Analysing costs of a facility-based Lay Health Worker intervention focused on improving health outcomes for HIV positive women and children

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Declaration

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Abstract

South Africa is facing a health care worker shortage which is contributing to poor health outcomes, especially in mother-to-child transmission of HIV. In order for Prevention of Mother to Child Transmission (PMTCT) programmes to achieve success, coverage needs to be dramatically increased. This paper aims to provide specifics on the costs of integrating a Lay Health Worker (LHW) into a clinic to improve patient uptake and retention of PMTCT services, in what was previously the Motheo district, Free State.

This study analyses the costs of a LHW model, as part of a randomised controlled trial to evaluate the impact of LHWs on PMTCT programme coverage and health outcomes. A total of 32 clinics were randomly selected under the randomised controlled trial, with 16 clinics having introduced the LHW model and the remaining 16 clinics offering the base standard of care. Scaling up across all 5 districts in the Free State province was also considered.

For the LHW model to operate across 16 facilities would cost R2,091,481 per year (R130,718 per clinic) or approximately R377 per first antenatal care (ANC) visit. Capital costs accounted for 3.7% and recurrent costs for 96.3% of the intervention. Personnel salaries accounted for 63.9% of overall project costs, with a contribution of 8.4% of total personnel costs to head office salaries. Due in part to the landscape and limited travel options, transport accounted for 8.3% of total costs.

It would cost R16 643,770 to scale up the LHW model to all five districts in the Free State, covering 222 public health facilities. South Africa's National Treasury has allocated R133.6 billion rand in the 2012/2013 budget [1] towards strengthening public health care, of which scaling up for the Free State would account for 0.012%, and 0.13% of all HIV/AIDS and TB expenditure.

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1. Research Protocol

1.1 Introduction

The 2010 Antenatal Sentinel HIV and Syphilis Prevalence Survey estimated that 30.2% of pregnant women aged 15 to 49 in South Africa were living with HIV. In 2011, over 63 000 children were infected with HIV, which remains the primary cause for the majority of child deaths [1]. In a global effort to encourage development by improving social and economic conditions, the World Health Organisation has outlined Millennium Development Goals (MDGs) designed to address disease, income deficiencies, poverty, hunger, ignorance, and squalor. Attainment of these goals, particularly in Sub-Saharan Africa, appears to be difficult. South Africa has ambitious targets to reach in regards of MDGs 4 and 5, which focus on the health of children and women, and MDG 6, which covers HIV/AIDS, tuberculosis and malaria [2]. Progress towards reaching these goals, and reducing infant mortality in South Africa, will depend largely on scaling up effective prevention against mother-to-child transmission (PMTCT) of HIV [3].

The majority of HIV infections in children occur through mother-to-child transmission. This can occur during pregnancy (in-utero), delivery, or mixed feeding. Without HIV services, a mother has a 30% likelihood of transmitting HIV to her child. By properly adhering to treatment and following correct feeding procedures, transmission can be reduced to 2%.

The South African Department of Health (DoH) launched a national PMTCT programme in 1992, although its initial impact was not substantial, due largely to limited treatment regimen and poor coverage [4]. By 2009, 30% of pregnant women were HIV positive [5]. By 2010, the South African guidelines were updated to better align with international standards, offering the

treatment regimens and initiation criteria as recommended by the World Health Organisation (WHO).

In accordance with these criteria, initiation of treatment for HIV positive pregnant women now commences without delay, regardless of the women's CD4 count. Issues with adoption still persist within the PMTCT programme, with only 50% of HIV positive, pregnant women accessing treatment, despite universal coverage. Complexities within the PMTCT treatment cascade can deter patients, or result in crucial dosage dates being missed during different stages of pregnancy. This can significantly increase the risk of vertical transmission, and may contribute towards drug resistance. At a primary health care level, the PMTCT programme's success depends on the development and testing of suitable community-based care models, focused on wide reaching, affordable inter-personal care. One such model has been to focus on the reassignment of roles in the clinic by shifting tasks from professional health workers, such as nurses, to lay health workers (LHWs). This allows for the streamlining of care by providing greater access to services for patients, while maintaining quality standards and maximising resources [5].

The main study, of which the costs will be analysed in this paper, will evaluate the impact of introducing facility-based LHWs at randomly assigned clinics in the Motheo district in the Free State province. Through monitoring specific patient health outcomes, the overall contribution of LHWs to the PMTCT programme can be quantified. The LHWs assigned as part of the intervention support the clinic through the provision of additional PMTCT focused services, as part of their job description. These services include assisting with task sharing, scheduling of

follow-up consultation appointments for HIV positive expectant mothers, facilitating health promotion sessions in the waiting areas, and the running of large awareness events to promote the intervention within the community. With the exception of the awareness events, all of these components are based within the clinic as part of a demand driven intervention.

1.1.1 Literature Review

Given the budgetary constraints and debilitating healthcare worker shortages, particularly in the context of lower-middle income countries, the World Health Organisation (WHO) has called for the adoption of task shifting in public healthcare facilities [6]. The South African National Department of Health recognises the need for the re-engineering of the current primary healthcare (PHC) approach, which includes formalising the work of LHWs. These workers are able to support aspects of PHC, especially in regard to controlling the spread of HIV/AIDS and TB. Many LHWs have previously worked as in-clinic volunteers or lay counsellors, and are able to assist through task-sharing [5]. While LHWs have little formal medical background, they often possess an understanding of HIV related and maternal issues. LHWs are usually based within their own communities, for which they feel a strong responsibility, while also possessing an historical knowledge of the surroundings. They have also been proven to be effective when assisting patients through the PMTCT programme [7].

LHWs form an affordable and quickly trained workforce which is able to assist health personnel through task-shifting, or task sharing as it is often referred to in South Africa. They are able to spend more time with patients, thereby overcoming the barrier associated with health professionals. LHWs are able to share health education with a community perspective which is

often based on their own experiences with testing, receiving treatment, and overcoming stigma and discrimination [8]. Perez and Martinez [9] take it a step further, and call them advocates for social justice within their communities. A study in Lusikisiki by Médecins Sans Frontiers and the Eastern Cape Department of Health trained community members to be Adherence Counsellors, as a primary healthcare resource of sub-professional workers, in managing HIV services [10]. The Adherence Counsellors assisted with task-sharing through the management of support groups, such as drug readiness sessions, and through patient follow-up visits. A report on the Lusikisiki study by Bedelu et al. [11] states that "As much responsibility as possible was delegated to lower-level health care workers while ensuring that professional medical oversight was provided to maintain quality control."

Looking past the success of the Lusikisiki project, other studies are cautious, stating that task-sharing must be just one part of a comprehensive system [5]. The high level of attrition is an important consideration and its determinants should be identified [12]. Hermann [13] finds that adequate remuneration is needed to retain LHWs, along with on-going training and quality supervision. How much should be spent is contested, as published research on costing is limited.

A detailed analysis of nine African countries [14] concluded that an increase in coverage of 20% for specific community-based/outreach interventions would save close to half a million lives at a cost of an additional US$1.21 per capita. Furthermore, increasing the quality of facility births would save over 100 000 lives at an additional cost of US$0.54 per capita. The study states that

in order for a health system to function, it requires both outreach services and facility-based care.

McCord et al. [15] reflect that LHW programme costs have "barely been examined", speculating that cost data is harder to come by than data on programme outcomes. In their analysis, they focus on the costs of a model which employs full-time LHWs offering health services door-to-door, whom are provided with short training and strong supervision. By expanding this model to South Africa, which is designed to be scaled up within a sub-Saharan setting, the proposed cadre of 35 191 LHWs would cost US$ 80.13 million, which constitutes 3% of the 2012 healthcare budget [16].

1.1.2 Justification for Research

Reflecting on the currently available literature regarding the use of LHWs, there is justification to further research the role of facility-based LHWs in South Africa in improving service delivery and health outcomes. Documentation of this process is also relevant to PHC re-engineering. More qualitative data is still needed on effectiveness and processes surrounding lay worker interventions [17]. Questions exist about which characteristics of LHWs, and which role specifics, make them effective [18]. Further documentation of these elements is needed to allow for replicability [19]. An evident gap exists in research of demand-side interventions concerned with facility-based LHW models. A demand-side approach is theorized to be a factor in preventing patient attrition at each level of the PMTCT cascade [20].

Unfortunately, no finalised, comprehensive policy template currently exists, with little field research on the standardisation of the remuneration, employment, training and supervision of

LHW services across South Africa. This paper aims to document the specifics involved in recruiting, training and mentoring LHWs from an NGO perspective, with a detailing of activities. This will be accompanied by a cost analysis and an estimation of cost to scale-up within the Free State province.

As will be explored through the costing analysis, placing a strong emphasis on training and support is hypothesised to be an investment which is directly proportionate to the value of the LHW to the facility. A common criticism of LHWs is that they often take on menial tasks within the clinic, and lack a defined role. By placing substantial weight on patient follow up and health education, this model aims to establish the LHW as an integral, higher value part of the clinic environment.

1.1.3 Aim and Objectives

This study aims to investigate the costs involved in implementing and scaling up a facility-based LHW intervention, to improve uptake and retention of HIV and antenatal services for HIV positive women and children in the Free State province. Therefore, it sets out to:

- Describe the LHW model and its key components in detail to aid with the costing analysis
- Analyse the costs involved in implementing specific activities of the presented facility-based LHW model
- Estimate the costs for scaling up the model to all 5 districts in the Free State province.

1.2 Methodology

1.2.1 Study Design

The main intervention is based in the Motheo district in the Free State and uses a pragmatic cluster randomised controlled trial study design. Within this district, 16 clinics have been randomly selected and assigned the base standard of care, with another 16 clinics randomly selected and assigned the introduction of the LHW intervention. This study will provide a cost analysis of the model components, and calculate the cost of scaling up this intervention in all 5 districts in the Free State.

1.2.2 Model Components

The LHWs assigned through the trial provide additional services through task sharing, patient follow-up, health education sessions, and large awareness events. This is supported by an emphasis on training and mentorship, as part of the model. These components will be described in detail, and separated for costing purposes, to be analysed in relation to scaling up by district.

1.2.3 Data Collection

The actual cost of introducing a LHW into a primary health facility, as outlined in the model, will be calculated retrospectively from a provider perspective. Data collection will be undertaken by the principle researcher where an ingredients-based costing methodology will be used, by multiplying the quantity of resources by their purchase cost, in order to obtain total costs. The implementing NGO will be consulted and the relevant project costs will be extracted from annual budgets, financial reports and ledgers over the three year period of the project. All research costs of the randomised controlled trial, such as data collection, will be omitted.

All collected data will captured and analysed using Microsoft Excel. All economic costs will be considered, as defined to include donated goods and services, which will be adjusted for reflective value. Expenditure will be separated into recurrent and capital costs and adjusted to reflect 2013 pricing. See Table 1 for methods used to identify, value and measure recurrent and capital costs. All costs are reflected in South African Rands, being the only currency used.

