Delayed.**
6. Communities, government and development partners actively approached and involved in biometric identification (census).	Partially completed.	These stakeholders were present during the census, and helped to oversee the verification process. However, biometric identification by way of finger-printing of workers, was not undertaken.	By August 2014.	October-December 2015. **Delayed.**
12. Advocacy with government to use iHRIS data.	Completed.	Following an analysis of census data, IntraHealth and IMA World Health met formally with officials and partners including the Secretary General of the Ministry of Health, Director in charge of payroll at the Ministry of Budget, and the Ministry of Public Service to discuss how to use the information recorded on iHRIS to pay health workers.	By September 2014.	June 2016 following analysis of iHRIS data.

				Delayed.
Component two				
9. Advocacy to use WISN with the government	Completed.	The project conducted a four day workshop on WISN with the Ministry of Health in order to develop the capacity of the Ministry of Health to better understand the WISN process and how it would be applied in the Congolese context.	By June 2014.	June 2014. Achieved on time.
10. Application of WISN methodology to assess staffing needs using data on Human Resources	Completed.	Once approval to proceed had been granted by the Ministry of Health, a WISN Steering Committee and Technical Working Group were established. A strategy and operational plan was developed. The Working Group designed the data collection tools a pilot study was undertaken in Kinshasa. Data collection for WISN was completed in another 4 provinces, namely: Maniema, Kasai, Kasai Centrale, and Nord Ubangi. This included 35 general reference hospitals, and 131 health centres.	By September 2014.	September 2017. **Delayed.**
Components one and two				
8. Data analysed together to produce situational report on Human Resources and data shared with government.	Partially completed.	By the end of the evaluation, the data from WISN and iHRIS had been analysed but not yet synthesized into a situational report for government.	By December 2014.	Not completed by March 2018. **Delayed.**
11. Advocacy work between government and DFID/IMA to commit finances to Human Resources for Health.	Ongoing.	IntraHealth and IMA World Health met with officials and partners including the Secretary General of the Ministry of Health, Director in charge of payroll at the Ministry of Budget, and the Ministry of Public Service to discuss how to use the information recorded on iHRIS to pay health workers. This led the Ministry of Budget to set up a review committee tasked with updating the payroll lists for occupational risk allowances and salaries for the two provinces.	Timeline not defined at outset.	August 2016 review committee to update the payroll was established.

Coverage

The intended coverage of both components of the intervention was achieved. For example, the WISN analysis under component two to inform the development of national staffing standards was conducted on data from a representative sample of health facilities from Kinshasa and four provinces. However, in relation to the census under component one there was a deviation from the original plans in relation to reach, which is reflected in the ToC. Formerly, it was planned that the census of workers would only be undertaken in zones covered by the ASSP programme, which was 28 zones in total. However, the provincial Ministry of Health requested that the census be undertaken in all 44 health zones of the Kasai and Kasai central provinces. Therefore, actual reach ended up exceeding planned reach for political reasons.

Moderating factors

Participant responsiveness:

When the intervention was first conceived, political engagement had mainly been confined to the Ministry of Health. DFID and the implementing partners already had strong relationships with the Ministry of Health through the co-design the ASSP programme. However, on commencing discussions on how to administer the census and also through the ToC workshops, it became clear to development partners that health sector pay was not solely within the jurisdiction of the Ministry of Health. In the DRC, the Ministry of Public Service is responsible for maintaining the register of civil servants and controls the information on workers to receive a salary, the Ministry of Budget is charged with preparing and monitoring the national budget, and the Ministry of Finance releases spend.

> Before undertaking or considering any action relating to the census, (the health sector) must approach the Ministry of Public Service, which has jurisdiction…. It defines the policy, it fixes the methodology and it determines the modalities to arrive at the collection of data, the verification of these data, the certification of these data, the reliability of data and everything else.

Government, 1st round interviews

It was admitted by international health partners that the delay in engaging with these ministries occurred in part because they did not have any experience in working with them.

