

Resource Requirements for Community-Based Care In Rural, Deep-rural and Peri-urban Sub-districts

A comparative analysis in 2 districts
In Gauteng and KwaZulu-Natal



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July 2017



Rural Health
Advocacy Project



GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA



health
Department:
Health
PROVINCE OF KWAZULU-NATAL

Acknowledgements

We would like to acknowledge and thank all those who made this study possible:

In Sedibeng:

- Mrs Salamina Hlahane, the district manager
- Mrs Bridget Lefhoedi, the Community-based services co-ordinator
- Mrs Puleng Mokoena , the DHIS co-ordinator
- Sedibeng Health Management Team
- The WBOT teams leaders
- The CHWs who filled the diaries

In uMzinyathi:

- Mr Ndebele, the district manager
- Mrs Shabangu, the deputy district manager
- Mrs Madela, the Community-based services co-ordinator
- Mr Ajeeth , the district health planner
- The WBOT teams leaders
- The CCGs who filled the diaries

For their insight and their assistance with our numerous questions

We also want to thank:

- Ms Mafoko Pomane and Mr Russel Rensburg from RHAP for their help with training CHWs and collecting diaries
- Mrs Marije Versteeg-Mojanaga and Richard Cook from RHAP for their assistance in conceptualising and making the project happen
- Mr Ndlovu and Mr Buthelezi for the training and data collection activities in uMzinyathi
- Ms Hloli Nonkenezwa and her colleagues for the high-quality data-entry

Photos on cover page from Getty Image and from Kim Ludbrook. Health post Photo from Centre for Health Policy

Finally, we also want to thank the South African Medical Research Council Health Systems Research Unit and the Rural Health Advocacy Project for providing funding for this study

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Abstract

Community health workers (CHWs) traditionally played a role in supporting the delivery of high priority interventions relating to HIV, TB and maternal and child health. While they are essential for these programmes and improving access to care, there has been significant inconsistency in the management and functioning of the programmes across South Africa. This inconsistency is partly because the role of CHWs articulated poorly in National or Provincial health policy and thus limited guidance on the qualification requirements, training, employment conditions, the scope of practice or the basic role of CHWs within the health system. In addition, very little attention has been paid to the differences in needs of CHWs' services between urban and rural areas.

This study was conducted to compare the resource requirements (both financial and human resources) of the CHW component of Ward Based Outreach Teams (WBOTs) between rural, deep-rural and urban/peri-urban communities in order to inform policy. Two districts were selected from with a sample of WBOT teams covering different types of areas. CHWs filled detailed diaries for two consecutive weeks (10 days) reporting on travel time, and activity time per type of activity, recipients visited and conditions covered. This recording resulted in 2,511 entries in uMzinyathi (16% in urban/peri-urban areas) and 4,140 in Sedibeng (68% in urban/peri-urban areas).

While travel time across rural and urban settings within each district did differ between types of sites it was not the most significant predictor of differences in time utilization. In Sedibeng, median travel time to clinics/CHCs was twice as long in rural than urban areas, with no difference in the travel time for home visits, while in uMzinyathi, median travel time for home visits was a third longer in rural areas and 20% longer to travel to clinics/CHCs. Time on activities themselves showed more significant differences with overall median time by unit of activity being 15% longer in rural than urban areas in Sedibeng and 10% longer in uMzinyathi respectively. While the median time per home visit in uMzinyathi was 50% longer in deep-rural areas than urban areas, home visits median time in Sedibeng was 20% longer in rural than urban areas.

Referral rates following home visits were alarmingly low in both districts, around 4% in Sedibeng in both types of areas, and 2% in uMzinyathi's urban areas, but significantly higher in deep-rural areas, at 12%. This low referral rate raises questions about the quality of screening by CHWs and the quality of supervision.

Expressed in cost per capita total population, expenditure on WBOTs amounted to R47 per capita per year in Sedibeng and R28 in uMzinyathi, translating to under 4% of the PHC expenditure per capita of around R1, 200 in both districts—a clear sign of underfunding of this platform of service. If the CHWs monthly stipend was increased to the level of the national minimum wage (R3,500), based on the existing number of CHWs, WBOTs cost per capita in Sedibeng would stand at R59 (up from the current R47). uMzinyathi shows very similar figures with WBOTs per capita expenditure amounting to R48, up from R28. Increasing stipends to the level of the national minimum wage would still amount to a small proportion of PHC expenditure per capita: 4.9% of PHC expenditure per capita in Sedibeng and 4.2% in uMzinyathi.

The number of home visits per capita, a pointer to the coverage level, was low in both districts, taking into account their specific demographics and burden of disease, compared to the number expected as per the 2012 report to the national Department of Health. In addition it was lower in rural areas at 0.4 home visit per capita per year in both districts, compared to 0.7 and over in urban/peri-urban areas. The expected number with full coverage would have been 1.2 home visits per capita in Sedibeng and 1.5 in uMzinyathi.

Modelling the number of CHWs required if each of the two districts was 100% urban or 100% rural and using each district's travel and activity time data, we found that, based on the Sedibeng profile, a rural (farms) district would need 33% more CHWs than an urban district. Using the profile of uMzinyathi, a deep-rural district would require 62% more CHWs than an urban district. If a CHW covers 250 households in an urban/peri-urban site, a CHW in a rural site should be allocated 169 households and 96 in a deep-rural site.

To maximise the potential of this layer of service delivery, there is a need to address the low level of resourcing of this platform as evidenced by the very small share of PHC expenditure it represents. Investments need to be made in the supportive supervision to ensure improved referral processes and good working morale. Improved staff morale will require much more than adequate lines of supervision though. There is a need to properly budget for the formal integration of this cadre in the health system that will allow for benefits (such as a pension), job security and opportunities for job progression.

Importantly, effective budget planning will need to recognise that different geographical areas have different needs regarding community-based services. With travel and home visits in rural and deep rural areas being significantly longer than in urban areas in addition to CHWs spending a smaller share of their time in home visits, there is a need for increased human resource allocations in rural areas compared to urban areas.

The following recommendations emanate from this report

- Type of sub-districts (urban/peri-urban, rural, deep-rural) must be taken into account for work and resource allocation:
 - a. Compared to urban/peri-urban areas, 33% more CHWs are required in rural areas to cover the same size of population
 - b. Compared to urban/peri-urban areas, 62% more CHWs are required in deep-rural areas to cover the same size of population
- The number of households per CHW must be adjusted per type of sub district:
 - a. In urban/peri-urban areas 250 households per CHW
 - b. In rural areas: 169 households per CHW
 - c. In deep-rural areas: 96 households per CHW
- Overall the level of resourcing of CBS should be reassessed as it represents a very small proportion of PHC expenditure (under 4%), given the role the CBS platform is expected to play in the continuum of services
- CHWs' stipends need to be standardised across the country, and should as a first step be aligned to the national minimum wage.
- Further research should be conducted to assess the reasons behind differences in duration of home visits and possibly differences in content between types of sub-districts.

- Further research should be done to assess the reasons behind low referral rates and the relative role of CHWs' training and quality of support/supervision.

Background

The South African health system is categorised by a large public sector and smaller private sector in addition to Non-Governmental Organisations (NGOs). The public sector represents 40% of health expenditure, or 11% of total government spending. As the private sector continues to expand, disparities in the provision of health services continue to widen, especially considering the approximately tenfold difference in annual per capita expenditure in the private compared to the public sector.

The public sector, with about 30% of the country's physicians, remains the only point of access to health care for the clear majority (83%) of South Africa's population.ⁱ Despite the rise in the number of graduating doctors in South Africa, the ratio of physicians per 1000 population has been relatively unchanged over the past decade. Nurses have been instrumental in health care delivery in South Africa, particularly in the rural areas that lack physicians. According to the National Department's HRH Strategy for the health sector 2012/13-2016ⁱⁱ, providing services to rural communities remains a challenge. Despite 43.6% of the population living in rural areas, they are served by 12% of the doctors and 19% of the nurses available in the country. Furthermore, South Africa experiences a high attrition rate of health workers (25%) further exacerbating HRH shortages in rural communities.

Community health workers (CHWs) are being increasingly recommended as a solution to overcome critical human resource shortages. CHWs are low-level health care workers that provide essential preventive services (health promotion, screening, adherence support) and in some countries, curative services (immunisation, antenatal care, malaria, pneumonia and diarrhoea treatment). This cadre of health care worker has been an especially important and cost-effective option in low-income and underserved contexts where chronic shortages of nurses and doctors have prevented access to essential services for the most vulnerable populationsⁱⁱⁱ. However, because the Community-based services (CBS) programs are primarily based on home visits, the requirements in high-density areas (urban/peri-urban) may be different to those in more remote, low-density areas (rural/deep rural).