Table 1: Methods used to identify, value and measure costs

Type of Cost	Identification	Measurement		Valuation	
	Categories	Costing method	Source of data	Valuation method	Sources of data
Recurrent					
Personal	Head office salary contributions, project office staff and lay health workers	% of time spent on project	Reports, staff interviews	Total remuneration package costs	Expenditure reports
Overheads	Office rental, water & electricity, courier & postage, insurance, security, telephone, bank charges	Quantity consumed, % of time & space spent on project	Expenditure reports, staff interviews	Procurement records	Expenditure reports
Consumables	Annual training, office supplies, hand-outs, airtime, T-shirts, print materials, catering, entertainment hire	Quantity consumed	Expenditure reports, office records	Procurement records	Expenditure reports
Transport	Flights, accommodation, per diems, transfers, mileage & parking claims, maintenance of vehicle, petrol, public transport fare, care hire	Quantity consumed, % of trip spent on project	Expenditure reports, project reports, staff interviews	Actual expenditure attributed to travel	Expenditure reports
Capital					
Vehicle	Purchase & registration of project car	Proportion of use dedicated to project	Project records, staff interviews, vehicle log book	Replacement prices	Local dealership listings
Equipment	Computers, cell phones, office and kitchen furniture	Proportion of use dedicated to project	Project records, staff interviews	Replacement prices	Local supplier catalogues
Training	Head office staff, project staff & LHWs, Department of Health staff	Number of staff trained	Actual costs from NGO	Actual expenditure	Expenditure reports, office records

1.2.4 Recurrent Costs

Recurrent costs will include the cost of items incurred within a year. In this study, such recurrent costs will include:

- Personnel (head office staff, project office staff and LHWs)
- Overheads (including rent, water and electricity)
- Consumables (including office supplies, airtime, print materials)
- Transport (including flights, accommodation, public transport fare).

Personnel costs will be valued based on fully loaded remuneration packages, including a contribution to a death and disability fund and bonus payments. These will be calculated at a proportion of time spent working on project activities. Overheads will be sourced from expenditure reports and staff interviews, and valued as a proportion of time and space dedicated to the project. Consumables will be measured through expenditure reports and office records. Transport costs will be determined as the proportion of trip activities spent working on the project, and will be sourced from staff project reports and staff interviews.

1.2.5 Capital Costs

Capital costs are resources that have a lifespan lasting more than one year. In this study, capital costs will include:

- Project vehicle
- Equipment (including computers and furniture)

- Initial training of project staff (2 x 5 day training facilitated by head office staff with provision of training manual for participants) and introducing project to Department of Health.

The capital items will be annuitised for appropriate useful life span at a 3% discount rate, as used in similar costing studies. See the template in Table 2 for a breakdown of the cost categories to be used.

Table 2: Capital and Recurrent costs of separated by cost category

Capital	Cost	% of Capital Costs
Vehicle		
Equipment		
Staff Training		
Monitoring and Evaluation System		
Subtotal		
Recurrent		% of Recurrent Costs
Personnel		
Overheads		
Transport		
Consumables		
Subtotal		
Total intervention costs		

1.2.6 Data Analysis

The average cost to each primary healthcare facility will be calculated by dividing the total intervention cost (recurrent and capital) by the total number of facilities offering the intervention. Activity costs will be calculated according to a percentage of each resource and input required, and presented as a proportion of total costs and a proportion of costs per facility.

The average cost for every antenatal care (ANC) patient exposed to the intervention will be calculated by dividing the total intervention cost by the average number of first ANC visits to the intervention facilities per year.

Table 3: Recurrent costs of total separated by activity

Activity	Cost	% of Recurrent Costs
General administration & support		
Follow-up schedule appointments		
Health promotion sessions		
Community Awareness Events		
Task sharing		
Subtotal		

1.2.7 Estimating Cost to Scale-up

As part of the analysis, the costs will also be separated by activity (Table 3), with each being a component of the tested model. Replicability of the activities will be considered when developing a budget for scale up in all five districts in the Free State, being Mangaung Metropolitan, Lejweleputswa, Thabo Mofutsanyana, Fezile Dabi and Xhariep. The template for Table 2 and Table 3 will also be applied to each of the five districts. Consideration will be given to potential challenges or requirements for adaptations, such as sparsely populated areas and distances to facilities. The total estimated cost of scaling up in each district will be reflected in the Table 4 template.

Table 4: Cost of scaling up intervention by district

District	Recurrent cost	Capital cost	Total cost
Mangaung Metropolitan Municipality			
Lejweleputswa			
Thabo Mofutsanyana			
Fezile Dabi			
Xhariep			
Free State Province Total			

1.2.8 Sensitivity Analysis

Performing a sensitivity analysis tests the robustness of findings to changes in key variables, such as cost components [21]. The study will utilise one way sensitivity analyses in considering the purchase of an additional project vehicle rather than weekly car rentals, and adjusting the discount rate for annuitisation of capital costs. This will assist with supporting generalisable conclusions based on the calculation outcomes.

1.2.9 Limitations

The costs to the facility associated with hosting an additional LHW, such as general use of the facilities and electricity, will not be included. These costs were initially considered, but were calculated to be nominal. Instead, the initial efforts required, including meetings with the facility staff to introduce the programme, will be outlined.

1.3 Logistics

Table 5: Dissertation Timeline

Date	Action
Protocol Submission: Supervisor's Feedback	August/September 2012
Protocol Submission: Department Approval	September/October 2012
Protocol Submission: Ethics Approval	September/October 2012
Literature Review	October/November/December 2012
Data Collection and Analysis	April/May/June 2013
Dissertation Write Up	July/August/September 2013
Dissertation Edit and Rewrite	September/October/November 2013
Dissertation Submission	December 2013
Article Dissemination	December 2013

1.4 Budget

All costs related to the project implementation will be managed by Community Media Trust, with funding from the Monument Trust and Johns Hopkins Health and Education South Africa (JHHESA). As the principle researcher is employed by the NGO as part of managing implementation, any travel relating to this study will be combined with project travel.

1.5 Ethical Considerations

While approval has already been granted by the UCT Research Ethics Committee for the original study (REC REF 046/2010), this study will still seek approval from the committee based on the additional objective outlined in this protocol. All study operations will be in accordance with the 2008 Declaration of Helsinki 2008 and Department of Health principles. Any further amendments to the protocol will be submitted to the UCT Research Ethics Committee as outlined. Permission to conduct research was obtained from both the Free State Provincial Department of Health and the Motheo District Department of Health.

1.5.1 Potential Benefits and Risks

The final study write up is intended to aid the refinement of the LHW model regarding health service delivery, and make recommendations for scaling up in the province, which may result in future benefits in the quality of care.

1.5.2 Privacy and Confidentiality

NGO and health facility staff that will be consulted as part of the cost collection process will remain anonymous.

1.5.3 Informed Consent

Each of the 32 clinics will be provided with an outline of the study, specifying the project purpose and proposed activities and timelines. Informed consent will then be captured on a form.

1.6 Dissemination of Findings

Study results will be presented through a Master in Public Health thesis at the University of Cape Town, with the possibility of additional reports being produced. Further circulation will take place through interested stakeholders via the Health Economic Unit and the Centre for Infectious Disease Epidemiology and Research (CIDER) at the University of Cape Town. Results will also be presented though the Joint Primary Healthcare Forum.

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2. Structured Literature Review

2.1 Objectives

This purpose of this review is to consolidate the current literature covering the development of lay health worker (LHW) models and PMTCT interventions, to isolate learning from previous studies and to identify potential gaps. The global history and role of the LHW was explored in detail to give perspective to present day initiatives in South Africa. The health worker shortage has been outlined, with task-shifting and primary health care being correctly defined. Recommendations from other studies have been considered in the context of this study.

2.2 Search Criteria

Peer reviewed journals, such as Human Resources for Health, were used as the primary source of reference material, along with organisation and government reports. Searches were done through popular databases, namely PubMed and PubMed Central, which allowed UCT student access. Searches took places in the period from July 2012 to November 2013. Further literature was generated using the "snowball" approach, by following up references in relevant papers. In the cases of certain key authors, their greater body of work was explored. This review is not intended to be comprehensive of all LHW literature, but is rather focused on comparable models. As there was a substantial amount of literature from South Africa, many studies from other countries were omitted in favour of local literature. Only articles in English were used. Grey literature was included, in the form of meeting notes and organisation reports.

Studies concerning any type of lay worker intervention, analysis or review were considered, with priority being given to those set in South Africa. Alternative names, such as Community Health Workers, and acronyms, such as CHWs, were used as part of the literature search and

referenced studies were interpreted with consistent naming of LHWs throughout this review. Similar inclusion criteria were used when looking for community driven, PMTCT-focused interventions and costing literature.

2.3 Problem

A significant challenge facing post-Apartheid South Africa has been the containment of a quickly spreading HIV epidemic and its related health complications. By 2007, the country represented less than 1% of the world's population, but carried 17% of the global burden of HIV infection, which was exacerbated by the world's worst TB epidemic [1]. The 2010 Antenatal Sentinel HIV and Syphilis Prevalence Survey estimated that 30.2% of pregnant women aged 15 to 49 in South Africa were living with HIV [2]. In 2011, more than 63 000 children were infected with HIV, which continues to be the primary cause of the majority of child deaths [3]. The past two decades have also seen a sharp increase in other communicable diseases, such as TB and malaria, which have diminished gains made towards other health indicators [4].

In a global effort to encourage development by improving social and economic conditions, the World Health Organisation (WHO) has outlined Millennium Development Goals (MDGs) designed to address disease, income, poverty, hunger, ignorance, and squalor. Attainment of these goals, particularly in Sub-Saharan Africa, has proven to be difficult. South Africa, in particular, has ambitious targets to reach in regards to MDGs 4 and 5, which focus on the health of children and women, and MDG 6, which covers HIV/AIDS, tuberculosis and malaria [5]. Progress towards reaching these goals, and reducing infant mortality in South Africa, will depend largely on scaling up effective prevention against mother-to-child transmission (PMTCT)

of HIV [6].

The majority of HIV infections in children occur through mother-to-child transmission. This can occur during pregnancy (in-utero), during delivery, or during mixed feeding. Without HIV services, a mother has a 30% likelihood of transmitting HIV to her child. By properly adhering to treatment programmes and by following correct feeding procedures, transmission can be reduced to 2%.

The South African Department of Health (DoH) launched a national PMTCT programme in 1992, although its initial impact was not substantial, due largely to a limited treatment regimen and poor coverage. The South African Government's response to HIV improved dramatically with a new administration in 2008, having previously been overshadowed by denial, efforts to undermine scientific evidence as a basis for roll-out, lack of political drive, and weak implementation of policies and programmes [7]. In 2009, 30% of pregnant women were HIV positive [8]. By 2010, the South African guidelines were updated to better align with international standards, offering the treatment regimens and initiation criteria as recommended by the WHO. This was met by a substantial increase in the provision of condoms and the scaling up of a free national antiretroviral therapy programme.

Initiation of treatment for HIV positive pregnant women now commences immediately, regardless of the women's CD4 count. Issues with adoption still persist within the PMTCT programme, with only 50% of HIV positive pregnant women accessing treatment, despite universal coverage. Complexities within the PMTCT treatment cascade can deter patients, or result in crucial dosage dates being missing during different stages of pregnancy. This can

drastically increase the risk of vertical transmission (mother-to-child), and may contribute to drug resistance. At a primary health care level, the PMTCT programme's success depends on the development and testing of suitable community-based care models, that are focused on wide reaching, affordable inter-personal care. One approach has been to focus on the reassignment of roles in the clinic by shifting tasks from health workers, such as nurses, to lower-level community health workers. This allows for the streamlining of care by providing greater access to services for patients, while maintaining quality standards and maximising resources [8]. The utter magnitude of the HIV epidemic has forced the development of innovative and affordable ways of delivering care to those that need it most, with lessons that can be learnt to support the health system [7].