> I think, basically, because we've come at it… from the starting point of the sector…to the extent that we have engaged constructively so far with government…that has almost always been with the Ministry of Health which is our sort of comfort zone where we have all the contacts.

Non-government, 2nd round interviews

There was also a widespread perception that the intervention, particularly component one, would likely be met with resistance from these ministries, as a more transparent payroll would minimise any opportunities for corruption.

> As you know, not all people want it to change, there are people who are in the mafia today, who divert resources…who would not want a situation of transparency, because they play with other people's salaries. So, if there is a transparent situation that means every person who works is known and if there is the money that is paid into the bank account of this person, the mafia can no longer survive…

Non-government, 1st round interviews

Once eventually consulted, the Ministry of Public Service questioned the legitimacy of international health partners to undertake a census, indicating that the intervention was not adequately aligned with national public administrative reform strategies. In particular, this Ministry was concerned that the approach could lead to a proliferation in multiple sector-specific systems which were incompatible with their own overarching system to manage the civil service payroll.

> This is the reason for the current reform…The idea is to have one system that manages both the human resources and the payroll of the public servants…The idea is to further reduce the multiplicity of databases and systems… a sector cannot claim to carry out a series of activities without receiving a mandate from the Ministry of Public Service which is the guarantor of the activity.

Government, 2nd round interviews

The implementing partners further realised the importance of having the Ministry of Public Service engaged in the census, as this ministry had the exclusive right to undertake finger-printing of all civil servants in order to prevent double registration. However, significant delays ensued in starting data collection for the census as the Ministry of Public Service would not authorise the use of finger-printing until an independent cabinet was established to oversee the process. The argument that Intrahealth could be viewed as being impartial was not accepted by the Ministry of Public Service. After several months of unsuccessful negotiations, the implementing partners decided to forge ahead without finger-printing, as information on the number and location health workers would still be useful to inform decision-making for workforce planning.

By mid-2016, the results of the census were presented by implementing partners to the Ministries of Budget, Finance, Health and Public Service Reform. The findings indicated that there were over 2000 ghost workers (21). The Ministry of Budget committed to setting up a payroll review committee which would be tasked with re-diverting the payments from ghost workers to legitimate workers.

> With that very public information, that there are 2000 ghost workers…I think they (the government) would risk their reputation and perhaps their jobs if they do nothing. Therefore, information has power.

Non-government, 3rd round interviews

Unlike the census for component one, the decision to update staffing norms was under the complete control of the Ministry of Health. The Ministry was invested in the idea of having a more efficient workforce, and so responsiveness to this aspect of the intervention was high. It acknowledged that the current workforce lacked in certain key personnel such as pharmacists, but that there was also a glut in other cadres such as doctors.

> The problem is that we are recruiting categories (of workers) that are overcrowded, for example the general doctors, there are too many now but we continue to recruit them…

Government, 1st round interviews

Facilitating strategies

In the delays running up to the census and in recognition of the political sensitivities related to reforming the payroll, DFID commissioned a political economy analysis. The purpose of this was to more closely examine communication lines and relationships between ministries, how incentive structures aligned and differed, and any other potential interventions they could exact to positively influence reform of the health sector payroll. The political economy analysis was helpful in explaining some of the existing power struggles between ministries which had contributed to the significant delays incurred during implementation. For example, although the Ministry of Public Service was in charge of recruitment and of granting employee registration, most line ministries including the Ministry of Health had started to deal directly with the Payroll department in the Ministry of Budget which seemed to have become the key decider over who was included in the payroll. Implementing partners identified that their political capital would be better invested in influencing the Ministry of Budget to pay legitimate workers their occupational risk allowance which was managed by the Ministry of Health, rather than to help improve the payment of salaries given the resistance faced by the Ministry of Public Service. To progress negotiations and advocacy with pay reform ministries, DFID's health team also enlisted the help of its governance team with its contacts and networks to assist in many of the political discussions.

> The Ministry of Health has direct control over primes (occupational risk allowances), payment occurs more frequently, and doesn't require the same process for salaries. Therefore there is potential for greater traction…so this could be a good opportunity to show how government can improve the system.