In the 1970s, CHW programmes were developed by NGOs working in South Africa to address the inequitable distribution of health services introduced through the Apartheid era. After 1994, however, South Africa initiated a Primary Health Care approach spearheaded by doctors and nurses, with the collapse of many Community health worker programmes. South Africa has seen a change its burden of disease over the past twenty years with a rise in the burden of HIV/AIDS coupled with the increasing impact of violence, injuries, diabetes and other non-communicable diseases.^{iv} The surge of non-communicable diseases is felt in both rural and urban communities in South Africa, in particular among the poorest in urban slums. The increasing burden of such conditions, reduced mortality due to ART, along with an increase in the proportion of South Africans over the age of 65 has resulted in growing demand for health care services^v. A new era of disease-focused CHWs emerged thereafter, focusing on HIV and TB related treatment and support. While this approach addressed a critical need, it resulted in an underutilisation of this cadre with the potential to realise a wider social and health impact by including more programs

At present in South Africa, CHWs play a role in supporting the delivery of high priority interventions relating to maternal and child health, HIV, TB and chronic diseases. While they have played an important part in ensuring the success of many of these programmes over the years, there has been significant inconsistency in the management and functioning of CHW programmes across the country. One of the primary challenges with CHW programmes is that the role of CHWs has never been fully articulated in National or Provincial health policy. In most contexts, there is no policy that guides qualification requirements, training, employment conditions, and scope of practice or primary role within the health system.

This inconsistency in policy is made worse by the fact that a significant proportion of CHWs are employed by NGOs and are not employees of the department of health. This has meant that not only is their function not clearly defined but also that their conditions of employment are determined by the NGO and not public service regulations. While NGOs would need to meet basic conditions of employment, there is no obligation to employ CHWs on a full-time basis or to provide them with basic benefits, such as a pension, that public sector employees are entitled to receive.

Since 2011 the National Department of Health (NDoH) has been embarking on some ambitious public health reforms, which have included preparation for the establishment of the National Health Insurance System and the continued rollout of the Primary Health Care Re-Engineering plan. As part of this process, the NDoH is developing a Ward Based Outreach Team (WBOT) policy. While the WBOTs policy encompasses all aspects of WBOT function, a central component of the policy will be to provide direction concerning the resourcing of CHWs to ensure consistency.

An important aspect is to ensure that potentially different requirements between urban and rural areas are quantified and costed, to support government resource allocation. This will be a key aim of this project.

Study Aims and Objectives

This study was conducted to compare the resource implications (both financial and human resources) of the CHW components of WBOT between rural and urban communities. The study focuses on different community-based service models implemented in two provinces to highlight potential differences between urban and rural sub-districts. This is done with a view to informing various WBOT policy options currently under consideration.

Objectives:

- To understand different models of community-based care being implemented in South Africa currently
- To compare time requirements for CBS delivery between rural, deep-rural, and urban/peri-urban sub-districts.
- To compare profiles and level of activity between categories of sub-districts.

- To measure current expenditure and HR deployment for the delivery of Community-Based Services (CBS) in different categories of sub-districts.
- To determine the adequacy of the observed level of activity by comparing to modelled target level of activity taking into consideration population structure and burden of disease.
- To identify resources implications of the target level of activity per category of sub-district.
- To establish a formula for resource requirements tailored for each type of sub-district.

Methods

Classification of sites:

The arrangement of sites urban/rural was based on the DHIS classifications. While we can't attest to the validity of these classifications they have been aligned to those used in the public health system. In order to further differentiate within rural sites, farm sites were classified as rural while far less densely populated sites were characterized as deep-rural. In urban areas, the majority of sites were peri-urban, and urban poor sites in the city centre were included in the categorization urban/peri-urban.

Selection of sites:

Gauteng and KZN provinces were first selected through initial discussions with the core research team within the MRC and RHAP due to the availability of functional and complete WBOT teams, in addition to the availability of both urban and rural teams through which the analysis could be conducted. Through the networks available to the research team and previous experiences working across South Africa, the team felt that those two provinces were further along in the implementation of their programmes and therefore sufficient data would be present to conduct the analysis appropriately. In Gauteng, the Sedibeng District was selected as it was implementing a health post model from which community health workers operated. This model appeared to demonstrate some early evidence of success^{vi}. The district, with a population of 935,831^{vii} people covers large poor peri-urban areas including both formal and informal settlements, as well farming areas.

Sedibeng District spans the entire southern area of the Gauteng Province and is made up of three local municipalities Emfuleni, Midvaal and Lesedi. Despite Midvaal making up approximately half of Sedibeng's total area, over 80% of the population live in Emfuleni. The eastern part of the district is predominantly agricultural or rural while the urban areas are mainly located in the western regions of the district in Emfuleni, with fewer urban concentrations in the other municipalities. Sedibeng is a large manufacturing hub, dominated by the metal and chemical sectors. Despite this, the local economy has been stagnating for years, resulting in a shrinking of the formal employment industry.

In comparison to South Africa as a whole, the demographic structure of Sedibeng is made up of a smaller share of people aged 20-34 (24.8 vs. 26.7) in addition to a smaller share of children between the ages of 0-14(27.6 vs 29.7). Furthermore, between 2003 and 2014, Sedibeng reports an average annual growth rate in the number of households of 2.3% and an average annual population growth rate of 1.6%. Taken together, this translates into a decrease in the average household size from 3.4 people per household in

2003 to 3.1 by 2013. Population density has also increased over the period 2004-2011, with Emfuleni sub-district reporting an increase in density of 0.9% pa, from 680 people per km² to 743. Midvaal sub-district reported a 4% per year increase, resulting in a population density of 55 people per km² and an overall increase in population density in Lesedi of 3.2% p.a.^{viii}

The health services in Sedibeng are catered for both through the public and private sectors. The district has 3 public hospitals, 2 in Emfuleni and the third in Lesedi. In addition, the district has five private hospitals, 4 of which are in Emfuleni. The district's primary health care facilities are also clustered in the urban and service centres, with rural areas being serviced by mobile units. 20 PHC clinics are located in Emfuleni, while Midvaal has four clinics and four mobile units and Lesedi has eight clinics and three mobile units. All 4 Maternity Obstetric Units in the district are located in Emfuleni as well. Due to the clustering of health facilities in Emfuleni, the establishment of WBOT services has enabled improved access to health services. By 2014/2015, the district had established 44 WBOT teams, made up of 57 team leaders and 163 trained CHWs, covering 46 of their wards.^{ix}

Sedibeng has made significant progress in mitigating the impact of the HIV epidemic, with declines in HIV incidence since 2008 amongst the young population. Sedibeng reports an overall prevalence rate between 16-22% at present and longer life expectancy due to increased access to antiretroviral medication.^x



The UMzinyathi district^{xi} in KwaZulu-Natal with a population of 513,974 was selected as it provided different models of community-based services, including CHWs operating mainly from targeted primary health care facilities in addition to WBOT teams working independently, and included both urban and deep-rural sub-districts.

uMzinyathi in KZN is a rural district with one mainly urban sub-district, Endumeni, making up 11% of the population, and three deep-rural sub-districts., Msinga, Nqutu, and Umvoti and Endumeni, representing 37%, 32%, and 20% of the population respectively.

The size of the district economy is small relative to the province but there has been an economic growth of over 7% per annum between 2000 and 2010. The most dominant economic sectors include manufacturing, general government services and the retail and accommodation sectors. The manufacturing sector has had the biggest growth over this period, with the proportional contribution of the agricultural sector declining from 15% to 11% and the general government sector declining from 20% to 17%. Employment growth has remained stagnant between 2000 and 2010, with a marginal decrease in the formal sector, and approximately 20% of the employed population working in the informal sector. The district reports a startlingly high proportion of the population being classified as discouraged work seekers (32%), close to 2.5 times the national average; with nearly 70% of the unemployed population under the age of 35. The Umvoti sub-district reports 28% of the population working in the informal sector, 2-3 times the proportion in the other municipalities. Furthermore, the district reports very high adult illiteracy rates (26%), more than double the provincial average and the second highest in the province. These figures are even more pronounced among women, with an adult female illiteracy rate of 29%. Access to schools is a particular problem in the district with 52% of the population residing outside the threshold distance of a secondary school. The district also reports a significantly lower Human Development Index (0.45 vs. 0.49 nationally). Furthermore, 80% of households earn less than R38,000 annually, compared to 68% nationally, with Nqutu and Msinga sub-districts reporting the highest proportions.

The annual population growth in uMzinyathi was 0.6% per annum between 2001 and 2011, with relative average household sizes being larger than the overall provincial figures, in addition to reporting the highest proportion of female-headed households (59% vs. 46%). The district also has a significant share of the population younger than 20 years (52.9% vs. 42% nationally). Approximately 43% of households reside in traditional dwellings, double that of the province overall. Population density in the district is low, with densities exceeding 30 persons/ha largely occurring in the urban centres. 63% of the district is made up of low-density rural settlements in Nquthi and Msinga sub-districts.^{xii}

Despite the socio-economic challenges faced by the district, HIV prevalence amongst pregnant women has declined from 28% in 2009 to 25% in 2011, being the lowest among all districts in the province and below the national average. However, while the district's reported average TB incidence of 1112 per 100,000 is lower than the provincial average, it is significantly higher than the national average of 805. Malnutrition in the district is also an issue of concern, with an incidence rate of 6.8 cases per 1000 children, compared to the national average of 4.8.