South Africa is battling a shortage of health workers, which is characteristic of countries in the sub-Saharan region. This is due partially to an increased "brain drain" of health professionals to first world countries, the loss of health workers to HIV/AIDS, and the increased scope of services needed to address other illnesses related to HIV/AIDS [4]. According to a 2007 report by Médecins Sans Frontières (MSF), there were 74.5 doctors to every 100,000 patients in South Africa [9]. While this number is much higher than the 2 doctors per 100,000 patients in Malawi, the distribution of health workers is uneven, with rural areas having substantially less access to health personnel than urban areas. In addition, the private sector caters to approximately 30% [10] of the population, but employs two thirds of the country's doctors and half of its nurses [9].

Furthermore, the demand on clinics has increased, driven by the impact of HIV and related infections, such as TB. The number of patient visits to Primary Health Care (PHC) facilities has grown by 52% from 1998/1999 to 2005/2006 [11]. Furthermore, utilisation rates have *increased* from an average of 1.8 visits per person in 1998/1999 to 2.5 visits in 2011/2012 [12]. Such rises in demand perpetuate the Human Resource shortage, causing a bottle neck for patients trying to access services and care.

This review of existing literature was augmented by new research into the impact of LHWs and PMTCT interventions. The Motheo district in the Free State was selected for this study, as it is was not subject to any similar interventions and has a high antenatal HIV prevalence of 31.6% [2]. The Free State province has 5 districts in total, and an HIV prevalence of 18.5% in the 15 to 49 years old age group [13].

2.4 Defining Lay Health Workers

LHWs are men or women chosen by the community to work on the front lines in promoting public health, usually to groups that have lacked access to adequate care [14]. They are not professionally trained, but have an intimate understanding of individuals in the community, and are able to serve as a liaison to health services. This includes facilitating access and improving quality of service delivery. They may not have graduated from high school, but should have a basic level of primary education that allows them to read, write and do simple mathematical calculations [15]. LHWs may be unpaid volunteers or may receive a salary. They are not civil servants or professional employees of the Department of Health, although they may be contracted by an organisation [16]. Globally, LHWs may be referred to by different names

such as Community Health Workers, Health Promoters, Village Health Workers, Community Health Volunteers, Health Agents and similar combinations. The level of knowledge and duties vary according to health priorities within countries, regions and communities [17].

Dovlo [4] defines 'mid-level workers' as substitutes for trained professionals, although they do share certain roles and responsibilities with LHWs. Furthermore, in a clinical setting, defining the right mix of professional and mid-level staff must be approached with sensitivity. While having workers at a lower level can drastically reduce the cost of service delivery, regulatory bodies are slow to extend the scope of practise allowed. While health systems have neglected to properly regulate, supervise and motivate this cadre's role, patients' health outcomes have still improved, highlighting the potential of LHWs. Dovlo emphasises that it would be a cost effective strategy to build capacity into training institutions. The cost of poor practices should also be investigated, and the means by which they can best be circumvented. Evidence gained from current concepts must be analysed and comprehensively reviewed to further contribute to the limited body of research on LHW models, to understand the best suited roles, and to confront scepticism towards community models. A variety of stakeholders and experts on substitution should meet regularly and reflect on evidence for devising feasible methods for scaling up responses to HIV/AIDs and related issues [4].

2.5 History of Lay Health Workers

The concept of a community-based health worker is neither new nor unique to the Southern African region. The barefoot doctor programme in China dates back to the middle of the twentieth century, where farmers were trained to offer basic medical services to rural areas.

This would include treating common illnesses and infections, and promoting good hygiene and family planning. In 1978, LHWs were prioritised on the global agenda at the Alma Ata conference on primary healthcare. Their work was seen to be a key component in the WHO goal of achieving "Health for All" millennium goals. Subsequently, LHW programmes were introduced in many low and middle income countries [18]. The inequality of Apartheid and lack of distribution of services resulted in the formation of similar LHW initiatives in South Africa. Health facilities were sparsely located in rural black communities with insufficient operational resources, leaving many without access to services [19]. The demise of Apartheid led to the first democratically-elected government which drafted a new Constitution, outlining "a right to health for all" as part of health sector reforms. The state introduced polices to dramatically improve the quality of life for the majority by addressing poverty and inequity, and restoring dignity, safety and security [20].

2.6 Primary Health Care Re-engineering

At present, the South African Department of Health recognises the need for re-engineering of the current Primary Health Care (PHC) approach, which includes formalising the work of LHWs. This reflects the recognition of community participation in health as a key component in PHC as included in the 1978 Alma Ata declaration [21].

These workers are able to support aspects of PHC, especially in response to controlling the spread of HIV/AIDS and TB. By using LHWs at a household level, the goal is to strengthen health promotion and prevention in order to improve overall health, and refer individuals who need further assistance. A community-based focus is needed towards maternal and child health and

PMTCT. As part of the larger re-engineering plan, ward-based outreach teams, comprising of a primary health care nurse and community health workers, will focus on priority districts with poor population health [22].

The increased demand for non-professional health workers has resulted in NGOs taking the lead in employing and managing different groups of LHWs aimed at specific programmes and needs, especially relating to HIV and TB [7]. These cadres are based at either a community or facility level, and include lay HCT counsellors, generalist LHWs focusing on health promotion, home-based carers providing palliative care, youth ambassadors, and TB DOTS supporters. This has created many low-paying job opportunities, against the backdrop of high unemployment. Presently, the government is the primary funder of LHWs through NGOs, which often obtain supplementary funding from donors. While most PHC clinics are supported by LHWs, there are no structural mechanisms that link the LHWs with the clinic, as they are not considered part of the formal health system [21]. Establishing relations between LHWs and professional staff has been a challenge [22].

According to a recent audit by the National Department of Health, there are approximately 65 000 LHWs varying by type, level and responsibilities. Further differentiation then occurs across provinces and organisations with trainings ranging from a few weeks to 4 years [23]. The Human Resources for Health Strategy for the Health Sector [22] calls for standardisation of services offered by LHWs, focusing on roles, responsibilities and employment mechanisms. The existing cadres must be trained to the same capacity expected from new LHWs. This transition from a varied and diverse informal workforce into a standardised workforce, which is part of

the formal PHC structures, will need to be carefully planned and managed. In maximising worker output, the 'scopes of practice' need to be redefined for all health workers, and not just LHWs. In-service training as part of on-going development will need to be offered. The strategy document refers to international evidence to advocate that LHWs are best utilised strengthen demand side interventions, especially related to antenatal care (ANC), and to promote health literacy.

2.7 Role of Lay Health Workers

Many LHWs have previously worked as in-clinic volunteers or lay counsellors, and are able to assist through task-sharing [8]. LHWs form an affordable and quickly trained workforce which is able to assist health personnel. They are able spend more time with patients, overcoming the barriers associated with health professionals. They are normally ward-based, working door-to-door to service households, either as a team or working alone. The majority of these LHW cadres are specialised in a single programme (rather than the generalised approach intended in the national policy framework), often dictated by the NGO or funder [21]. A study by Thurling and Harris [24] found that lay counsellors who had been trained for PMTCT programmes have requested additional training on grief counselling, home-based care, nutrition, TB and HIV/AIDs. This was intended to further assist the community and cascade down information to patients.

A study in Lusikisiki by MSF and the Eastern Cape Department of Health trained community members to be Adherence Counsellors, as a primary healthcare resource of sub-professional workers, in managing HIV services [25]. This formed part of a demand-side intervention where the Adherence Counsellors were based at health facilities, rather than going door-to-door. The

Adherence Counsellors assisted with task-sharing through the management of support groups, such as drug readiness sessions, and through patient follow-up visits. The demand-side approach recognises that there is a demand for services which is constrained by a resource-limited environment with a chronic health worker shortage, inhibiting the scale-up of treatment. As with many other LHW initiatives, the Adherence Counsellors were not officially supported through Department of Health staffing structures, but rather employed by a local, community-based NGO.

A report on the Lusikisiki study by Bedelu et al. [26] states that "As much responsibility as possible was delegated to lower-level health care workers while ensuring that professional medical oversight was provided to maintain quality control." Appropriate training, mentorship and supervision were singled out as key components to be considered for future models. While the nurses initially questioned the ability of the workers, their on-going involvement in clinical discussions and patient management was advocated by the head physician. With time the nurses began to realise the benefits of having their workload reduced, and these auxiliary workers were in turn able to perform central functions in supporting clinic operations. This included patient support, treatment preparedness and adherence counselling, facilitation of support groups, arrangement of follow-up visits, teaching patients on ART to package pillboxes, handling HIV counselling and testing, and collecting and collating statistics. Quality assurance was maintained through a heavy emphasis on weekly meetings and training workshops. Community actors, such as volunteers, support groups, various committees and activists, were

engaged to enhance programme quality in terms of clinical and social outcomes and programme retention [27].

The Lusikisiki study was able to achieve rapid scale-up of treatment coverage and enhanced service efficacy, using existing capacity from within the community as a key component. Concerning clinical outcomes, the low loss of follow-up was regarded as a success attributed to the work of the Adherence Counsellors [25].

A qualitative study by Heunis et al. [28] provides evidence that LHWs are uniquely positioned to understand and influence patients behaviour, and to increase the quality of services and care. This evidence was extracted through a series of interviews about patient behaviour with different healthcare providers. It concludes that due to their growing presence, multi-skilling and importance in the health system, LHWs are able to break the professional barrier in assisting and influencing patients. For example, a LHW is able to take additional time to explain the importance of HIV testing and can empathise with the potential discrimination within their community. LHWs can offer services that prevent new infections and support continuity of care, directly reducing the burden of HIV and TB in communities [21]. However, Heunis et al. note that despite the unique position of the LHWs to impact on patient behaviour and improve health service delivery, they are rarely consulted for their insight.

2.8 Prevention of Mother-to-Child Transmission of HIV

While LHWs have little formal medical background, there is an understanding of HIV related and maternal issues. LHW are usually based within their own community for which they feel a strong responsibility, and about which they possess a historical knowledge of the surroundings.

They have been proven to be effective when assisting patients through the PMTCT programme, which has a higher efficacy when administered correctly [29]. This is explored further in the systematic review by Lewin et al. [30] which evaluates the use of LHW interventions in improving maternal and child health in low and middle-income countries. It highlights that most of the reviewed interventions were effective when focused on specific health issues, compared to a worker being responsible for an array of general PHC related duties. It did, however, conclude that not all interventions had mechanisms of evaluation built into their programmes, or output that that could be generalised across different settings. This includes data on beneficiary availability, resources needed for intervention, information on drug shortage, and further financial support for such programmes. Coetzee et al. [29] identify a high rate of attrition between testing for HIV and commencing treatment. This presents an opportunity for facility-based LHWs to facilitate testing for antenatal clinic attendees. By filling this gap, a LHW is able to provide assistance with access to treatment and on-going adherence, or prevention , depending on the patient eligibility [7]. By providing this role in primary healthcare, LHWs will be able to assist with ensuring continuity of care for PMTCT programmes. PMTCT is regarded as a cost effective intervention with substantial life-saving benefits. Scaling up coverage could have a considerable impact on the trajectory of the HIV epidemic [7].