Non-government, 2nd round interviews

For component two, the delays experienced were mainly because the WISN process required some of the data collected from the census, such as the number and cadres of health workers employed in different types of health facilities. However, implementing partners admitted that they had also underestimated other data requirements as well as the complexity of data analysis using the WISN method. WISN uses annual service statistics to assess workloads but most of the health facilities in the DRC do not keep good records which would affect the precision of the results. This led the implementing partners to request additional capacity and resources, as well as the enlistment of international expertise, in order to facilitate progress on WISN data collection and analysis.

Role of context

A major change which served to facilitate success in implementing the intervention was the introduction of 'bancarisation' for the occupational risk allowance in October 2015. Bancarisation refers to the establishment of bank accounts to pay employees, which was already in place for salaries. Previously, workers would be paid the occupational risk allowance in cash by the state's public accountant. Bancarisation would have helped to elevate the profile of the issue of ghost workers, as payments to non-existent workers would now start to accumulate at the bank, and after a period of time, these unclaimed funds would be returned to the central bank but not the Ministry of Health. This would mean the government would be losing significant amounts of money to the bank, thus offering them a clear incentive to clean the payroll.

> One of the reasons the decision (to clean the payroll) was made was because of bancarisation…Money you can't access, you cannot use. Therefore, it needs to be changed so that the funds can be used.

Non-government, 3rd round interviews

Despite the poor road infrastructure in remote areas and lack of internet connectivity, the DRC environment did not pose a barrier to implementing some of the more logistical aspects of the intervention such as the deployment of equipment and training. .

Full coverage of iHRIS was achieved as local staff were accustomed to overcoming difficulties of the terrain and technical solutions such as VSAT (Very Small Aperture Terminals)[c] were employed to enable internet access at health zone offices.

Unintended consequences

An unintended but positive consequence as it was outside the scope of the initial ToC, was the reaction of the donor community to the intervention. With the exception of the World Bank, donors had historically shyed away from programmes tackling the underlying causes of poor health worker remuneration, preferring to invest in performance-based financing. Reasons given included: a lack of clear entry points, varying priorities, pressure to demonstrate quantifiable impacts on service delivery within short time-scales, inability to directly fund the wage bill due to weak public financial management systems, and difficulty in securing funding for high-risk system strengthening interventions. However, on presenting the results of progress made on the intervention at the joint donor health group and related thematic groups, there were signs of a gradual coalition of support to similar interventions in the future.

> One of the major barriers to progress in this area is not that people don't think it's important, it's just people don't have a sense of practically how we can take on the issues of human resource management in a constructive way…I think we're just beginning to make some headway and there's the early momentum towards this area that hopefully also attracts more attention.

Non-government, 2nd round interviews

> Everything a project can do is limited…it's like a torch of the Olympic games. We bring the torch, it goes so far, but it needs someone to carry on the relay. So, the project brings ideas that people may not have thought of, gives evidence... Now, people have to take this and say we want to change that, the government can do this…

Non-Government, 2nd round interviews

Another positive consequence was that the intervention had successfully enabled a shift in perceptions previously held by health workers around their remuneration.

> …in the previous programme, one of the outcomes of that, unfortunately, was that there was quite a strong sense that the management of the health care workers and their remuneration was something that health care workers turned to the programmes to provide… in the early stages of the programme, if you visited one of those health zones, the staff would often say that the programme has to pay us. By the later stages…I really noticed that they were turning to the Ministry of Health and the government in the DRC, to say, look, we deserve to be paid, we need to be paid, what are you going to do about ensuring the health workers receive the salaries that are due, and to manage more effectively...I think that's a really important shift and a real one… an important transition that the programme enabled to happen.