After the initial selection of districts, meetings with the District managers were set up to introduce the project, present provincial ethics approval for the study and get buy-in from the core implementation team at the district level. Discussions with the district allowed for the selection of sub-districts and facilities, health posts or WBOT teams. The selection of teams was made to ensure that within each province, a selection of both urban and rural sites was possible to allow for intra-district comparisons in addition to inter-provincial analysis across KZN and Gauteng.

As community-based care services (CBS) are directed more specifically to poorer areas, the term 'urban' in the study reflects, in fact, a mix of urban impoverished communities, urban informal settlements and per-urban settlements. In uMzinyathi the term 'rural' refers to deep-rural settlements while in Sedibeng the term 'rural' refers to more regrouped farm worker settlements on farms.

Policy analysis

A description of the national, provincial and district community-based care policies (where they exist) is provided to assess alignment between policies and highlight areas of difference that may result in various resource implications. This was done through a desktop analysis of policy and strategic planning documentation provided by health authorities. Specifically, this was done to identify the:

- Organisation of community-based services: Overall management structure for community-based services in the district and sub-district,
- Categories of workers providing the community-based services (team leader (PN vs. EN), CHW, and home-based carers).

- Population covered by the services including the population size, demographic structure and the burden of disease (including HIV prevalence, TB incidence) to inform the modelled resource needs.

Sedibeng community health worker policy:

The Community Health Worker policy in Gauteng draws on directives provided by the National Department of Health. Following the lead of KZN, Gauteng, amongst other provinces, initially registered and transferred the management and remuneration of community health workers to the department of health. The CHWs in Gauteng are not salaried employees of the department of health, however, and only receive a stipend of R2500 and are not entitled to any additional benefits. The province is now using a private company for the employment and payment of CHWs.

Sedibeng District has pioneered a health post approach in one of its sub-districts, the urban/peri-urban Emfuleni sub-district. These health posts are small prefabs that allow for the nurse team leader to provide support and training to CHWs that convene there every morning before their outreach activities. Furthermore, health posts function as a 'mini-clinic' providing basic health services including health screening, treatment of minor conditions as well as controlled chronic diseases, family planning and maternal and child care. Any complicated conditions are referred to the clinic. The health posts allow for improved access to essential health services for the community and ideally reduce the walking distances for both patients and community health workers. The health posts also provide a space for community health workers to meet in the morning and at the end of the day to receive mentorship and supervision, in addition to an opportunity to discuss their day to day challenges amongst each other. Ideally, these health posts would also reduce overcrowding in the clinic by treating simple conditions.

The responsibilities of CHWs in Gauteng range from household need assessments, health promotion and prevention, to provision of basic health interventions such as first aid, oral rehydration, and sputum collection. CHWs also provide psychosocial and adherence support and facilitate referrals to health facilities. Due to safety concerns in Sedibeng, CHWs conduct home visits in pairs. Discussions are underway on the minimum educational requirements for CHW eligibility; this, however, would render many of the currently active CHWs ineligible for re-selection. The Department of Health has finalised a training curriculum for CHWs over three rounds; at present, most CHWs have received the first two modules.



uMzinyathi Community Health Worker Policy:

The Kwazulu-Natal Department of Health has committed to implement an integrated community health programme by standardising and integrating all healthcare related activities that are historically carried out by condition. Community Caregivers (CCGs) in KZN are directly employed by the Department of Health and entitled to pay and benefits as per conditions of employment, including sick (12days) and vacation leave (22 days) in addition to 4 months of unpaid maternity leave. The Community Caregivers are employed for a 24-month fixed term contract and paid a monthly salary of R1800.

CCGs working in urban/peri-urban areas are expected to serve a minimum of 70-80 households per month (4 households per day), while those in rural areas are expected to serve 50 households per month (3 households per day). As these CCGs are expected to provide integrated services, they are responsible for a range of conditions including but not limited to malaria, HIV and AIDS, TB treatment and control, rehabilitation, and the management and control of chronic conditions including hypertension and diabetes. These Community Caregivers are expected to deliver promotive and preventive health services, determining population needs through household assessments and facilitating referrals to health services. Furthermore, CCGs are authorised to dispense Vitamin A and deworming medication to children and recently authorised to provide home based pregnancy tests to women.

Through the integration of services, the responsibility of home-based carers, around the provision of palliative care has been absorbed as part of the larger package of services provided by CCGs. The CCGs are responsible for managing eight patients requiring intensive health services according to policy.

CCGs are also responsible for a range of reporting requirements including daily, weekly and monthly reports to monitor their activities.

The process of developing full WBOT teams is still underway, and therefore some of the community caregivers are operating as part of a team while others still operate directly out of a health facility. Thus, CCGs are expected to report directly to their supervisor, which may include a facility manager or a dedicated team leader.

The management structure of the uMzinyathi district programme includes the director, clinical and programmes manager and CCG coordinator at the district level. Within each sub-district, there is one community health facilitator, except Msinga sub-district, which has three. Endumeni sub-district has 7 CCG Supervisors, responsible for 112 CCGs, while Msinga has eight supervisors responsible for 129 CCGs; Nquthi has nine supervisors responsible for 151 CCGs; and Umvoti has 7 supervisors responsible for 117 CCGs. Each supervisor receives a salary of R2300 per month. They are expected to supervise up to 25 CCGs, although now, each appears to be supervising up to 16 CCGs. CCG supervisors are expected to conduct at least two supervised household visits per week and provide support and mentorship to the caregivers. Their role includes:

- identification of training gaps,
- assisting in training activities at primary health care level,
- serving as the link between community and facilities by providing information about home based programme activities to ward based structures,
- communicating challenges of the programme to the PHC level,
- completing evaluation reports on CCG performance, and
- convening weekly meetings with the CCGS regarding their performance

Time monitoring and Diaries

To measure time spent on travel and the activities themselves, we selected in both districts WBOT teams covering different types of areas (urban/peri-urban, rural, and deep-rural) to fill diaries for two consecutive weeks (10 days). The methodology for the construction of the diaries was based on a similar study conducted in Ethiopia by Mangham et al.^{xiii} to determine how community health workers spend their time, with adaptations made according to the South African setting according to the knowledge of the study team and desktop review. The diaries had been discussed with the districts, piloted with other teams and further modified before full training to fill diaries took place. The diaries allowed for day to day collection of CHW activities including the time it took to travel and to conduct their day-to-day activities, the types of activities, disease areas and the recipients they saw (Figure 1). The 110 CHWs in uMzinyathi and 111 in Sedibeng were trained in teams of 7 to 10 CHWs. The start of the data collection was staggered as the training was taking place. After the initial two days of diary filling each team was revisited by a researcher to assess the correctness of recording and redress possible mistakes, in addition to another visit at the end of the first week. The diaries were collected by researchers at the end of the two weeks period.

Table 1. Daily Diary

CHW Code	22		Name Area	Boipotang			
1 Page per Day							
Date	25-nov						
Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

	Travel		Activity				Length Activity	
	Time Start	Time End	Type Activity	Content	Condition	Recipient	Time Start	Time End
1	8.30	8.40	e	b	c		8.40	8.55
2	8.55	9.14	c	a	c	f	9.14	9.25

Type of activity	
Household registration	a
Household screening	b
Home visits, other	c
Health Post	d
Clinic/CHC	e
Support Groups	f
Creche, ECD institutions	g
Other institutions	h
Specific health days Cty	i
School health follow-up	j
Meeting with supervisor	k
Meeting with community	l
Meeting other	m
Training	n
Break (including lunch or tea)	o
Other (specify)	p

Content	
Bring medicine to patient	a
Collect medicine	b
Screening	c
Referral	d
DOTS	e
Tracing defaulters	f
Home based Care	g
Health education	h
With Supervisor	i
Other (specify)	j

Condition	
Mother & Child	a
HIV	b
TB	c
Other Chronic	d
Nutrition	e
Family Planning	f
Other (specify)	g

Recipient	
Pregnant woman	a
Post-Natal (birth to 6 weeks)	b
Infant up to 1 year	c
Child (1-5 years)	d
Child (5-18 years)	e
Adult	f
Elderly - over 60	g
Family	h
Community	i
Development workers	j

The data was entered into an Excel spreadsheet and analysed to assess the following variables per type of site:

- Travel time per type of activity. As the travel time is not distributed normally, medians rather than means have been used.¹
- Activity time per type of activity, also based on the median
- Distribution of activities
- Overall share of time between home visits and other activities
- Distribution of conditions (ANC, TB, ...) for home visits
- Distribution of type of recipients for home visits
- Number of recipients per home visit

¹ The **average** is the sum of all the numbers in the set divided by the amount of numbers in the set. The **median** is the middle point of a number set, in which half the numbers are above the **median** and half are below. When the data is not normally distributed (ie a curve with a peak in the middle and few outliers), it is recommended to use the median and not the average.