A report by Baek and Rutenberg [31] considers the strengths of the Mothers2mothers (m2m) programme. While this initiative is intended to be led through clinic-based peer support, it provides valuable insight into supporting pregnant women in PMTCT services. HIV-positive pregnant women and new mothers were provided with focused education sessions and one-

on-one psychosocial support, and assisted with accessing services. Women who participated in the m2m programme were significantly more likely to disclose their HIV status to others, test for CD4 count cells during pregnancy, receive Nevirapine for both the mother and infant, and exclusively infant feed. The mothers also reported improved psychosocial indicators such as being less likely to feel alone or overwhelmed, or to fear the future. The authors advocate that this peer support model has resulted in an increased uptake of PMTCT services. It focuses attention on simplifying the complexities of the drug regimen through providing adequate counselling, patient-orientated resupply systems, adherence support groups, monitoring side effects, and providing reminder services for patients.

2.9 Task-shifting

Given the budgetary constraints and healthcare worker shortages, particularly those facing lower-middle income countries, the WHO has called for the adoption of task shifting in public healthcare facilities and has provided guidelines [32]. This call is given further prominence by the urgent need for care brought on by the HIV/AIDS epidemic [16].

Within the South African public health sector, 34.9% of medical practitioner and 40.3% of professional nursing posts remained unfilled in 2008 [33]. The WHO reported that in 2011 there were only 75 physicians per 100,000 people in South Africa [34]. The WHO defines task shifting as task delegation from professionally trained health workers to less specialised LHWs, to maximise human resources and improve coverage. In 2010, there were roughly 40 000 lay workers and 48 000 professional nurses, indicating that LWHs existed in significant numbers in comparison to health professions [23]. This workforce would be well suited to extend their skills

and services in reducing the burden placed on professional nurses and towards impacting on health outcomes.

The WHO guidelines [32] support the model of "treat, train, retrain", explaining that existing health systems need to maximise their current resources (both financial and human) to expand access to all population groups and improve overall quality of care. The model follows three steps: focusing on the treatment and prevention of HIV/AIDS and related infections among health workers themselves, on-going training of new and existing workers, and exploring approaches to prevent health worker attrition.

A published guide by the WHO entitled "Task shifting to tackle health worker shortages" [35] calls for a departure from conventional models that rely on costly and highly concentrated specialised professionals, who are often disconnected from the needs of the community. It states that training a new community health worker takes between one week and a year, compared to three to four years needed to train a nurse. This type of task shifting requires accompanying legislation which enables and regulates the role of the LHW. This is not always realistic given the immediate needs, resulting in varying tasks and duties being taken on by LHWs, often with insufficient training. Standards must be set for defining the training and experience needed, with an appropriate examination and mentoring process. This can be achieved through credentialing. Samb et al. [36] support this approach, while emphasising that governments and international organisations must assist in preparing health authorities to introduce task shifting as an initiative. This must include setting up regulatory frameworks, and

formalising criteria needed for the hiring, training and management of a supporting health cadre. Introducing a lesser trained workforce into an existing health system must be done with delicacy, in order not to provoke the existing professional health workers, on whom the system is heavily dependent. These professionals continue to provide the backbone of clinical practice, which the LHWs are supporting.

Critics such as Dovlo [4] question whether it is a feasible option for poor countries to consider delegating professional skills and responsibilities to less qualified practitioners. The need for on-going supervision and training is a theme that will be explored throughout this literature review. Due to poor quality of care results in Mozambique, the Ministry of Health suspended training of non-professional health workers providing ART, until the training programme could be re-examined [37].

Similar questions have been asked of task sharing initiatives in high-income countries, such as the efficacy of nurses assuming certain responsibilities from doctors. Results of LHW programmes in the United States have also varied. A systematic review of LHW programmes by Viswanathan et al. [38] showed mixed results on participant behaviour change and health outcomes. Brownstein [39] recognises the potential strengths of such programmes, but concludes that stronger evidence-based research is needed.

The paper “Task shifting: the answer to the human resources crisis in Africa?” [16] agrees that the government has a role in introducing a regulatory framework and upgrading specific training institutions. National scale-up cannot be led primarily by NGOs, who often have a

limited geographic scope and lack long term donor funding. It calls for the community as a whole to be actively involved in the process, in order to take ownership. Introducing community workers into the health care system evokes community involvement in accessing services and provides a voice for their needs.

Lehman et al. [16] question if the task shifting approach can play a significant role in re-engineering the PHC model and contribute in the long term towards alleviating health systems crises, especially in relation to HIV/AIDS. The WHO warns that implementing task shifting should be not be seen as a short term solution or cost-saving measure, but rather as a long term investment for improving services [32].

Jaskiewicz and Tulenko [40] analyse the workload facing LHWs, noting from a multi-country study that there is an ever increasing number of tasks which are learnt on site. In resource constrained settings, LHWs are expected to do more with less, and often lack the necessary support, supplies and equipment. An example was highlighted, where LHWs focusing on improving new-born care in Bangladesh attended less than 5% of all births due to challenges with their workload, travel distances and difficulty receiving timely notifications. While there is no optimal number specifying how broad a range of tasks can be performed, there appears to be a tipping point where the high work load and limited support start to diminish productivity and quality of service. The study states that generalist LHWs are prone to having the heaviest workload, given their wide range of responsibilities. When there are too many tasks at hand, they may not perform all their duties, but rather select those that are more easily accomplished. Therefore, roles must be clearly defined, with specific duties, in order to

maximise the effectiveness of LHWs. Programmes must monitor and assess if adjustments need to be made, such as reducing catchment populations, increasing capacity through training, or providing stronger support structures. LHWs should be consulted for their feedback on how best their environment can be organised to maximise productivity and to garner motivation. Further research needs to be done to define the desired degree of productivity for specific components of LHW programmes.

2.10 Health Promotion

LHW are able to impart health education with a community perspective, which is often based on their own experiences with testing, undergoing treatment, and overcoming stigma and discrimination [41]. Perez and Martinez [42] go further, and call them advocates for social justice within their communities. LHWs represent a voice of those who do not have access to services and should “be understood as a critical component of integrated systems of health care and as advocates for the myriad issues that keep people outside of the grasp of life, liberty, and the pursuit of happiness.” LHWs are able to serve as “connectors” and “navigators” of the health system, but are also able to influence policy makers through their frontline experiences. While individual interventions are effective, it is widely recognised that behaviour change programmes achieve better results with combinations of interventions [7].

In a paper on “Health Promotion in South Africa” [20], Onya identifies health promotion as one of the main pillars in PHC, as part of achieving ‘Health for All’. Responsibility for implementation lies with all levels of government, supported by the National Health Promotion Directorate, as well as national NGOs providing health promotion campaigns. Onya calls for a coordinated

monitoring and evaluation of health promotion services, in an effort to curb fragmentation, and to ultimately address key social determinants of health, such as low literacy among women.

The WHO defines health literacy in this context as "as forming the bridge between the provision of treatment and the preparation and involvement of people and communities in comprehensive responses to HIV and AIDS." It encourages individuals to take control of their health, know their status, and gain access to treatment. They will be able to provide support to others and advocate for their right to services and treatment. Health Literacy is the degree to which individuals are capacitated in understanding basic health information to make appropriate health decisions [43]. Research in the United States has shown that a higher level of treatment adherence is associated with health literacy than with years of formal education [44]. While appropriate education is needed, health literacy may well be futile without the engagement and support of community-level actors. The WHO recommends that health literacy must be integrated across the HIV & AIDS education continuum, and not seen as a separate component, new initiative or additional burden. It should be included as part of all programme planning processes, especially relating to community-led initiatives. Affected communities and individuals, supported with the necessary knowledge and skills, should be exploited for their expertise. Health promotion processes and impacts should then be monitored, evaluated and documented to form an evidence base for developing future initiatives [43].

2.11 Recruitment, Management & Supervision

At the time of the main randomised controlled trial study design, no finalised comprehensive

policy template existed, with little field research on the standardisation of staffing, training and supervising LHW services across South Africa. This study aims to address the research gaps through evaluating the role and impact of integrating a LHW into a clinic, to improve patient uptake and retention of PMTCT services.

Randomised controlled trials provide the most rigorous study design for evaluating the effectiveness of an intervention. A Cochrane review on the use of LHWs [45] found, however, that these trials often had poor intervention documentation regarding its setup, operation and causal factors for certain outcomes. Supporting qualitative research is needed, as randomised controlled trials are not always the most appropriate or comprehensive, particularly for interventions focused on primary healthcare reengineering. In addition, while the similar trials showed effectiveness, there is heterogeneity within subgroups, such as infant feeding and childhood immunisation. Including complimentary research, which can be conducted independently, will shed light on factors that contributed to programme outcomes. This could include documenting how the LHWs are recruited, trained and managed, and their relationship with patients and professional health workers. Such factors could provide insights into the causes for heterogeneity among trial results. The Cochrane review concludes that too few trials incorporate an in-depth process evaluation, including the use of qualitative analysis to interpret what influences the outcomes of these intricate studies.

A review of literature on LHW programmes by USAID [46] shares a similar sentiment. It states that to "effectively evaluate LHW programs, identifying key characteristics attributed to program success or failure is essential". However, defining characteristics, roles and

responsibilities can be difficult, given the extent to which the context can vary. It reviewed programmes in South Africa to highlight the key components involved in the success and failures of working with LHWs. These included the importance of establishing a feedback loop between the LHWs and the health system, on-going monitoring and evaluation of programme, training, setting up routine meetings, recruitment through involved agencies, considering traditional beliefs and leaders in programme design, developing a strong management structure, and learning from past experiences. Areas needing improvement focused primarily on the lack of standardisation and the inconsistencies that resulted. This included the lack of a clear LHW policy, differing roles and responsibilities, varying levels of training, operational inconsistencies, disorganised recruitment, absence of evaluation, a lack of career pathing, and insufficient supervision and support.

Uwimana et al. conducted an analysis [21] on the engagement of LHWs from 33 NGOs in KZN, working across 42 health facilities on TB, HIV and PMTCT related activities. Lack of supervision was cited as a challenge by government and NGOs, revealing that assigned supervisors were unable to properly oversee such large groups of LHWs. Recommendations were made to establish formal structures at the health facility to strengthen the supervision process. With regards to training, most of the LHWs were equipped according to the mandates of the hiring NGO. Given that funding was influenced by donor funds towards vertical TB or HIV programmes, training was aimed at specific tasks, with very little training related to PMTCT. LHWs in the focus groups appealed that they should all be trained to provide a wider range of services, allowing for greater coverage and career generalisability. Government and NGO

managers hypothesised that facility-community linkages and NGO-LHW collaborations could be improved by developing a robust monitoring and evaluation system for community-based activities. Support should be integrated into the programme at a facility level, providing supervision and creating a formal link to the community.

A study by Jaskiewicz and Tulenko [40] outlines the absence of regular and reliable supervision to be one of the weakest links in a LHW programme. It stresses that the quality of supervision is very important in avoiding low morale and poor productivity. It argues that health professionals often lack the background for a supervisory role and instead treat it as a bureaucratic exercise. This then results in “policing”, rather than helping the LHWs identify problems and implement innovative solutions. A more participatory supervision role is needed along with peer-to-peer support. In Bangladesh, higher level LHWs were assigned to oversee other LHWs, allowing them to relate to the expectations, pressures and context of the work. This also provided a new role to which LHWs could aspire. The paper goes further to recommend that mobile phones should be considered for improving supervision and communication, and to combat isolation.