Non-government, 3rd round interviews

DISCUSSION

Theory-driven process evaluations are gradually gaining traction in health systems research (31), as outcome-focussed evaluations don't explain why an intervention worked and whether it could work elsewhere, thus limiting the drawing of context-sensitive conclusions, particularly for complex interventions. This study has provided a detailed assessment of the intermediate steps and processes underpinning a complex health systems strengthening intervention aimed at improving the management and remuneration of workers by government in the DRC. The evaluation applied a conceptual framework of implementation fidelity developed by Carroll et al. (18)

Implementation adherence

Despite the challenges associated with working on an intervention of this nature and in a fragile state, full coverage of the intervention was achieved. Most of the component interventions described in the initial ToC were also carried out as described, although some were not executed as intended such as the finger-printing of workers. This was high risk as it was possible the government wouldn't accept the results without this form of biometric data. Certain activities not anticipated at the beginning of the process, for example the political economy analysis, were also undertaken.

The desire to maintain strict adherence and fidelity is often countered by a need to adapt and alter programmes, which can cause tensions in implementation (32). Inconsistencies in fidelity may compromise the internal validity of the evaluation (33). On the other hand, an intervention may work better if adaptation to the local setting is allowed (34). Several authors state that fidelity should be maintained for certain core intervention activities, while less important or adaptable elements at the periphery may be changed to achieve an ecological fit (35-37).

Adaptive programming can lead to a compromise on implementation fidelity but may be more relevant to health systems strengthening interventions which target one or more of the six building blocks of the health system and where evidence on cause and effect is weak (19, 38). Detailed planning and inflexible designs are not always a good match when addressing the dynamic properties of health systems (39). This can be contrasted against clinical public health interventions, such as the delivery of community-based models of care, where high fidelity may be more important in order to preserve clinical effectiveness, for example by adhering to the correct dose and intensity (37, 40).

Moderating factors

Berkel et al. have shown that for public health prevention programmes, even if they are delivered as intended, limited participant responsiveness in terms of involvement and engagement in the programme will mean these programmes are unlikely to achieve their intended outcomes (41). In this case, participant responsiveness was a strong moderator of the intervention, as gaining the support of certain government stakeholders was eventually key to ensuring the outcome of improving payments to workers was achieved. Historically, external partners have found it challenging to credibly support state functions; a large scale multi-donor project initiated in 2005 aiming to reform the payroll for several sectors in the DRC had previously been unsuccessful as civil servants had not felt implicated enough in the process, and viewed it as a donor-driven exercise (42).

In particular, the political economy analysis proved to be a powerful tool in revealing insights into how power, resources and incentives were distributed between the stakeholders involved in the intervention, and thus helped to support more effective participation. Engaging in politics is often uncomfortable for health professionals, but efforts to reform the health system need to be politically informed in order to effectively influence decision-making (43) .

Context also played a significant role in the interplay between the intervention and its effects; the introduction of concurrent interventions such as ‘bancarisation’ was timely and a strong motivator to clean the payroll, as the government would have continued to lose money to the central bank if they did not take any action. This had not been anticipated at the outset in the ToC, and so a challenge for the researchers was being able to identify and monitor any new interventions or indicators that become relevant during the course of the research. As noted by Adams et al., there is a lack of guidance and tools on how to report on context for evaluations of interventions which have effects across a health system (19).

Suitability of the evaluation approach

A key criticism of the approach identified by the authors in another paper is that it should have adopted a systems thinking approach to developing the ToC at the outset (26). Systems thinking makes explicit how things are connected to each other within some notion of a whole entity, thus improving the perception of the overall system and the interactions between its parts (44). As argued by de Savigny and Adam, the more complex the intervention, the more the need for systems thinking and a comprehensive assessment of system-wide effects (45). Therefore, rather than evaluating whether the intervention fixed a specific problem, it was more important to identify if and how the intervention would contribute to reshaping the system in a more favourable way (26, 46). Many of the component interventions were significantly delayed because international health partners had not taken into account the wider public institutional system beyond the health sector, and the influence of certain key government stakeholders.