Significance testing on the median travel and activity times were conducted through quantile regression for individual activities while the Kruskal Wallis test was used to test overall significance in travel and activity time between different services across urban and rural sites.

Utilisation in urban and rural areas

We used full district data extracted from the District Health Information System (DHIS) to assess possible differences in access to services. For each PHC facility (clinic, community day centre, community health centre) with WBOT teams, we collected the population per facility (provided by the district manager), the type of site, the number of facility headcounts, the number of home visits headcounts. We then calculated per type of site, the average number of PHC facility visits per capita and the number of home visits headcounts per capita for the period April 2015 to March 2016. We used the Kruskal-Wallis test to assess the significance of the difference.

Costing

For this report, the costing focusses on the cost to the health system, therefore, the provider perspective. It covers expenditures incurred for the community-based services (CBS), including personnel up to the assistant director for CBS: the financial costs. While the study did attempt to collect cost data related to out of pocket transport costs incurred by CHWs to come to work, the quality of the data was insufficient to report. As a result, this study does not cover costs to the CHWs: cost of transport and communication and other costs paid by CHWs. Understanding these costs are however integral to effective management and planning for this layer of service delivery.

We carried out costing for each district with its specific organisational structure. In Sedibeng half of the WBOT teams are based at health posts. In this costing, we allocated a share of the health post and professional nurse costs to the CBS to acknowledge its other use as a mini-clinic. uMzinyathi does not have health posts.

Costs are presented in 2 categories: set-up and recurrent costs. Set-up costs (infrastructure, equipment, and training) are not one-off costs. Structures and equipment need to be replaced over time and training, in particular in the absence of refresher training, needs to be repeated. We thus calculated annualised cost of capital using straight depreciation (cost/number life years).

Set-up costs

- Health posts: While some health posts were donated, new health posts are now being bought by the district. We reflect the purchase cost of the structure and its equipment; we allocated 15 life years for annualisation. We allocated 35% of health post costs to the CBS.
- Training: CHWS in 2015 had two training sessions lasting 2-weeks each. Training is organised by the provinces and costs were not available. We thus extracted the cost of training from the investment case carried out in 2015^{xiv} indicating a cost of R6,000 per person for the four weeks training. In uMzinyathi, supervisors received training as part of the ongoing monthly in-service training, and community health facilitators have a short supervisory training. Formal training does not take place every year, and we allocated five life years to training for annualisation.
- Kits: CHWs received kits which were different between the two districts. On the advice of the district, we allocated two life years to the kits in Sedibeng and uMzinyathi. In uMzinyathi CHWs are also provided with a jacket, an umbrella and a small cooler box. This is not the case in Sedibeng. In both districts, CHWs do not get cell phones or airtime. No equipment (cell phone, laptop...) is allocated to supervisors.

Recurrent costs

- Staffing: We applied the staffing organogram in place at the end of 2015 and the salaries/stipends of that time. In Sedibeng dedicated nurses supervisors in health posts were retired nurses with a pension. They were paid a top-up of 13% of their salary with no benefits. We allocated an average of 55% of the professional nurse's costs to the supervision of WBOTs. CHWs are paid a monthly stipend (R2,500 in Sedibeng, R1,800 in uMzinyathi).
- Kits replenishment: We added the annual cost of supplies for kits replenishment. Some costs could not be identified separately as they fall under a different cost centre. In uMzinyathi, vitamins A and D, the only 'medicines' provided by CHWs, are provided by the Philamthwena centre (nutrition centre) and are not included in the kits replenishment costs.
- Health posts maintenance: We added 35% the annual health post maintenance cost in Sedibeng
- Transport: CHWs walk to houses, and no transport refund is available for meetings. In uMzinyathi, a dedicated car is available for the community health facilitator who transports the CHWs supervisors as required.

We then calculated costs as annualised set-up costs plus recurrent costs. We present cost for the district, cost per capita total population and cost per CHW.

Since no transport allowance is paid to CHWs, the cost per CHW is no different between urban and rural areas. The cost implications of the type of areas is a function of the difference in the number of CHWs required for the same population between rural, deep-rural and urban/peri-urban. This is examined in Scenarios.

Scenarios

To determine the adequacy of the observed level of activity and assess the number of CHWs required for a given population by type of site, we compared the distribution of activity with that suggested in the 2012 report to the NDoH^{xv}. This report models the number and type of home visits for a population based on the demographic structure of that population and its burden of disease in the form of HIV prevalence, number of people on ART and PTB incidence, extracted from the DHIS and the District Health Barometer published by the Health Systems Trust^{xvi}. We used the Stats SA 2016 population projection and demographic structure for the Sedibeng and uMzinyathi districts, as well as the burden of disease indicators as mentioned above. We extracted from the DHIS the number of people on ART at the beginning of the year, the number initiated during the year, and the number of ART patients with concurrent TB treatment. We then standardised this data by applying results to a district with 100,000 total population. Given the difference in burden of disease, we analysed Sedibeng and uMzinyathi separately. We then calculated the number of home visits which would be required with 70% coverage. We compared with the number of home visits per capita in areas with WBOTs team and assumed 70% coverage.

For each district, we run two scenarios.

- Scenario 1: the 100,000 population is 100% urban/peri-urban,
- Scenario 2: the 100,000 population is 100% rural or deep rural.

We assessed the time required to cover the home visits and other activities for each scenario and each district, in the following way:

- We used the median time of combined travel and length of activity per type of home visit from the analysis of the CHWs diaries.
- We applied the number of home visits modelled for 100 000 population to calculate home visits time required
- We applied the observed share of CHW time spent on home visits to calculate total CHW time required for home visits and other activities for the 100 000 population.

From the total CHW time required we modelled the number of CHWs required for each scenario separately for Sedibeng and uMzinyathi, as well as the support/supervision structures, applying the different rules of each district:

- CHWs work 30 hours a week in Sedibeng, but 40 hours in UMzinyathi
- CHWS work in pairs in Sedibeng for security reasons but on their own in UMzinyathi

We then applied the findings relating to the difference in number of CHWS required by type of site to calculate the number of households a CHW should cover by type of site. We used as the base the number of 250 households per CHW recommended in government guidelines and applied it to urban/peri-urban areas.

Sensitivity Analysis

With the on-going discussions on stipend level for CHWs, we modelled the implications of aligning CHWs' stipends to the national minimum wage. We thus assumed a monthly stipend of R3,500 (R42,000 a year) and calculated the increase in district expenditure and WBOTs expenditure per capita for the existing number of CHWs. In uMzinyathi, supervisors are paid slightly higher than CHWs and their stipend was modelled at R50,000 a year.

Results

Sedibeng

Time Analysis

A combination of rural (farms) and peri-urban sites were sampled in Sedibeng for the completion of diaries; peri-urban sites represented 68% of the samples while rural sites represented the remaining 32%. A total of 111 CHWs were sampled. The number of CHWs per site ranged from 4-5 per health post to up to 25 when CHWs were based in facilities. Over 4000 diary entries were recorded covering a total of 690 days. In Sedibeng, CHWs shared their time between home visits (household registration, household screening and other home visits), time at health post or clinic (used as their base but also conducting health education/screening sessions), collecting medicines from the clinic/CHC, taking part in health days, attending crèches and other institutions, meeting with supervisor and with community. Overall, both travel time and activity time recorded were significantly different between peri-urban and rural sites. Values in bold in the table indicates that differences in medians were statistically significantly. Median values are reported here for comparison purposes as the data was not normally distributed.

CHWs in rural sites spent 7% longer travelling than those in peri-urban sites and 15% longer on activities. Differences in travel time between peri-urban and rural areas varied between types of activity. CHWs travelling to the clinic in rural sites spent a median of 30 minutes compared to 15 minutes to reach the health post, clinic or CHC in the peri-urban areas. The difference in travel time was not significant for other activities, probably explained by the regrouping of families on farms

CHWs in rural areas spend 26% longer on household registration and 53% longer on household screening. Differences in other activity time were not statistically significant.

Table 2. Median time in min on travel and activities per type of activity and sites in Sedibeng

Number entries	Household registration	Household Screening	Home Visits other	Health Post / Clinic /CHC	Support Groups	Creche, ECD inst	Other Institution	Health Days	School Health f/u	Meeting Other	Other	Median
Peri-urban	911	205	938	495	2	11	8	7	4	5	209	
Rural	218	135	538	304	5	0	15	3	3	6	111	
Median Travel Time												
Peri-urban	15	15	15	15	28	20	10	15	18	30	17	15
Rural	15	17	15	30	16		25	10	10	165	9	16
Median Activity Time												
Peri-urban	19	15	20	25	10	15	10	20	53	330	24	20
Rural	24	23	20	30	34		10	15	21	225	30	23

CHWs conducted too few support group sessions and school health day follow ups to allow for significance testing around the medians; these activities were thus combined. This still did not yield any significant differences in either travel or activity time between rural and peri-urban CHWs.

Travel time constituted 43% and 44% of the total share of time in urban/peri-urban and rural sites respectively, with activity time taking up the remaining 57% and 56% of the total time in urban/peri-urban and rural sites respectively.