2.12 Costing

A document titled “Costing Guidelines for HIV Prevention Strategies” [46] by the Joint United Nations Programme on HIV/AIDS (UNAIDS) provides consensus on costing definitions and guidance on cost allocations. As outlined, all research costs must be omitted and only operational costs relating to the intervention are to be included.

Definitions are outlined for different cost types, and data collection forms are provided to assist with the categorisation of different costs and any adjustments that may be required. These guidelines are designed to assist programme planners and managers in costing specific interventions focused on reducing HIV transmission, and outline eight points that can be followed with a spread sheet tool for calculating data on unit costs. The first step calls for *the target population to be prioritised*. In the case of this study, the target group is HIV positive pregnant women presenting at specific public health facilities in the Motheo District in the Free State. All components of the intervention have been specifically focused on PMTCT directed at the target group in reducing vertical transmission. Then *coverage targets need to be set for reaching a specific sub-population*. This was achieved through collecting base-line data of HIV positive pregnant women accessing services. Targets had to be set in order to fulfil the statistical requirements of getting a significant result. *An effective intervention package must be designed for the target population*. This was achieved through creating a range of LHW in-clinic services covering patient follow-up, health promotion, task-shifting, running community events, and monitoring and evaluation. The next step requires *computing the economic cost of intervention*. This is done through collecting the NGO costs of the intervention. The cost per LHW can be calculated, but the cost effectiveness will not be included in the scope of the study report. A spread sheet tool is provided to assist with calculations. Then *the total resource needs based on the size of the sub-population will need to be estimated*. This study report considers scaling up the intervention and refers to district HIV prevalence and resources. *The impact of the planned intervention on the incidence and prevalence of HIV must be explored*. This can be

seen by comparing outputs of the case and control clinics. The final steps *cover re-examining and optimising the allocation of resources*, *and* including *any resource gaps*.

2.13 Financial Incentives

The strain facing the South African health system cannot be remedied hastily or with a simple solution. Financial constraints and health worker shortages create large obstacles that require a long-term, calculated plan. A sufficient financial investment has to be made in recruiting and training a large cadre of LHWs, along with funding the impending upgrades that the majority of primary health facilities and services already require [47]. The LHW initiative is to be seen as an enabling tool in re-engineering primary healthcare, and not a miracle fix. The expected benefits would therefore come at an additional initial cost, with cost-saving only seen down the line. Hiring and training a non-professional health worker is, however, substantially more affordable than training a professional, as is focusing on prevention rather than treatment. In a model devised to demonstrate the financial benefit of CHW programmes within sub-Saharan Africa, a cadre of 35,191 trained CHWs in South Africa was calculated to cost 80.13 million US Dollars [48]. Adapting the model to present day prices, the proposed CHW programme would cost approximately 3% of the 2012 Health budget [49].

In an article advocating for prevention strategies, Canning [50] claims that funding spent on prevention is approximately 28 times more effective than when spent on treatment. These studies drew a response from the WHO and Global fund at the XIV World AIDS Conference, held in Barcelona in 2002, noting that prevention and treatment must always be in combination to be effective.

While multiple studies confirm the cost-effectiveness of an aggressive programme of antiretroviral treatment, they also emphasize the need for more creative strategies of prevention [51] [52]. This argument is developed further by Canning, stating that Government and international organisations are mistaken in neglecting to consider the cost-effectiveness analysis approach in policy-making. Given the scarce availability of resources, cost effectiveness analysis is the "right tool" to maximise health benefits. In developing countries, the costing of alternatives must always be explored when considering scaling up an intervention. The ethical basis must also be considered, given that treatment comes at a high cost when compared to prevention approaches, but forms part of a comprehensive strategy. If LHWs are able to substantially decrease the burden of HIV/AIDS, then the related financial investment will be comparatively cost-effective.

2.14 Expanding Treatment Eligibility

Findings supporting the early initiation of treatment have led to the recommendation and adoption of new guidelines in which HIV positive pregnant women would be eligible to commence with treatment immediately, regardless of HIV disease stage or CD4 count. As ANC and PMTCT programme structures already existed, expanding ART to all HIV positive women would only include the additional treatment costs involved in covering the period between the end of pregnancy and ART eligibility [53]. It also simplifies the PMTCT cascade, in which complexity had emerged as a challenge to adherence. Creating a uniform standard for PMTCT treatment allows for a simpler understanding of protocol for health workers and patients. Previous policies were designed to balance clinical benefits with limited resources, by prioritising treatment through CD4 count eligibility. In light of evidence on ART reducing the risk

of transmission, current policies for all HIV positive groups need to be reviewed. Benefits could be found not only in epidemiological and clinic measures, but also in cost-effectiveness.

2.15 Gaps in Current Research

Looking past the success of the Lusikisiki project, other studies are cautious in stating that task-sharing must be just one part of a comprehensive system [47]. Task-sharing alone will not resolve the financial and health worker shortages caused by HIV/AIDS. The high level of health worker attrition is important and its determinants should be identified [54]. Adequate remuneration is needed to retain LHWs, along with on-going training and quality supervision [55]. Prior initiatives have compensated lay health workers on a part time basis with a stipend, lacking the formalisation of full-time employment with salaried work. While still under the umbrella title of lay health worker, this cadre has had a far reduced scope of work with little to no career pathing or assimilation into the formal health sector.

Reflecting on the current literature regarding the utilisation of LHWs, there is justification to further research the role of facility-based LHWs in improving service delivery and health outcomes in South Africa. Documentation of this process is also relevant to PHC re-engineering. More qualitative data is still needed on effectiveness of lay worker interventions [45]. Questions exist regarding which characteristics of LHWs and which role specifics make them effective [56]. Further documentation of these elements is needed to allow for replicability [4].

2.16 Going Forward

The “Human Resources for Health Strategy for the Health Sector” report provides details on current developments regarding the formalisation and scale-up of LHW initiatives across South Africa. In October 2011, the first 5000 new category LHWs were trained within Provincial guidelines developed for their training and employment [22]. Much needs to be decided before the LHWs can be rolled-out as part of the PHC team. Stakeholders need to reach agreement on a standardised scope of work, required competencies, training and supervision, remuneration and other contractual conditions. While it has been mutually accepted that ward teams will be led by a nurse, the make-up of home-based carers and specialised or generalised LHWs is still to be agreed upon.

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3. Journal Manuscript

Human Resources for Health
4000 word limit excluding abstract, figures and reference list

3.1 Abstract

3.1.1 Background

South Africa is facing a health care worker shortage which is contributing to poor health outcomes, especially in mother-to-child transmission of HIV. In order for Prevention of Mother to Child Transmission (PMTCT) programmes to achieve success, coverage needs to be dramatically increased. This paper aims to provide specifics on the costs of integrating a Lay Health Worker (LHW) into a clinic to improve patient uptake and retention of PMTCT services, in what was previously the Motheo district, Free State.

3.1.2 Methods

This study analyses the costs of a LHW model, as part of a randomised controlled trial to evaluate the impact of LHWs on PMTCT programme coverage and health outcomes. A total of 32 clinics were randomly selected under the randomised controlled trial, with 16 clinics having introduced the LHW model and the remaining 16 clinics offering the base standard of care. Scaling up across all 5 districts in the Free State province was also considered.

3.1.3 Results

For the LHW model to operate across 16 facilities would cost R2,091,481 per year (R130,718 per clinic) or approximately R377 per first antenatal care (ANC) visit. Capital costs accounted for 3.7% and recurrent costs for 96.3% of the intervention. Personnel salaries accounted for 63.9% of overall project costs. There was a contribution of 8.4% of total personnel costs to head office salaries, with 52.5% of overheads being attributed to head office overhead costs, compensating

head office structures and support services. Due in part to the landscape and limited travel options, transport accounted for 8.3% of total costs.

3.1.4 Conclusions

It would cost R16 643,770 to scale up the LHW model to all five districts in the Free State, covering 222 public health facilities. South Africa's National Treasury has allocated R133.6 billion rand in the 2012/2013 budget [1] towards strengthening public health care, of which scaling up for the Free State would account for 0.012%, and 0.13% of all HIV/AIDS and TB expenditure.

3.1.5 Keywords

Task-shifting, Lay Health Workers, Community Health Workers, PMTCT, health promotion, primary health care, costing, model, Free State, South Africa

3.2 Background

The 2010 Antenatal Sentinel HIV and Syphilis Prevalence Survey estimated that 30.2% of pregnant women aged 15 to 49 in South Africa were living with HIV. In 2011, over 63 000 children were infected with HIV, which remains the primary cause of the majority of child deaths [2]. In a global effort to encourage development by improving social and economic conditions, the World Health Organisation has outlined Millennium Development Goals (MDGs) designed to address disease, income, poverty, hunger, ignorance, and squalor. Attainment of these goals, particularly in Sub-Saharan Africa, is proving to be a challenge. South Africa has ambitious targets to reach in regards to MDGs 4 and 5, which focus on the health of children and women, and MDG 6, which covers HIV/AIDS, tuberculosis and malaria [3]. Progress towards reaching these goals, and reducing infant mortality in South Africa, will depend largely on scaling up effective prevention against mother-to-child transmission (PMTCT) of HIV [4], contributing to the majority of HIV infections.

Issues with adoption to the PMTCT treatment programme still persist, with only 50% of HIV positive pregnant women accessing treatment, despite universal coverage. Complexities within the PMTCT treatment cascade can deter patients, or result in crucial dosage dates being missed during different stages of pregnancy. This can drastically increase the risk of vertical transmission, and may contribute towards drug resistance. At a primary health care level, the PMTCT programme's success depends on the development and testing of suitable community-based care models, focused on wide reaching, affordable inter-personal care. One such response has been to focus on the reassignment of roles in the clinic by shifting tasks from

health workers, such as nurses, to lower-level community health workers. This allows for the streamlining of care by providing greater access to services for patients, while maintaining the quality standards and maximising resources [5].

Facing budgetary constraints and debilitating health care worker shortages, the South African National Department of Health recognises the need for re-engineering the current Primary Health Care (PHC) approach, which includes formalising the work of Lay Health Workers (LHWs). These workers are able to support aspects of PHC, especially in regard to controlling the spread of HIV/AIDS and TB. Many LHWs have previously worked as in-clinic volunteers or lay counsellors, and are able to assist through task-sharing [5]. While LHWs have little formal medical background, they often possess an understanding of HIV related and maternal issues. They have also been proven to be effective when assisting patients through the PMTCT programme [6].

LHWs form an affordable and quickly trained workforce which is able to assist health personnel through task-shifting. They are able spend more time with patients, overcoming the barrier associated with health professionals. LHW are able to share health education with a community perspective, which is often based on their own experiences with testing, receiving treatment, and overcoming stigma and discrimination [7]. A study in Lusikisiki by Médecins Sans Frontiers and the Eastern Cape Department of Health trained community members to be Adherence Counsellors, as a primary health care resource of sub-professional workers, in managing HIV services [8]. A report on the Lusikisiki study by Bedelu et al. [9] states that "As much responsibility as possible was delegated to lower-level health care workers while ensuring that

professional medical oversight was provided to maintain quality control." Despite the success of the Lusikisiki project, other studies are cautious, emphasising task-sharing as just one part of a comprehensive system [5]. The high level of LHW attrition is important, and its determinants should be identified [10]. Hermann [11] finds that adequate remuneration is needed to retain LHWs, along with on-going training and quality supervision.