The application of systems thinking to health systems strengthening interventions is gradually increasing. It is now understood that health systems themselves are complex and adaptive, consisting of multiple relationships and interactions between people, institutions and resources (39, 47, 48). The response of people and systems is not always straightforward or easily predicted, and is dynamic rather than static (49, 50). The process evaluation framework applied here has mainly been applied to clinical or public health programmes, rather than health systems strengthening interventions (51-54). However, other frameworks such as the Consolidated Framework for Implementation Research, which identifies the significant role played by individuals, could have been considered (55). Furthermore, systems thinking tools such as social network analysis can be used to explore the critical relationships between networks of organizations and individuals that can either facilitate or impede the successful implementation of interventions (39, 50).

Consideration of sustainability

The government did not dedicate any extra resources to the intervention but rather reallocated the existing budget to pay the correct workers. In the absence of any additional revenue to health, it is unlikely the government will be able to maintain the information system without any external financial and technical support, which could compromise the sustainability of the intervention. An initiative in Sierra Leone to improve the integrity of the health worker payroll was successful on account of the political will as well as financial and technical support of donors, but the research did question whether the gains made would be sustained on withdrawal of donor assistance (13).

Limitations

Although it was not an objective of this study, it would have been desirable to also measure outcomes linked to the intervention. There had been plans to use the baseline and end-line evaluation surveys of the ASSP programme to conduct a controlled before-and-after study. This would have enabled a quantitative comparison of health worker motivation, government payments, distribution, and performance for those workers receiving the intervention in the Kasai provinces against workers from other provinces who had not been exposed to the intervention. However, the security risk posed to researchers as a result of instability arising in the two Kasais in 2016 meant that the end-line survey could not be undertaken in the Kasai

provinces. Nonetheless, this analysis still offers credible evidence on the contribution of the intervention to the outcomes for government payments reported by Likofata et al.(21). Key activities of the intervention were implemented as intended, with most elements of the ToC supported and confirmed by evidence on observed results. Furthermore, no other similar interventions to clean the payroll or update staffing standards were being implemented in parallel.

Another limitation of the study was that the sensitivity of the topic and stakeholders involved may have made it difficult to evoke a truthful response from interviewees. In particular, government officials would have wished to present themselves in a positive light, and so there is a risk their responses were subject to social desirability bias. To establish reliability of the findings, several different perspectives were represented and similarities and differences across accounts compared. The lead author who conducted all of the interviews was also non-Congolese, and so their difference in background and beliefs would have further influenced both the information yielded by participants and how it may have been interpreted.

Conclusion

In conclusion, this study has highlighted the need to apply a politically-informed systems thinking approach to evaluating complex health systems strengthening interventions. Such interventions may necessitate a more adaptive approach compared to more clinical interventions given the dynamic nature of the system within which they occur. A framework of implementation fidelity identified participant responsiveness and context as key moderators of the intervention. However other approaches such social network analysis could offer more suitable alternatives to evaluating similar complex health systems interventions. There is also a need for more guidance for researchers on how best to assess and measure context for these types of interventions.

DECLARATIONS

Ethics approval and consent to participate

The study received human subjects review and approval from the Tulane University Institutional Review Board (Reference number: 14-633280), the Kinshasa School of Public Health Ethics Committee (Reference number: ESP/CE/024/2014), and the London School of Hygiene and Tropical Medicine Research Ethics Committee (Reference number: 8475). Informed written consent was obtained from all those participating in the study.

Consent for publication

Not applicable.

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The lead author has recently been appointed as a health adviser for the Department for International Development (DFID). DFID funded the health systems strengthening programme referred to in the article.

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Authors' contributions

RM analysed and interpreted the survey data. RM also designed, collected, analysed and interpreted the qualitative data of the study and drafted the manuscript. JB, SMJ and DRH helped to design the study and write the manuscript. All authors read and approved the final manuscript.

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[a] A health zone is a defined geographical area with a population between 100,000 and 150,000 people and is usually served by one reference hospital. DRC is thought to have 516 health zones in total.
[b] Prior to July 2016 and decoupage, the provinces were: Kasai Occidental, Equateur, Maniema and Province Oriental.
[c] VSATs are devices that are designed to facilitate effective telecommunications and Internet connectivity in remote places