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Chapter

Comparative Assessment of Hygiene Behaviour Change and Cost-Effectiveness of Community Health Clubs in Rwanda and Zimbabwe

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Abstract

Two similar Community Health Club (CHC) interventions to achieve hygiene behaviour change and improved family health in Africa took place—one in Zimbabwe implemented by an NGO and the other in Rwanda as part of a Randomized Control Trial. Both interventions achieved high levels of community response, although the Zimbabwe project was more cost-effective, achieving blanket coverage of all households in the area with over 90% compliance in 12 recommended practices at a cost of US\$4.5 per beneficiary in 8 months. In Rwanda, the spread of the intervention reached only 58% of the households in the first year costing US\$13.13 per beneficiary. By the end of three years, the spread had increased to 80% with over 80% of the 4056 CHC Members adopting 10 new practices without any extra cost to the project. Although the Zimbabwe program showed better Value for Money, being more efficient, long term sustainability to prevent slippage of hygiene behaviour change depends on a strong monitoring system. Scaling up hygiene behaviour change is best achieved systematically by building the capacity of the Environmental Health Department to take responsibility for the supervision of CHCs in every village. Investing in an integrated national program, which can enable Government to coordinate NGO efforts, is a more cost-effective use of scarce resources in the long term.

Keywords: community health clubs, cost-effectiveness, hygiene behavior change, Zimbabwe, Rwanda

1. Introduction

With a strong international drive to achieve the Sustainable Development Goals (SDGs) and end absolute poverty by 2030 [1] there is a renewed interest to broaden

community development initiatives from the ‘silo vision’ which characterized much community development from 2000 to 2015, when the Millennium Development Goals (MDGs) [2] encouraged a more narrow focus, to a more integrated approach with the current SDGs. As no single SDG goal on its own will be sufficient to completely eliminate poverty, implementing organizations are looking for ways to combine programs across sectors: for example, the Goal 6 (Safe Water and Sanitation) if combined with Goal 2 (Food Security and Good Nutrition), is likely to be more successful in improving Goal 3 (Improved Family Health). If, in the same program, Goal 5 (Women’s Empowerment) results in Goal 8 (increased Employment), then a substantial reduction of the primary Goal 1, (the elimination of *Absolute* Poverty) would be expected. Integrated programs are not only more aligned with this holistic people-centered approach but will also be more likely to be cost-effective.

The Community Health Club (CHC) model of community development is an integrated and holistic strategy to start up CHCs—voluntary Community-Based organizations (CBOs) in rural or peri-urban area—which include all residents in active membership of a group. Membership of a CHC is freely available to all ages, education levels and social status. The club meets weekly for at least 6 months to find ways to improve family health by preventing common diseases through safe hygiene, with the purpose of increasing social capital, through shared understanding and coordinated action with the objective to improve living standards with existing resources.

The CHC is the vehicle for community development which, if extended into a full A.H.E.A.D Model (Applied Health Education and Development), can easily coordinate many activities into a single program in a process of development in four main stages, preferably over a 4-year period:

- Stage 1: Health Promotion (HP): Health education and participatory activities to improve hygiene (Goal 3)
- Stage 2: Water, Sanitation & Hygiene (WASH): construction of facilities through self-supply (Goal 6)
- Stage 3: Food, Agriculture and Nutrition (FAN) Clubs: nutrition gardens and ensuring a balanced diet (Goal 2)
- Stage 4: Gender Equity & Women’s Empowerment (GEWE): management of income generating projects (Goal 5 and 6)

2. The development of the Community Health Club Model

2.1 Community health clubs in Zimbabwe

In Zimbabwe, the Community Health Club (CHC) Model of development has succeeded in mobilizing communities in over 2340 CHCs in an integrated way (mainly Stages 1 and 2) over the past 25 years, through Africa AHEAD, the pioneer of this approach, thereby benefitting over 1.7 million people, across over half the districts in the country [3]. Although the full four-stage AHEAD Model has been used less often due to sector-specific donor funding in past years, the full AHEAD model was successfully conducted in 285 CHCs in Makoni District between 1999 and 2003 [4] and was found to be a cost-effective method of integrated development at <US\$5 per beneficiary per year for Stage 1. Since 2003, over 30 NGOs have