Reflecting on the current literature regarding the use of LHWs, there is justification for further research into the role of facility-based LHWs in South Africa in improving service delivery and health outcomes. More qualitative data is still needed on the effectiveness of lay worker interventions [12]. Questions exist regarding which characteristics of LHWs, and which role specifics, make them effective [13]. Further documentation of these elements is needed to allow for replicability [14]. A demand-side approach is theorized to be a factor in preventing patient drop off at each level of the PMTCT cascade [15]. Unfortunately there is little field research on the standardisation of employing, training and supervising LHW services across South Africa. This study aims to address identified research gaps through evaluating the role and financial implications of integrating a LHW into a clinic to improve patient uptake and retention of PMTCT services.

The main intervention, which was the subject of this costing analysis, is based in the Motheo district in the Free State, and uses a pragmatic cluster randomised controlled trial study design. Within this district, 16 clinics have been randomly selected and assigned the base standard of care, with another 16 clinics randomly selected for the introduction of the LHW intervention. The 16 facility-assigned LHWs support the clinic through the provision of additional PMTCT

focused services. Their job descriptions include assisting with task sharing, scheduling of follow-up consultation appointments for expectant mothers, facilitating health promotion sessions in the waiting areas, and the running of open day events to promote the intervention within the community, as part of a demand driven intervention. While the measured outcomes of the trial improved on balance, they are not discussed within the scope of this paper.

3.2.1 LHW model components

Annual training sessions were held for the LHWs in which they were taught a scientific approach to the functioning of the human body, the lifecycle of diseases, the different treatment regimens, and how medicine works to treat infections. This understanding, combined with on-going support, equipped the LHWs with a valuable skill-set within the clinic environment, rendering them vital in achieving the level of service required, and not constituting merely "another pair of hands". These trainings took place over five days and were facilitated by staff within the organisation. Participants were provided with writing materials and updated manual chapters. Content was presented using digital projectors and flip chart paper.

Project operations included a field coordinator, project trainer and administrator stationed at the project office in central Bloemfontein. While the LHWs were considered part of the clinic team and adhered to specific clinic hours and policies, they were directly managed by the field coordinator who routinely met with facility managers to maintain communication and resolve any issues. The project trainer organised weekly mandatory refresher trainings at the office, providing the LHWs with an opportunity to discuss clinical content, be updated on new policies,

and address issues pertaining to payments, annual leave and transport. The project office staff were recruited and managed by Community Media Trust (CMT), a national NGO based in Cape Town, which provided further support with regards to human resources and finances, in accordance with organisational policies. A project coordinator was based at the head office.

The LHWs conducted health promotion sessions in the waiting area of the clinic, which provided an opportunity to refer expectant mothers for the individual follow-up schedule programme and HIV testing. Women testing HIV negative were counselled and encouraged to re-test at 32 weeks. Women testing HIV positive voluntarily had their contact information recorded on the schedule card, allowing the LHWs to provide support and reminders for appointments by SMS or phone call. At every subsequent clinic visit, the expectant mothers were able to meet with a LHW for advice on reducing the risk of vertical transmission of HIV.

Each clinic hosted a community open day event at a lively nearby location, such as a taxi rank or shopping centre. The event featured music, health promotion sessions facilitated by LHWs, related materials being distributed, and prizes awarded for active listeners. It served to promote the LHW programme and drive demand of HCT and PMTCT services. Partner organisations, such as New Start, were invited to provide HCT services and tests for diabetes and hypertension, in which the LHWs also assisted.

The LHWs also assisted in clinic duties as part of task sharing, with emphasis placed on antenatal services. Duties included patient administration, weighing babies, disclosing PCR test results, and registering new ARV patients. The LHWs were trained in HIV counselling and

testing, thus allowing them to test and counsel pregnant women as an entry point into the PMTCT programme. In order for PMTCT programmes to achieve success, coverage needs to be dramatically increased. This paper aims to provide specifics on the costs in integrating a LHW into a clinic to improve patient uptake and retention of PMTCT services, in what was previously the Motheo district, Free State.

3.3 Methods

3.3.1 Study design and setting

The Motheo district in the Free State was selected for this study, as it is was not subject to any similar interventions, and had a high antenatal HIV prevalence of 31.6% [16]. The Free State province has 5 districts, and an HIV prevalence of 18.5% in the 15 to 49 years old age group [17]. This study provides a description of the model and an analysis of the costs involved, and estimates the financial investment needed in scaling up to all 5 districts in the Free State.

3.3.2 Data management

The actual cost of introducing a LHW into a primary health facility, as outlined in the model, is calculated retrospectively from the provider perspective of the implementing NGO. Data collection was undertaken using an ingredients-based costing methodology in multiplying the quantity of resources by their market value, in order to obtain total costs. This approach is particularly useful when assessing the replicability of a study, as specific parameters can be adjusted. The implementing NGO was consulted in extracting relevant project costs from annual budgets, financial reports and ledgers over the three year project period. All research costs of the randomised controlled trial, such as data collection, were omitted. Interviews were

also conducted with LHWs, nurses and facility managers, in order to identify any misrepresented or hidden costs. All economic costs were considered, defined to include donated goods and services, which were adjusted for present day values. This was collected by finding rates for similar items through local providers. The project benefited by absorbing items from previous grants and other projects, including training materials and office furniture. Expenditure was separated into recurrent and capital costs, and adjusted to reflect 2013 pricing. All costs are reflected in South African Rands.

3.3.3 Recurrent costs

Recurrent costs reflect the cost of items incurred within a year. In this study, such recurrent costs include:

- Personnel (head office staff, project office staff,LHWs)
- Overheads (including rent, water and electricity, insurance)
- Consumables (including office supplies, airtime, print materials)
- Transport (including flights, accommodation, public transport fare, vehicle maintenance)

Personnel costs were based on fully loaded remuneration packages, including a contribution to a death and disability fund and bonus payments. These were calculated as a proportion of time spent working on project activities. Overheads were sourced from expenditure reports and staff interviews, and valued as a proportion of time and space dedicated to the project. Consumables were measured through expenditure reports and office records. Transport costs

were determined as the proportion of trip activities spent working on the project, and sourced from staff project reports and staff interviews.

3.3.4 Capital costs

Capital costs are resources that have a lifespan lasting more than one year. In this study, capital costs include:

- Project vehicle (purchased used with no maintenance plan)
- Equipment (including computers and furniture)
- Initial training (including training project staff and introducing project to Department of Health)

The capital items were annuitised for appropriate useful life span at a 3% discount rate, as recommended by Drummond et al. [18]. The project vehicle was assigned a 10 year life span, with all equipment, furniture, initial staff training and the Monitoring & Evaluation system being given a 5 year life span.

3.3.5 Data analysis

All collected data was captured and analysed using Microsoft Excel. Activity costs were calculated according to a percentage of each resource and input required, and presented as a proportion of total costs and proportion of costs per facility. The average cost for every ANC patient exposed to the intervention was calculated by dividing the total intervention cost by the average number of first ANC visits to the intervention facilities per year. While there were two LHWs recruited to one particular clinic (due to greater geographical isolation) the costing was adjusted to account for one LHW per facility.

3.3.6 Estimating cost to scale up

As part of the analysis, the costs have been separated by activity, with each being a component of the tested model. Replicability of the activities were considered in developing a budget for scale up in all five districts in the Free State, being Mangaung Metropolitan, Lejweleputswa, Thabo Mofutsanyana, Fezile Dabi and Xhariep. Specific consideration was given (by district) for particular challenges, such as sparsely populated areas characteristic of the province, concentration of health services and distances to facilities.

3.3.7 Ethics

This study abided by the University of Cape Town's ethical guidelines with all study operations in accordance with the Declaration of Helsinki of the 25th World Medical Assembly. Permission to conduct the study was obtained from the Motheo District Department of Health and Free State Provincial Department of Health.

3.4 Results and discussion

Total costs of operating the LHW model across the 16 selected facilities costs R2,091,481 per year, at R130,718 per clinic. There was an average of 5,541 first ANC visits, which amounts to approximately R377 per first ANC visit. Capital costs accounted for 3.7% and recurrent costs for 96.3% of the total amount. As shown in Table 6, the initial staff training cost R32,531 (1.6% of total costs, 42% of capital costs), which also included meetings to introduce the project to the Free State Department of Health and train facility managers on the intervention. Emphasis was placed on this component to avoid compromising the introduction of LHWs into the facilities. Providing an in-depth training curriculum, covering both content and hands-on skills, assisted

with gaining full buy-in from the health facilities and was emphasised through training as a core cost. Refresher training sessions are classified under consumables in recurrent costs, as part of providing on-going training for the LHW team.

The model aimed to positively impact clinical outcomes and to alleviate the work burden faced at a health facility level. The intervention also directly created employment for project staff, offering professional career path options through on-going on-the-job training, skills accreditation and financial assistance. Personnel salaries make up the largest recurrent cost category, with the LHW team accounting for 63.9% of overall project costs. The model employed LHWs on a full-time basis, rather than on a stipend, therefore allowing the NGO to enforce full-time working hours without the LHWs having to supplement their income elsewhere. The clinic staff can rely on the LHW attending work on a daily basis, taking on responsibilities within their role, and being considered a part of the clinic team. In order to provide organisational support and structures (such as finance, HR and management) there is a contribution to head office personnel salaries, which accounts for 8.4% of total personnel costs. In addition, 52.5% of overheads went towards head office overhead contributions, which amounts to approximately R9,698 per clinic annually.

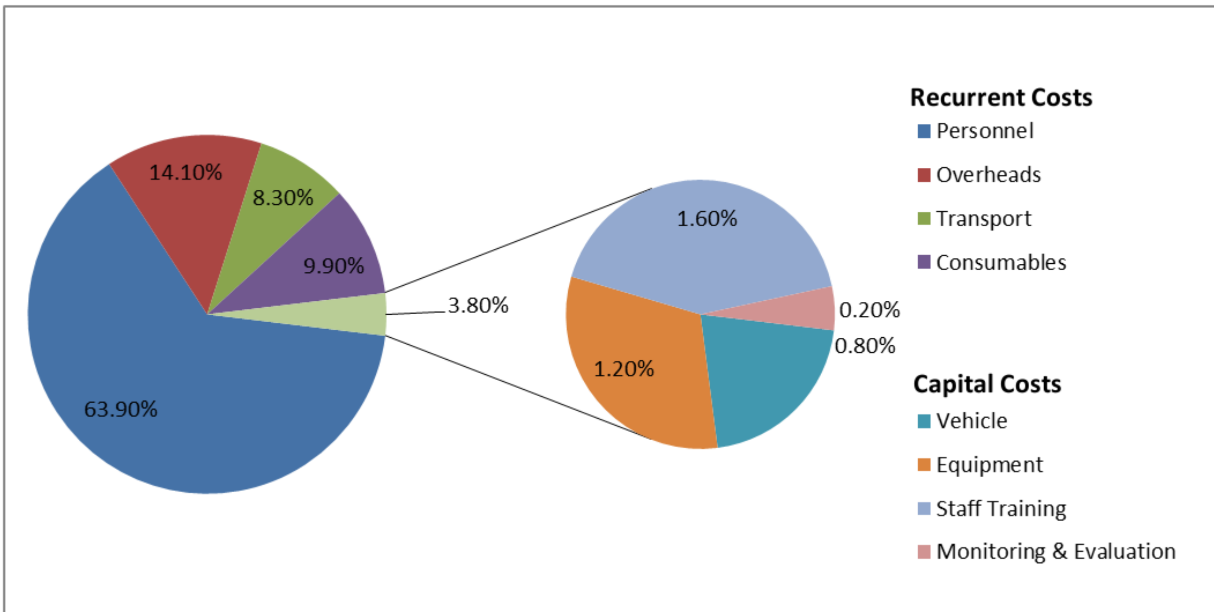
The sparse layout of the Free State presented logistical issues, as there are few public transport options and heavy road construction, causing delays. Transport accounted for 8.3% of total costs, despite the purchase of a project vehicle (procured at R83 042.29 in 2008 and adjusted for present day value). This was in part due to the outlier of spending R85,680 per year on car hire to transport the more rurally located LHWs to the project office and open day events. Even

in remote areas, Transport was considered an essential investment to provide on-going training, mentorship and supervision.