Table 3. Time distribution per type of activity in Sedibeng

	Home visits	Health post/ Clinic /CHC	Support Groups	Creche, ECD inst	Health days	School hlth f/u	Meeting Other	Other
Peri-urban	66%	23%	0%	0%	0%	0%	1%	8%
Rural	57%	29%	1%	1%	0%	0%	3%	8%

Analysis of the share of CHW's time per broad type of activity after combining travel and activity time shows that large majority of time amongst CHWs working in both rural and urban/peri-urban areas was spent conducting home visits. These home visits reflect 57% and 66% of their total recorded time respectively, a statistically significant difference. CHWs in rural areas spent 29% of their time in clinics compared to 23% in combined health post and clinic in peri-urban/urban areas, also statistically different. Meeting with supervisors in the facilities is included in facility time. CHWs are expected to meet either in the health post or clinic in the morning before beginning home visits and daily activities and come back at the end of the day. If CHWs work directly out of the health post, clinic visits are required for training activities or to pick up the chronic medication for home deliveries.

Content of home visits and Referrals

Several contents could be recorded for the same home visit. The content of home visits showed statistically significant differences between urban/peri-urban and rural areas. While screening and health education were often involved in home visits, bringing medicines to homes took place in 28% of home visits in urban/peri-urban areas but in only 18% in rural areas. The large proportion of time spent bringing drugs to a patient in the home could be because in Emfuleni CHWS deliver pre-packaged chronic medication to elderly patients in the home as part of a Kgatelopele programme to improve adherence. Tracing defaulters was the cause of about a quarter of home visits in rural areas but only 4% in urban/peri-urban areas. Home-based care (HBC) defined by the CHWs as dressing wounds was twice as common in rural than urban/peri-urban areas probably due to the distance to a clinic or health post.

Few home visits translated into the CHW making a referral, with no difference between urban/peri-urban and rural areas: 3.7% in peri-urban and 3.3% in rural areas.

Table 4. Content of home visits in Sedibeng

Type of Site	Screening	Health Educ	Bring meds	Tracing defaulters	HBC	Referral	DOTS	Other
Peri-urban	40%	30%	28%	4%	3%	4%	3%	4%
Rural	30%	19%	18%	26%	7%	3%	2%	7%

Conditions

The conditions addressed during the home visits showed different patterns between urban/peri-urban and rural areas (statistically significant differences are indicated in bold): a larger share of home visits for mother and child under 5 visits, family planning, and chronic conditions in urban/peri-urban areas. In rural areas TB related visits were almost twice as frequent as in urban/peri-urban areas, and nutrition-related visits also more frequent than in urban/peri-urban areas. No difference could be observed in HIV related visits.

Table 5. Home visits per condition in Sedibeng

Number Home Visits per Condition									
Type of Site	Mother/child	HIV	TB	Chronic	Nutrition	FP	Other	Unknown	# H.Visits
Peri-urban	143	402	402	926	67	249	103	86	2054
Rural	40	190	341	234	45	71	42	29	891
Share of Visits per Condition									
Type of Site	Mother/child	HIV	TB	Chronic	Nutrition	FP	Other	Unknown	# H. Visits
Peri-urban	7%	20%	20%	45%	3%	12%	5%	4%	2054
Rural	4%	21%	38%	26%	5%	8%	5%	3%	891

Recipients

For most home visits CHWs recorded seeing only one person (diaries allowed for the recording of up to 3 recipients), with the average number of recipients standing at 1.1 per home visit. There was no difference between urban/peri-urban and rural areas. However, differences between types of sites could be observed in the distribution of recipients as could be expected in the differences in the type of conditions seen between mentioned above. A larger share of home visits to pregnant women and infants were observed in urban/peri-urban than rural areas. New mothers on the farms may go back to their families around the time of birth. However, while more adults are visited in rural than urban/peri-urban areas, there were fewer visits with elderly recipients in rural areas. This difference may reflect the fact that older people are less likely to remain on farms.

Table 6. Home visits per type of recipient in Sedibeng

Number Recipients													Recipients	H. Visits	Av. Recipients/HV	
Type of Site	Preg wom	Post-Natal	Infant	1 - 5	5-18	Adult	Elderly	Family	Community	Unknown						
Peri-urban	92	32	49	111	112	992	622	255	14	26	2305	2054	1.1			
Rural	18	5	9	36	75	512	194	118	1	28	996	891	1.1			
Share of Visits per Condition													Visits			
Type of Site	Preg wom	Post-Natal	Infant	1 - 5	5-18	Adult	Elderly	Family	Community	Unknown						
Peri-urban	4%	2%	2%	5%	5%	48%	30%	12%	1%	1%	100%					
Rural	2%	1%	1%	4%	8%	57%	22%	13%	0%	3%	100%					
													Mother & Child		5-18	
Peri-urban	14%	5%														
Rural	8%	8%														

Costing of WBOTs

Half of the 44 WBOT teams are based in health posts. The costs are presented separately for health-post based teams and facility-based teams. The purchase cost of health post and its equipment amounted to just under R530,000 per unit. CHW kits cost R2,495 per kit and are expected to last for two years, excluding the replenishment of supplies. Monthly stipends/salary package stood at R2,500 per CHW, R20,937 per staff nurse and R3,869 per retired nurse on a full-time basis. Averaging across the teams studied, there was the equivalent of 1 full-time staff nurse per team, ranging from half-time to 2 staff nurses 80% of time. As an average professional nurses spent 55% of a full-time equivalent (FTE) on WBOTs, the remainder of their time being spent on consultations or other health post/facilities duties. No additional supplies (uniform, cell phone and airtime) are given to CHWs or their supervisors. The combined cost to the district of the teams based in health posts and facilities amounts to just over R44 million, or R47 per capita total population, equivalent to 3.9% of the district PHC expenditure per capita. Expressed in cost per CHW, it amounts to about R52,000 per CHW. Management/Supervision (Assistant director, professional nurses and staff nurses) represent 28% of the annualised expenditure and training 2.3%.

Table 7. WBOTs cost in Sedibeng

SEDIBENG WBOTS AT HEALTH POSTS		Unit Cost	Quantity	Life Years	% for WBOTs	Annualised District Cost	Annualised Cost per CHW
Set-up	Infrastructure	490,000	22	15	35%	251,533	593
	Equipment Health Post	39,200	22	15	35%	20,123	47
	Equipment: kits	2,495	424	2	100%	528,940	1,248
	Training CHWs	6,000	424	5	100%	508,800	1,200
Recurrent	Salaries/Stipends						
	Asst Dr	426,000	1	1	50%	213,000	502
	Professional Nurses	46,423	22	1	55%	561,721	1,325
	Staff Nurses	251,244	22	1	100%	5,527,375	13,036
	CHW WBOTs	30,000	424	1	100%	12,720,000	30,000
	Health Post Maintenance	10,000	22	1	100%	220,000	519
	Kit replenishment	250	424	1	100%	106,000	250
Overheads @8%						1,652,599	3,898
ANNUALISED	Total					22,310,091	52,618

SEDIBENG WBOTS BASED IN FACILITIES		Unit Cost	Quantity	Life Years	% for WBOTs	Annualised District Cost	Annualised Cost per CHW
Set-up	Equipment: kits	2,495	424	2	100%	528,940	1,248
	Training CHWs	6,000	424	5	100%	508,800	1,200
Recurrent	Salaries/Stipends						-
	Asst Dr	426,000	1	1	50%	213,000	502
	Professional Nurses	46,423	22	1	55%	561,718	1,325
	Staff Nurses	251,244	22	1	100%	5,527,375	13,036
	CHW WBOTs	30,000	424	1	100%	12,720,000	30,000
	Kit replenishment	250	424	1	100%	106,000	250
Overheads @ 8%						1,613,267	3,805
ANNUALISED	Total					21,779,100	51,366

uMzinyathi

Time analysis

As indicated earlier, rural sites in uMzinyathi refer to deep-rural areas. Deep rural sites represented 77% of the samples, urban/peri-urban sites the remaining 23%. A total of 2,511 entries were recorded by 110 CHWs, covering 850 days. Overall, both travel time and activity time recorded were significantly different between peri-urban and rural sites. Values in bold in the table indicates that medians were statistically significantly different.

CHWs travel time for home visits was 33% longer in deep-rural areas than in urban/peri-urban areas, and it also took 20% longer to travel to clinics in deep-rural areas. Travel time was not significantly different for other activities. Concerning activity time, CHWs in deep-rural areas spend 50% longer seeing clients during home visits, and 18% longer during Philamthwena, while spending slightly less time in the clinic as compared to CHWs in urban/peri-urban sites. Travel time made up a much lower share of the total time

in uMzinyathi than it did in Sedibeng, taking up 23% and 20% of the time in deep-rural and urban/peri-urban sites, while activity time took up 77% and 80% of the share respectively.