Table 6: Capital and Recurrent costs of separated by cost category, in 2013 Rand

Capital	Full Intervention	Per Clinic	%
Vehicle (incl. registration)	17,699	1,106	0.8%
Equipment	24,351	1,522	1.2%
Staff Training	32,531	2,033	1.6%
Monitoring & Evaluation System	3,712	R232	0.2%
Subtotal	78,293	4,893	3.7%
Recurrent			-
Personnel	1,335,723	83,483	63.9%
Overheads	295,622	18,476	14.1%
Transport	173,932	10,871	8.3%
Consumables	207,910	12,994	9.9%
Subtotal	2,013,188	125,824	96.3%
Total	**2,091,481**	**130,718**	**100%**

Figure 1: Pie chart of capital and recurrent cost breakdown in 2013 Rand



The recurrent costs can be classified by activity to gain an understanding of each component cost as seen in table 7. The activities are often complementary, requiring the same general administration and support, as well as common knowledge of content and similar training. Each additional activity comes at a nominal cost, but provides substantial value once the investment has been made in the mentorship, training and supervision. Certain activities require specific resources, such as follow-up appointments requiring printed cards and diaries to record the patient information, and airtime to contact the patient with reminders for appointments. Costs for the open day events component included catering, hiring of sound equipment, hand-outs and catering. All components made contributions towards project salaries according to proportion of time attributed to each component.

As detailed in the literature review, there is little research done on the costing of similar LHW models or components. This makes it difficult to compare the value of the project LHW's scope of work to other studies.

Table 7: Recurrent costs separated by activity, in 2013 Rand

Activity	**Full Intervention**	**Per Clinic**	**% of total costs**
General Admin and Support	695,277	43,455	33.2%
Follow-up Schedule Appointments	367,191	22,949	17.6%
Health Promotion Sessions	557,372	34,836	26.6%
Task Sharing	193,359	12,085	9.2%
Community Awareness Events	199,988	12,499	9.6%
Subtotal	2,013,188	125,824	100%

3.4.1 Sensitivity analysis

Performing a sensitivity analysis tests the robustness of findings to changes in key variables, such as cost components [19]. Transport constitutes a major challenge across rural South Africa, and the Free State province is no exception. In one year, approximately R85,680 was spent on car hire, in addition to the project vehicle. The LHWs located in the outer sub-districts need to travel to office meetings, open day events and training sessions, which is often not possible with public transport. As an alternate option, providing increased seating and improved suspension, the purchase of a multi-cab vehicle has been annuitised for a 10 year item life, considering petrol, maintenance, insurance and the avoidance of public transport costs. The large capacity vehicle would cost R93,687 per year compared to R68,569 for the sedan vehicle used in the project.

3.4.2 Scaling up

In estimating the costs for scaling up the model to all 5 districts in the Free State, multiple factors were considered in relation to the intervention. The roles and responsibilities of the staff would be focused solely on the project, without having to conform to stipulations of a controlled trial. This would allow the office staff to oversee more LHWs, and the LHW teams to have less frequent routine meetings, without compromising the quality of their work. Operating an office in each district (with the exception of Xhariep combining with Mangaung) would align with government structures and simplify travelling to the office for routine meetings and training sessions, which will remain a challenge for the LHWs. Scaling up the model makes provision for recruiting of new LHWs, with one being placed in every primary health facility in

the districts. If existing LHWs were to be utilised under the model, then the Staff Training cost category (which includes recruitment) could be omitted.

Table 8: Estimated costs for scaling up by district, in 2013 Rand

	Mangaung (44) & Xhariep (21)			Lejweleputswa (45)			Fezile Dabi (38)			Thabo Mofutsanyane (74)		
Capital	Scale Up	Per Clinic	%	Scale Up	Per Clinic	%	Scale Up	Per Clinic	%	Scale Up	Per Clinic	%
Vehicle	17,699	272	0.4%	17,699	393	0.5%	17,699	466	0.6%	17,699	239	0.3%
Equipment	37,923	583	0.8%	31,608	702	0.9%	30,255	796	0.9%	39,770	537	0.8%
Staff Training	91,030	1,400	1.9%	71,808	1,596	2.0%	59,002	1,553	1.8%	99,814	1,349	1.9%
M&E System	3,712	57	0.1%	3,712	82	0.1%	3,712	98	0.1%	3,712	50	0.1%
Recurrent												
Personnel	3,441,983	52,954	72.9%	2,544,853	56,552	71.1%	2,271,853	59,786	70.7%	3,792,983	51,257	73.9%
Overheads	365,772	5,627	7.8%	315,818	7,018	8.8%	298,622	7,858	9.3%	365,772	4,943	7.1%
Transport	224,831	3,459	4.8%	192,592	4,280	5.4%	186,512	4,908	5.8%	224,831	3,038	4.4%
Consumables	536,530	8,254	11.4%	400,855	8,908	11.2%	344,690	9,071	10.7%	588,415	7,952	11.5%
Total	**4,719,481**	**72,607**		**3,578,946**	**79,532**		**3,212,345**	**84,535**		**5,132,998**	**69,365**	

Each project office would be comprised of an office coordinator and an administrator, with the number of trainers dependent on the size of the LHW team. They would have access to a project car, for routine visits to the health facilities. The office space would include an additional training room for hosting the LHW groups and for storing print materials. Other details would remain similar to the intervention, with the exception of operating at a slightly reduced intensity due to the increased LHW group size. This would result in less frequent group meetings and supervisor visits to the facility, without reducing the emphasis of the model. As part of estimating scaling up to the provision of one LHW for every primary health facility per district, LHWs had to be subdivided into manageable groups. This would assist in determining how many trainers would be required and the costing of consumables, such as stationary and print materials.

Given that Xhariep borders Mangaung and would only require 21 LHWs due to its sparse population density, it would be beneficial to combine the two districts into one office to share the operational costs. Transport is less of an issue in Mangaung, as clinics (44 in total) are more densely distributed, due to a largely urban setting in comparison to the other districts in the Free State. This office would require three trainers to oversee the combined seven sub-districts, comprised of 65 LHWs who would be divided into four smaller groups. Scaling up the model for both of these districts would cost R4,719,481, or R72,607 per clinic, per year. Personnel would cost R3,441,983 (72.9%) with transport at R224,831 (4.8%).

Scaling up the model in Lejweleputswa would require two trainers to oversee 45 LHWs in five sub-districts. This would require the LHWs to be managed as three groups of 15 LHWs. Implementing across the district would cost R3,578,946, at R79,532 per clinic. Personnel would cost R2,544,853 (71.1%) and transport R192,592 (5.4%).

Fezile Dabi district has 38 clinics across four sub-districts, and would require two trainers to oversee the two LHW groups of 19 each. It would cost R3,212,345 to scale up in the district, at R84 525 per clinic. Personnel would cost R2,271,853 (70.7%) and transport would cost R186,512 (5.8%).

Lastly, taking the model to scale in the large Thabo Mofutsanyane district would require 74 LHWs working across 6 sub-districts, costing R5,132,998 in total, at R69,365 per clinic. This would require three trainers to oversee 4 groups of LHWs. Personnel is estimated to cost R3 792,983, at R69,365 per district. Transport would cost R224,831 (4.4%). For a larger and

spread out district such as this, it would be recommended that the multi-cab vehicle option be pursued, as considered in the sensitivity analysis.

Table 9: Estimated costs per activity for scaling up by district, in 2013 Rand

Activity	Mangaung & Xhariep		Lejweleputswa		Fezile Dabi		Thabo Mofutsanyane	
	Intervention	Per Clinic	Intervention	Per Clinic	Intervention	Per Clinic	Intervention	Per Clinic
General Admin & Support	765,427	11,776	715,473	15,899	698,277	18,376	765,427	10,344
Follow-up Schedule	1,148,611	17,671	809,341	17,985	707,878	18,628	1,270,811	17,173
Health Promotion Sessions	1,625,480	25,007	1,167,777	25,951	1,023,659	26,938	1,800,438	24,330
Task Sharing	597,993	9,200	427,253	9,495	371,271	9,770	668,406	9,033
Community Events	431,606	6,640	334,274	7,428	300,592	7,910	466,920	6,310
Subtotal	4,569,117	70,294	3,454,119	76,758	3,101,678	81,623	4,972,002	67,189

When examining individual activities in taking the model to scale, the same considerations apply. In order for the model to have the desired impact, it is recommended that it is applied in its entirety, with all components being retained as complimentary to each other. Removing an activity may be relevant where the same services exist at a district level, such as community awareness events with similar messaging. Replicability can be extended to other districts in South Africa, in which case travel costs may be reduced where districts are more urbanised and improved public transport options exist.

3.4.3 Limitations

The study did not consider costs to the facility as part of the cost allocation. In addition, buy-in and support for the model at a facility level was crucial but difficult to quantify within this paper. Since beginning the trial, LHW policy has shifted towards a community-focused model, structured on ward-based outreach teams (WBOTs).

3.5 Conclusion

For the purposes of extrapolation, Motheo district can be considered a microcosm of the Free State, inasmuch as it provides a rational basis for estimating the costs of a province-wide

implementation of LHWs. In total, it would cost R16,643,770 to scale up the LHW model to all five districts in the Free State, covering 222 public health facilities. South Africa's National Treasury has allocated R133.6 billion rand in the 2012/2013 budget [1] towards strengthening public health care, of which scaling up for the Free State would account for 0.012%, and 0.13% of all HIV/AIDS and TB expenditure. In strengthening primary health care through the financing of this initiative, reductions could be made by closing down old hospitals in the Free State, which are expensive to maintain and are over represented in traditionally white areas. Redirecting such funds from relatively over-serviced areas towards a province-wide LHW initiative would contribute towards the ideal of achieving more equitable access to health services in South Africa. In addition, tangible progress would be made towards South Africa achieving MDGs 4, 5 and 6, if only in the Free State.

The true value of the LHW to the health facility lies in a strong emphasis on training, mentorship and supervision. Common criticism of LHW models is workers often perform menial tasks within the facility and lack a defined role. This model aims to establish the LHW as an integral, higher value part of the clinic environment in providing health education and ensuring continuity of care. Moreover, the model demonstrates that the financial implications of utilising LHWs can be definitively quantified at the district level, based on the empirical experience of the Motheo study, and can be extrapolated with predictable results at the provincial level. If a systematic expansion of the primary healthcare workforce includes LHWs to increase enrolment in treatment programmes and uptake of services, it could dramatically alter the face of the HIV epidemic, with demonstrably low incremental costs.

3.6 List of abbreviations

PMTCT – Prevention of mother-to-child transmission

ANC – antenatal care

LHW – lay health worker

DOH – Department of Health

MDG – Millennium Development Goals

PHC –Primary Health Care

3.7 Competing interests

The author declares that no competing interests exist.

3.8 Author's contributions

Jean-Pierre Zeelie was responsible for study design, data collection, data analysis and writing the paper. He was supervised by Dr. Edina Sinanovic from the Health Economics Unit, University of Cape Town.

3.9 Acknowledgements

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4. Policy Brief: Costing Components of a Facility-based Lay Health Worker Model focused on improving PMTCT outcomes

4.1 Introduction

The Minister of Health has committed to improving health outcomes in South Africa through primary health care re-engineering, which includes recognising and utilising Lay Health Workers (LHWs) as a viable workforce in improving access to, and uptake of, health services.

Historically, lay health workers have played a vital role in the delivery of health services to under-serviced parts of South Africa. Predominantly working within their own communities, they are well positioned to act as "agents of change". This cadre of worker typically possesses few formal qualifications, and often works for a stipend or on a volunteer basis. LHWs are quickly trainable and able to bridge the gap between the health professional and the patient [1]. This may include providing support with issues such as adherence to treatment, side effects and mental health [2].

South African health policy has shifted towards the adoption of community-based models, such as the Ward Based Outreach Teams, which include Community Health Workers offering health services and making referrals on a door-to-door basis. While these models drive demand and aim to improve access for those that need it most, the role and function of the facility-based LHW is still relevant in the health system.

The University of Cape Town and Community Media Trust conducted a study using a lay health worker model to supports pregnant mothers accessing public health services in randomly selected clinics in the Free State. The overall aim was to increase Prevention of Mother to Child Transmission (PMTCT) programme coverage, to reduce the number of children born with HIV and to alleviate the work burden faced at a health facility level.

Figure 2: Text box on facility-based LHWs as an investment

Facility-based LHWs should be seen as an investment for the following reasons:

- Low cost workforce
- Quickly trainable in comparison to professional staff
- Maintaining continuity of care
- Driving demand and improving access to services
- Alleviating burden placed on health professionals
- Existing structures in place
- Job creation offering professional career path options

4.2 Research objective

To highlight the components and costs of a facility-based LHW model aimed at improving uptake and retention of PMTCT services.

4.3 Findings

- Operating the LHW model across the 16 facilities costs R2,091,481 per year, at R130,718 per clinic.
- There was an average of 5,541 first antenatal care (ANC) visits, which amounts to approximately R377 per first ANC visit.
- The initial staff training cost R32,531 (1.6% of total costs), which included meetings to introduce the project to the Free State Department of Health and train facility managers on the intervention.

- Transport accounted for 8.3% of total costs, due to the sparse layout of the Free State, which presented logistical issues with few public transport options and extensive road construction.
- Personnel salaries constituted the largest cost, with the LHW team accounting for 63.9% of overall project costs. LHWs were employed on a full-time basis, therefore allowing for enforcement of full-time working hours, and obviating the need for LHWs to supplement their income elsewhere.

Table 10: Capital and Recurrent costs, separated by cost category, in 2013 Rand

Capital	Full Intervention	Per Clinic	%
Vehicle	17,699	1,106	0.8%
Equipment	24,351	1,522	1.2%
Staff Training	32,531	2,033	1.6%
Monitoring & Evaluation	3,712	R232	0.2%
Subtotal	78,293	4,893	3.7%
Recurrent			-
Personnel	1,335,723	83,483	63.9%
Overheads	295,622	18,476	14.1%
Transport	173,932	10,871	8.3%
Consumables	207,910	12,994	9.9%
Subtotal	2,013,188	125,824	96.3%
Total	**2,091,481**	**130,718**	**100%**

4.4 Model components

4.4.1 Health Promotion Sessions

The LHWs provide health promotion sessions in clinic waiting rooms, encouraging all pregnant women to test for HIV and to book early for antenatal care. They have been extensively trained in all aspects of HIV and AIDS, the PMTCT protocol, and maternal and child health.

4.4.2 Follow-up schedule Appointments

Expectant mothers are offered the opportunity to voluntarily participate in the individual follow-up programme - starting with a test for HIV. Women testing HIV negative are counselled on protecting themselves and their unborn baby against HIV, and are followed up to ensure re-testing at 32 weeks of pregnancy. Women testing HIV positive are intensively counselled on all aspects of the PMTCT protocol, and contact information is recorded on individual follow-up schedule cards. The LHW highlights important dates, and stays in contact by SMS or phone to offer support and to provide reminders to return for PMTCT services on the specified dates. This reduces loss to follow up and increases programme coverage. At each visit to the clinic, expectant mothers are able to meet one-on-one with the LHW, who provides further information on managing HIV within pregnancy and reducing the risk of vertical transmission.

4.4.3 Task sharing

LHWs also work to reduce the burden on over-worked healthcare professionals through task-sharing [3]. This involves the LHWs assisting in everyday clinic duties, with an emphasis on antenatal services. Tasks include general patient administration, weighing of babies, assisting with administering immunisations, disclosure of PCR test results, and registering new ARV

patients. The LHWs have also been trained in HIV counselling and testing to assist with achieving clinic targets. This provides the LHW with an ideal opportunity to test and counsel pregnant women, and it facilitates an early entry point into the PMTCT cascade.

4.4.4 Community Awareness Events

LHWs also host large awareness events at lively locations near the clinic, such as taxi ranks, shopping malls or community centres, with events featuring entertainment, testing for chronic diseases, and health promotion sessions. Information pamphlets and condoms are distributed, and prizes are awarded to active listeners. The events promote the LHW programme, as well as raising awareness of HCT and PMTCT services.

Figure 3: Pie chart of recurrent costs in 2013 Rand

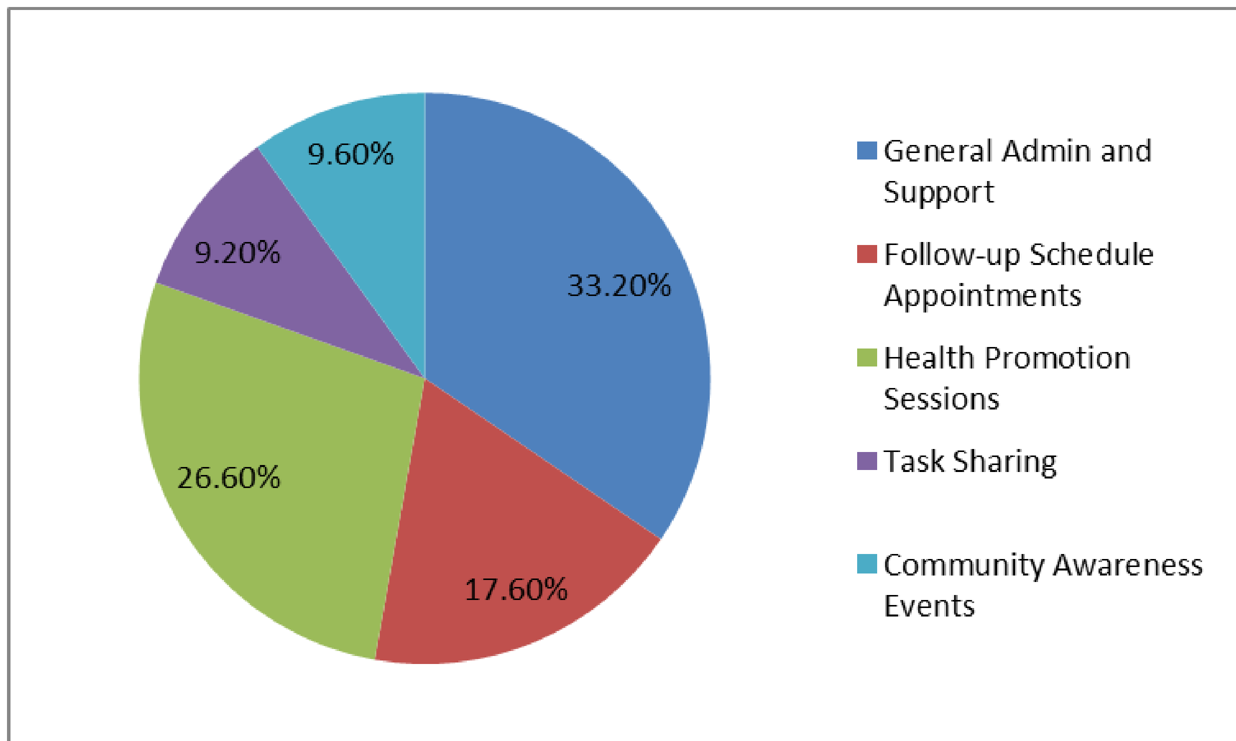

Table 11: Recurrent costs, separated by activity, in 2013 Rand

Activity	Full Intervention	Per Clinic	% of total costs
General Admin and Support	695,277	43,455	33.2%
Follow-up Schedule			
Appointments	367,191	22,949	17.6%
Health Promotion Sessions	557,372	34,836	26.6%
Task Sharing	193,359	12,085	9.2%
Community Awareness Events	199,988	12,499	9.6%
Subtotal	2,013,188	125,824	100%

Figure 4: Text box on Health Literacy Approach

Health Literacy Approach

Training aims to capacitate LHWs with accurate and updated information on all aspects of HIV/AIDS and other important health topics, such as maternal and child health, and chronic non-communicable diseases so that the LHWs can, in turn, share this information in an easy-to-understand way and in the local language. In this way, accurate health information spreads through populations, mobilising communities towards understanding the biomedical approach adopted by the health system, and to take an active part in preventing disease and managing their own health. It also strives to empower individuals and communities to increase their health seeking behaviour through increased health knowledge and awareness, thus impacting positively on health outcomes.

4.5 Policy implications

- For the purposes of extrapolation, Motheo district can be considered a microcosm of the Free State, inasmuch as it provides a rational basis for estimating the costs of a province-wide implementation of LHWs.
- In total, it would cost R16,643,770 to scale up the LHW model to all five districts in the Free State, covering 222 public health facilities.
- South Africa's National Treasury has allocated R133.6 billion rand in the 2012/2013 budget [4] towards strengthening public health care, of which scaling up for the Free State would account for 0.012%, and 0.13% of all HIV/AIDS and TB expenditure.

- In strengthening primary health care through the financing of this initiative, reductions could be made by closing down old hospitals in the Free State, which are expensive to maintain and are over represented in traditionally white areas.
- Redirecting such funds from relatively over-serviced areas towards a province-wide LHW initiative would contribute towards the ideal of achieving more equitable access to health services and tangible progress towards achieving Millennium Development Goals 4, 5 and 6 [5].
- If a systematic expansion of the primary healthcare workforce includes facility-based LHWs to increase enrolment in treatment programmes and uptake of services, it could dramatically alter the face of the HIV epidemic.

4.6 References

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