Table 8. Travel and activity time per type of activity

Number Entries	Home visits	Clinic/CHC incl Meeting with supervisor	Philamhtwena	Creches and other instutions	Campaigns	Meeting w/comm and other	War room	Training	Support Groups	Other
Peri-urban	434	64	25	6	5	11	6	9	3	15
Deep-Rural	1301	147	100	40	30	24	20	67	13	151
Median Travel time										
Peri-urban	15	25	30	27	20	20	30	35	30	16
Deep-Rural	20	30	30	23	30	30	35	30	30	15
Median Activity time										
Peri-urban	40	120	360	50	150	40	122	51	55	43
Deep-Rural	60	115	425	73	235	100	188	120	95	40

The share of time spent on different activities, after combining travel and activity time, varied little between peri-urban and deep-rural areas. However, a significant difference could be observed with CHWs spending 55% of their time on home visits in urban/peri-urban and 49% in deep-rural areas, and 17% of time in clinics in urban/peri-urban areas while CHWs in deep-rural sites spent 11% of their time in the clinic.

Table 9. Share of time per type of activity

	Home visits	Clinic/CHC	Meeting w/Supervisor	Philamhtwena	Creches and other instutions	Campaigns	Meeting w/comm and other	War room	Training	Support Groups	Other
Peri-urban	55%	17%	1%	15%	1%	2%	3%	2%	2%	1%	1%
Deep-Rural	49%	11%	2%	16%	2%	3%	4%	2%	5%	1%	5%

Content of home visits and referrals

Most home visits involved health education and/or screening in both types of sub-districts, with health education being significantly higher in deep-rural areas (49% vs. 34%). Bringing medicine to patients was not a frequent occurrence, although it was more frequent in urban/peri-urban than deep-rural areas.

Referral rates were low in both areas but reflected 12% of home visits in deep-rural areas, substantially higher than in urban/peri-urban areas (2%). Child health represented a minority of visits (12% in deep-rural and 8% in urban/peri-urban areas). No difference could be observed between areas in the rate of defaulter tracing, a low occurrence at about 5% of home visits.

Table 10. Content of home visits in uMzinyathi

Type of Site	Health education	Screening	Bring medicine to patient	Referral	Child health	Home based Care	Tracing defaulters	DOTS	Other	Blank	# HV
# Entries											
Peri-urban	147	111	52	7	33	37	23	22	20	0	434
Deep-Rural	635	303	87	150	153	102	75	58	71	3	1,301
Share of H.V.											
Peri-urban	34%	26%	12%	2%	8%	9%	5%	5%	3%	0%	
Deep-Rural	49%	23%	7%	12%	12%	8%	6%	4%	5%	0%	

Conditions

Overall the type of conditions addressed during home visits showed limited differences between urban/peri-urban and deep-rural areas, except for family planning taking a larger share of home visits in deep-rural areas (18% vs. 11%) and TB taking up a larger share in urban/peri-urban areas (28% vs. 19%).

Table 11. Conditions seen in home visits in uMzinyathi

Number Entries	Mother & Child	Family Planning	Nutrition	TB	HIV	Other Chronic	Other	Unknown	# Visits
Peri-urban	47	46	46	123	60	87	21	10	434
Rural	180	235	181	252	252	300	127	8	1301
Share of visits									
Peri-urban	13%	11%	11%	28%	14%	20%	5%	2%	
Rural	14%	18%	14%	19%	19%	23%	10%	1%	

Recipients

Mothers and children under 5 represented 18% of recipients in urban/peri-urban areas and a significantly higher 34% in deep-rural areas. Most recipients in both sites were adults under 60. Elderly people represented a small share of recipients, largely due to the young demographic structure of the district.

Table 12. Recipients of home visits in uMzinyathi

Number Recipients	Pregnant woman	Post-Natal (birth to 6 weeks)	Infant up to 1 year	Child (1-5 years)	Child (5-18 years)	Adult	Elderly - over 60	Family	Community	Development workers
Peri-urban	14	12	13	39	18	214	32	54	22	19
Rural	75	78	52	247	141	606	112	179	31	3
Share of visits										
Peri-urban	3%	3%	3%	9%	4%	49%	7%	12%	5%	4%
Rural	6%	6%	4%	19%	11%	47%	9%	14%	2%	0%

WBOTS Costing

In uMzinyathi, CHWs receive a monthly stipend of R1,800 while supervisors receive R2,300. Community health facilitators are staff nurses, nursing assistant or ASOS. We pegged their salary to a mid-point nursing assistant at R177,660. The district CCG co-coordinator is an assistant director. The annualised cost for the district, excluding offices and support for the district CCG coordinator, stood at just under R14 million, or R28 per capita total population amounting to 2.4% of PHC expenditure per capita. Expressed in cost per CHW it amounted to R29,948 per CHW. Management/supervision stood at 16.7% of annualised expenditure and training 5.8%

Table 13. WBOTS cost in uMzinyathi

UMZINIATHI 2015-16		Unit Cost	Quantity	Life Years	Annualised District Cost	Annualised Cost per CHW
Set-up	Training Supervision	2,000	6	5	2,400	5
	Training CHWs	6,000	481	5	577,200	1,200
	Car for community health facilitators	350,000	6	5	420,000	873
	Equipment Kit	510	481	2	122,655	255
	jacket + umbrella + cooler box	477	481	1	229,466	477
Recurrent	Salaries/stipend					
	District CCG co-ordinator	426,000	1	1	426,000	886
	Community health facilitator	177,660	6	1	1,065,957	2,216
	CCG supervisor	27,600	16	1	441,600	918
	CCG	21,600	481	1	10,389,600	21,600
	Kit replenishment	671	481	1	322,751	671
Transport supervisors	101839	4	1	407,356	847	
ANNUALISED	Total				14,404,985	29,948

Utilisation in urban and rural areas

The pattern of utilisation of services was different between the two districts, with uMzinyathi showing a higher level of clinic/CHC utilisation (3.1 visits per capita per year) than Sedibeng (just under 2). In addition in Sedibeng, the clinic headcount per capita/per year was significantly higher in the urban/peri-urban than the rural setting, so did the number of home visits per capita, based on areas with WBOTs: 1 home visit per capita in urban/peri-urban and 0.4 in rural areas. In uMzinyathi, the number of home visits per capita stood at 0.7 in urban/peri-urban and 0.4 in deep-rural areas. Note that when 1 home visit covered 2 recipients, for the purpose of this calculation, it was counted as 2 home visits.

Table 14. Utilisation of services per district and type of site

SEDIBENG	Urban	Rural
Clinic		
Headcount per capita / Year	2.0	1.7
Home Visits		
Home Visits per Capita / Year (70% coverage)	1.0	0.4
Total Contacts with PHC/ capita/Year	2.7	2.0
UMZINYATHI		
Clinic		
Headcount per Capita / Year	3.2	3.1
Home Visits		
Home Visits per Capita / Year (70% coverage)	0.7	0.4
Total Contacts with PHC/ Capita/Year	3.7	3.4

The expected number of home visits per capita, after applying the demographic structure and burden of disease of each district, for an average 70% coverage, would amount to an average of 1.2 home visits per capita per year in Sedibeng and 1.5 in uMzinyathi.

Scenarios

Applying time on travel and activity time per type of activity and type of home visits presented earlier, the number of CHWs required per type of district was calculated.

In Sedibeng, CHWs spent 66% of their time on home visits (travel + time in homes) in urban/peri-urban and 57% in rural areas. If the district was entirely urban, and with CHWs working in pairs, 334 (168x2) CHWs would be required to cover home visits and other activities for a population of 100,000 people. If the district was entirely rural, with people living on farms, 446 (223x2) CHWs would be required, 33% more than in a urban/peri-urban district. If CHWs did not work in pairs, this proportional difference would remain the same. There is currently 88.5 CHWs per 100,000 population in Sedibeng.

Table 15. CHWS required for 100,000 population per type of site in Sedibeng

Home visits per year for 100,000 population				
Median Time in Minutes	Travel + In Home			
	Per Visit		For 1 year home visits combined	
	Peri-Urban	Rural	Peri-Urban	Rural
Registration	35	40	77 707	88 808
Screening	35	40	77 707	88 808
Home visits Other				
Mother & under 5	36	40	1 285 120	1 427 912
HIV/TB	35	35	1 114 737	1 114 737
Chronic	35	45	1 441 292	1 853 090
Other	39	50	805	1 045
Total in Hours			66 623	76 240

Number CHWs Required per 100,00 population		
	Peri-Urban	Rural
% time on Home Visits	66%	57%
Days per year on duty	200	200
Hours per CHW/day	6	6
Hours/year per CHW for HV	792	684
Number CHWs per activity	2	2
Number CHWs Required	168	223

33% more in rural areas

In uMzinyathi, CHWs spent 55% of their time on home visits in urban/peri-urban and 49% in deep-rural areas. Unlike in Sedibeng, CHWs do not work in pairs. To cover home visits and other activities for a total population of 100,000 people, 137 CHWs would be required if the population was all living in urban/peri-urban areas. If 100% of the population were living in deep rural areas 221 CHWs would be required, 62% more than if the district was all urban/peri-urban. There is currently 87 CHWs per 100,000 population.

Table 16. CHWS required for 100,000 population per type of site in uMzinyathi

Median Time on home visits for 100,000 population

Median Time in Minutes	Travel + In Home			
	Per Visit		For all home visits combined	
	Peri-Urban	Deep-Rural	Peri-Urban	Deep-Rural
Registration	85	75	326,440	288,036
Screening	35	90	430,133	1,106,057
Home visits Other				
Mother & under 5	71	110	1,400,341	2,169,542
HIV/TB	61	90	2,398,437	3,538,677
Chronic	72	89	2,675,318	3,306,991
Other	110	120	2,299	2,508
Total in Hours			120,549	173,530

Number CHWs Required per 100,00 population		
	Peri-Urban	Deep-Rural
% time on Home Visits	55%	49%
Days per year on duty	200	200
Hours per CHW/day	8	8
Hours/year per CHW for HV	880	784
Number CHWs per activity	1	1
Number CHWs Required	137	221

62% more in deep-rural than peri-urban areas

Households per CHW

According to governments guidelines a CHW should cover 250 households. Using this base for urban/peri-urban areas, the number of households per CHW in rural areas should be 33% lower or 169 households, and 62% lower in deep-rural areas or 96 households per CHW.

Table 17. Number households per CHW per type of site

Type of area	Ratio to Urban sites	# households per CHW
Urban/Peri-urban	1	250
Rural	-33%	169
Deep-rural	-62%	96

Sensitivity analysis

Increasing the CHW stipend to R3,500 a month would increase the Sedibeng district expenditure by 25% and the WBOTs expenditure per capita from R47 to R59. WBOTs expenditure would still represent under 5% of PHC expenditure per capita. In the less resourced uMzinyathi district, the stipend would almost

double, translating in an increase of 71% in district expenditure on WBOTs. The WBOTs expenditure per capita would move from R28 to R48 but would still represent only 4% of PHC expenditure per capita

Table 18. Financial impact of CHW stipend increase to national minimum wage

	Current	Changed stipend
Sedibeng		
CHW stipend/month	2,500	3,500
% increase in stipend		40%
% increase in district expenditure		25%
WBOTs expenditure per capita	47	59
PHC expenditure per capita	1,200	1,200
WBOTs as % PHC expenditure	3.9%	4.9%
uMzinyati		
CHW stipend/month	1,800	3,500
% increase in stipend		94%
% increase in district expenditure		71%
WBOTs expenditure per capita	28	48
PHC expenditure per capita	1,150	1,150
WBOTs as % PHC expenditure	2.4%	4.2%

Discussion

South Africa has recognised the importance of community-based services as part of the continuum of care of primary health care services. The scope of services address the needs of different population groups ranging from mother and child needs to adults with HIV and TB and the elderly with chronic diseases. It is envisioned to be complementary to facility-based services and serve to increase access to health services. CBS are not a new concept in South Africa, and this platform and its recognition and utilisation have fluctuated over the past few decades, with high interest in the 1970s, less so at the end of the 80s and 90s, and a renewal of interest in response to the HIV/AIDS epidemic. The move towards the institutionalisation of CBS with the PHC Re-engineering has pushed national level, provinces and districts towards the development of CBS policy. Much has been discussed regarding the scope of services and type of cadres. However, an area that has remained relatively unexplored is how CBS requirements differ between urban/peri-urban, rural and deep-rural areas, for a type of service focusing largely on home visits. The purpose of this study was to identify possible differences in needs and activities between these types of areas and their consequence for resource allocation.

Defining urban/peri-urban, rural and deep-rural in the context of CBS is challenging. These services have been rolled out in priority to the areas with the highest needs. As such in urban/peri-urban they are in poor formal and informal settlements, areas traditionally referred to as peri-urban given the geography

of apartheid. Rural areas also cover different realities: from small towns to farming areas to more sparsely distributed rural settlements. Deep-rural areas refer to low density areas where access and organisation of services are different from those in rural areas. We chose two districts in two provinces with different organisation of CBS: Gauteng and Kwazulu Natal. In Gauteng, Sedibeng has large poor peri-urban areas and smaller rural areas made up of farms with farm workers. In KZN, uMzinyathi has an urban/peri-urban sub-district with the three other sub-districts representing deep-rural areas. For the sake of generalisability we used the District Health Information System categorisation of facilities, hence of the WBOTs teams attached to them as urban/peri-urban and rural.

Understanding resources requirements in these different areas required an analysis of the way CHWs spent their time. The use of self-completion diaries enables a significant number of CHWs to fill diaries, but raises the issue of reliability of the data. The alternative approach is time and motion study which, due to its costs, must cover a much smaller number of observations and carries the limitation of the Hawthorne effect^{xvii} through which observed participants might modify their actions to do the desirable thing, knowing they are observed. We opted to ask a sample of teams of CHWs to fill a diary for 10 days (2 consecutive weeks) but spread out over several months to attempt to provide an accurate picture of all possible activities CHWs participate in. A total of 221 CHWs filled diaries with over 6,500 entries. We checked for markers of reliability of the data, by comparing the travel and time spent per activity across multiple entries. The travel time between different types of home visits (household registration, screening, etc.) came out quite consistent within the same type of area. Also, the profile (difference in) of recipients was consistent when comparing entries within each type of geographical area.

The community programmes in the two districts were organised differently, with half of the teams in Sedibeng operating out of the health posts, the other half operating from facilities from which they were supervised. In uMzinyathi, some of the WBOTs are attached to clinics but have their own CHWs supervisors, while the other WBOT teams are not attached to a clinic. In Sedibeng, as part of the Kgatelopele programme, emphasis was placed on delivering medicines to elderly whose chronic disease was stabilised. In uMzinyathi, an emphasis was placed on nutrition with CHWs spending significant time (a day at a time) at the nutrition centre (Philamthwena) where they saw children and mothers and monitored child growth. We thus analysed the two districts separately to highlight the possible differences type of sites in each district.

To identify possible differences in requirements between urban/peri-urban, rural and deep-rural areas, we compared travel time and activity time per type of activity, the share of CHW time on home visits, the profile of home visit recipients, conditions covered, referral rates and utilisation of PHC services. As the data was not normally distributed, we reported on the median values.

A limited number of activities were defined in the diaries to allow for ease of completion and improved reliability. For example, activities within health posts were not categorised for increased specificity to highlight tasks such as administration, meetings, etc. However, the diaries allowed for activities to be further broken down into "content", "condition" and "recipients" which then allowed for a more nuanced time analysis within each activity.

Travel time was expected to be the main differentiator between urban/peri-urban, rural and deep-rural areas. Interestingly in Sedibeng, while a statistically significant difference could be observed between

rural and urban/peri-urban teams, median travel time was overall only marginally longer in rural than urban/peri-urban areas. This could probably be explained by the fact that on farms families of agricultural workers are homed in regrouped pseudo-settlements. Surprisingly, the same observation regarding travel time is made in uMzinyathi; however, specific differences are seen when an analysis is done by specific activities. In Sedibeng, travel time constituted 43% and 44% of the total share of time in peri-urban and rural sites respectively. Travel time made up a much lower share of the total time in uMzinyathi, taking up 23% and 20% of the time in peri-urban and deep-rural sites, while activity time took up 77% and 80% of the share. More significant differences could be observed per type of activity. In Sedibeng, travel time to clinics/CHCs was twice as long in rural than peri-urban areas, with no difference for home visits. This is not surprising because there are no clinics directly on the farms themselves, and CHWs only come into the clinic in the morning before travelling for the day to the farms to conduct their activities. In uMzinyathi, median travel time for home visits was a third longer in rural areas and 20% longer to go to clinics/CHCs.

Time on activities themselves showed more significant differences than travel. Overall median time on activity was 15% longer in rural than peri-urban areas in Sedibeng and 10% longer in uMzinyathi. While the median time per home visit in uMzinyathi was 40 minutes in urban areas, it was 50% longer (60 minutes) in deep-rural areas. In Sedibeng home visits median time was 24 minutes in rural areas, 20% longer than in peri-urban areas (19 minutes). All these differences were statistically significant, and further research is needed to understand the reasons behind these differences. Do they cover a wider range of needs in rural and deep-rural areas compared to peri-urban areas? Does the format of social interaction vary between urban and rural areas requiring more time in homes? Whatever the reasons CHWs spend more time in the home in rural and deep-rural areas impacting on the number of home visits they can perform.

When combining travel and activity time per type of activity, CHWs in Sedibeng spend most their time on home visits (an average of 66% and 57% in urban/peri-urban and rural areas respectively) and in health posts/clinics (23% and 29% respectively). Combined, these activities accounted for 89% and 86% of CHW time respectively. In uMzinyathi a similar picture emerged with CHWs spending 55% of their time on home visits in urban areas and 49% in deep-rural areas. They also spent around 15% of their time at the nutrition centre in both types of areas, and 18% of their time in clinics (including meeting with supervisors) in urban areas, and 13% in rural areas. These 3 activities combined accounted for 88% of CHWs' time in urban areas and 79% in deep-rural areas.

For each home visit, time (travel + activity time) is higher in rural/deep rural areas than urban areas in both districts. Additionally, CHWs spend a lower share of total time on home visits in rural/deep-rural than urban areas in both districts. As a consequence, the number of home visits per CHW per week is lower in rural/deep-rural than urban/peri-urban areas. Therefore, for a given number of home visits for a given population, a higher number of CHWs will be required in rural/deep-rural areas than urban/peri-urban areas. The implications of this finding is highlighted in the discussion of scenarios.

Reasons for home visits varied between the two districts. In both districts, health education and/or screening was the main activity during home visits. Bringing medicine to patients was more frequent in Sedibeng than in uMzinyathi because of the Kgatelopele program. In both districts, however, it was more frequent in urban than rural/deep-rural areas. Tracing defaulters was rare in uMzinyathi at about 5% of

home visits in both peri-urban and deep-rural areas. It was low in peri-urban areas in Sedibeng (4%) but much higher in rural areas at 28%. Referral rates were low in both districts, around 4% in Sedibeng (both types of areas) and 2% in uMzinyathi's peri-urban areas but, at 12%, significantly higher in the district's deep-rural areas. This low referral rate raises questions about the quality of screening. Other districts have also observed low referral rates from CHWs. Anecdotal evidence from Tshwane shows that during a strike by CHWs, home visits were made by staff nurses. During that period the referral rate increased considerably. Further study should investigate the reasons behind low referral rates: inadequate CHW training? Inadequate supervision/support? How much unmet needs are addressed?

The vast majority of home visits were recorded as involving only one recipient. Overall the profile of recipients was significantly different between urban and rural areas. In Sedibeng mother and child under 5 represented a small proportion of home visits recipients, 14% in peri-urban areas and 8% in rural areas. Farm areas had a smaller share of pregnancy/postnatal home visits and of older people than urban areas, likely to indicate that fewer women remain on farms during the neonatal period and that individuals over the age of 60 may not remain on farms past 'productive' age. In uMzinyathi by contrast, mother and child represented 34% of visits in deep-rural areas compared to 14% in peri-urban areas; this could partly be due to the demographic profile of the district, with 70% of the population under the age of 35.^{xviii} As in Sedibeng, adults under 60 accounted for about half of all recipients.

Costing

Costs are presented as annualised costs combining the annualised set-up costs and one-year recurrent cost. Set-up costs (equipment, training) are often reported as one-off costs when these expenditures have in fact to be repeated over time even if not every year. CHWs in peri-urban and rural/deep-rural areas receive the same training, kit, stipend and supervision. There is no transport nor cell phone allowance. Thus, the cost per CHW is similar between sites within a district. Annualised costs expressed as costs per CHW amounted to approximately R52,000 in Sedibeng and R29,948 in uMzinyathi. Cost differences between districts can be explained by the higher CHW stipend in Sedibeng (R2,500 per month compared to R1,800 in uMzinyathi) and the different supervision/management structure with supervisors in Sedibeng being retired nurses and staff nurses while in uMzinyathi they are 'super-CHWs' with a stipend of R2,300. Retired nurses received a low salary which was a top up over their pension at R3,869 a month for a full-time nurse and does not include benefits. While a cheap solution given the skills of a retired nurse, it may be unfair given their age to expect them to walk to houses to do on site supervision. They are increasingly complemented by more expensive staff nurses who receive a full salary package.

Expressed in cost per capita total population, WBOTs teams amounted to R47 per capita per year in Sedibeng and R28 in uMzinyathi. In 2015 the PHC expenditure per capita stood at around R1,200 in both districts,^{xix} WBOTs teams expenditure translated to between 2% and 4% of the PHC expenditure per capita in uMzinyathi and Sedibeng respectively. This very low proportion of PHC expenditure confirms the concerns with CBS being a severely underfunded platform of service delivery, limiting its ability to produce the expected impact.

Having focused on differences in CBS within each district between urban/peri-urban, rural areas and deep-rural areas it is important to assess whether the quantum of PHC services (facilities and CBS) was different between types of sites. In Sedibeng, utilisation rate of facilities (clinics, CHCs) measured by the number

of facility headcounts per capita was higher in urban/peri-urban than rural areas, so were the number of home visits per capita. This could be explained by a demographic profile in farm areas with proportionally fewer children and elderly people than in urban areas. The same pattern could be observed in uMzinyathi. But is this level of utilisation of CBS services that which could be expected? In 2012, the SAMRC modelled for the national department of health the number of home visits which could be expected per year based on the demographic structure and burden of disease of the country. This model was adapted separately for each district, with their different demographic structure and burden of disease (HIV and TB). According to this modelling, Sedibeng would be expected to have 1.2 home visits per capita total population and uMzinyathi 1.5 for a 70% coverage. A lower observed number is recorded in the DHIS in particular in rural/deep-rural areas with an average of 1 home visit per capita in peri-urban and 0.4 in rural areas with WBOT teams in Sedibeng, and respectively 0.7 and 0.4 per capita in uMzinyathi. However, in uMzinyathi CHWs also see children and mothers at the nutrition centre, Philamthwena.

To quantify the implications of the time differences observed between types of sites, we used the target number of home visits per capita for each district and applied it to a district with 100,000 total population. Comparing the number of CHWs required if this district was 100% urban/peri-urban and then 100% rural or deep-rural, using each district time data, we found that rural and deep-rural areas require higher number of CHWs than urban/peri-urban areas to conduct the same number of home visits: a rural (farms) district would need 33% more CHWs than an urban/peri-urban district, based on the Sedibeng profile. With the profile of uMzinyathi, a deep-rural district would require 62% more CHWs than an urban/peri-urban district. The need for higher number of CHWs to serve the same population with the same number of target visits is mainly due to two factors: firstly, the share of CHW total time spent on home visits is lower in rural or deep rural than in urban/peri-urban areas in both districts. Secondly, the length of combined time for travel and time in homes is longer in rural areas than urban areas, again across both districts, mainly due to longer time in homes. This demonstrates that there are geographical implications on the number of recipients CHWs can cater to daily and should be considered when developing policy and allocating resources. Based on an average of 250 households per CHW in urban/peri-urban area, a CHW in rural area would be expected to cover 169 households and in deep-rural areas 96 households.

Although the cost per CHW is the same in rural and urban areas, the increased number of CHWs required in rural and deep-rural areas means that budget allocations should be higher per capita in rural than urban areas.

The sensitivity analysis, which modelled an increase of CHWs' stipends to align with the new national minimum wage at R3,500 per month, shows that despite this significant increase WBOTs expenditure per capita will remain a small share of PHC expenditure per capita: 4% in uMzinyathi and 5% in Sedibeng.

An important aspect not covered in this report is the issue of support/supervision. Whilst Sedibeng has recently appointed staff nurses as dedicated WBOT team leaders to complement and in some places replace retired professional nurses, in uMzinyathi immediate support/supervision is carried out by 'Super' CHWs, raising questions about the extent of their clinical skills. Further research should be done to assess the impact of supervisors' different levels of clinical skills on CHWs referral rates.

Policy recommendations

Based on the findings of this report, we want to make the following recommendations:

- Type of sub-districts (urban/peri-urban, rural, deep-rural) must be taken into account for work and resource allocation:
 - a. Compared to urban/peri-urban areas, 33% more CHWs are required in rural areas to cover the same size of population
 - b. Compared to urban/peri-urban areas, 62% more CHWs are required in deep-rural areas to cover the same size of population
- The number of households per CHW must be adjusted per type of sub district:
 - a. In urban/peri-urban areas 250 households per CHW
 - b. In rural areas: 169 households per CHW
 - c. In deep-rural areas: 96 households per CHW
- Overall the level of resourcing of CBS should be reassessed as it represents a very small proportion of PHC expenditure (under 4%), given the role the CBS platform is expected to play in the continuum of services
- CHWs' stipends need to be standardised across the country, and should as a first step be aligned to the national minimum wage.
- Further research should be conducted to assess the reasons behind differences in duration of home visits and possibly differences in content between types of sub-districts
- Further research should be done to assess the reasons behind low referral rates and the relative role of training and quality of support/supervision.

Conclusion

Urban/peri-urban, rural and deep-rural areas have different needs concerning community-based services, and such differences must be considered in resource allocation decisions. Home visits in rural and deep rural areas are significantly longer than in urban areas and CHWs spend a smaller share of their time in home visits. Rural and deep-rural areas need more CHWs than urban areas. Beyond differences between types of areas, CBS services are the poor cousins of facility-based services, representing in the districts studied, between 2.4% and 4% of the PHC expenditure per capita. Increasing CHWs stipends to the recently agreed national minimum wage would push CBS services up to under 5% of PHC expenditure per capita, still a low level for an important platform on which so many programs rely. Increased resourcing of support/supervision is necessary to ensure dedicated supervisors with some level of clinical skills (ENs) can support the work of the community health workers to maximise potential health benefits. Referrals are low and a higher presence of supervisors on site would likely elicit higher case finding and higher rates of referral.

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