been trained by Africa AHEAD and CHCs are now routinely used throughout Zimbabwe by most NGOs. CHCs have enabled many communities to be better organized to mitigate against cholera [5] as well minimize common diseases such the diarrhea, pneumonia and malaria, skin and eye diseases as well as neglected tropical diseases such as intestinal helminths (worms) and schistosomiasis (bilharzia) which were virtually eliminated in reported clinical cases in an area in Makoni District where CHCs had been active for 4 years [6]. An assessment of hygiene behavior change in CHC programs in Chipinge, Chimanimani and Buhera Districts also showed a strong pattern of hygiene improvement based on monitoring records of the program, where 12,311 CHC members enrolled in 127 FAN Clubs [7]. This resulted in improved livelihoods and social capital through communal nutrition gardens with a community member reporting: *'There was a new spirit of cooperation, empathy and love within the participating communities as a result of the FAN intervention as the training provided a mechanism for visiting each other and showing empathy for each other in times of need.'* Although there is much anecdotal evidence through qualitative research [8–10] in Zimbabwe, there is an absence of any comparative research on CHC impact and 'Value for Money' between different countries in the published literature.

2.2 Replication of the CHC model to other countries

Africa AHEAD was instrumental in starting CHCs in around 20 countries through the training of other NGOs. Project monitoring records of these initiatives have shown positive hygiene behavior changes in a diverse range of cultures. In East Africa, an outstanding response was recorded in Uganda in 2004, where 116 CHCs were started in 15 camps for internally displaced people enabling the construction of 8504 latrines, as well as 6060 bath shelters and 1552 hand washing facilities within 4 months [11]. In peri-urban areas in both Namibia [12] and South Africa [13], CHCs have been successfully used to enable community maintenance for ablution facilities in informal settlements. In one South African slum, open defecation was reduced by 76%, and dumping of solid waste reduced by 50%. In the rural areas of Kwa Zulu Natal, communities improved their hygiene, sanitation and water supply through CHCs [14].

In West Africa, the Community Health Club Model was introduced into Sierra Leone in 2002 for post conflict rehabilitation, which then morphed into the 'For Di Pikin Dem Wel Bodi' program which is successfully improving child and maternal survival rates in Koinadugu District [15]. CHCs were also used to mobilize Muslim communities in a trial in Guinea Bissau to reduce infant and maternal mortality by increased treatment seeking behavior [16].

The CHC concept was transplanted from Africa to the urban slums in the Caribbean, firstly being replicated into the Dominican Republic [17], and then, more successfully, across the island to Haiti by voluntary community leaders who report that CHCs *'foster positive social relations that can positively improve health-related behaviors'* [18]. In Guatemala they are being used to build trust to enable a strong community response for a water supply project [19]. In 2009, Vietnam, the Ministry of Health started CHCs in three provinces which they considered a *'low cost, high impact'* method demonstrating a significant reduction in diarrhea cases as measured by reported clinical cases at a cost of under one dollar per CHC beneficiary using government environmental health workers [20].

However, none of these programs have been revisited to assess their progress nor have different programmes been compared in published literature and much useful learning is being lost for lack of such research.

2.3 Scaling up the Community Health Club Model in Rwanda

Rwanda is the only country in Africa to have embedded the CHC model into a national program known as the Community Based Environmental Health Promotion Programme (CBEHPP) [21]. In 2010 the Economic Development and Poverty Reduction Strategy II laid out the target of ‘CHCs with enhanced health promotion and behaviour change capacity’ to reach 70% of all villages in Rwanda by 2018 [22]. By 2015, CBEHPP had succeeded in establishing CHCs in virtually all the 15,000 villages throughout this small, but highly organized country of 12 million people. CBEHPP contributed to Rwanda becoming one of only five countries in Africa to meet sanitation targets of the MDGs and to halve the number without sanitation in the country. The *Imihigo* assessment is a regular evaluation by government in Rwanda whereby each Mayor is held accountable for various achievements (including a CHC in every village). The *Imihigo* assessment in 2015 recognized that CBEHPP had successfully galvanized communities in Rusizi District to achieve hygiene and sanitation change [23].

Based on the Rwandan success story using CBEHPP, the African Union (AU), with backing from the African Development Bank (AfDB) and the African Ministers’ Council for Water (AMCOW) recommended in 2016 that the CHC Model should be used in the 10 most fragile states in Africa to achieve the SDGs. The AU’s Kigali Action plan states:

‘... Rwanda has gained substantial experience with social approaches such as the Community Based Environmental Health Promotion Programme (CBEHPP) and Community Health Clubs (CHCs) the implementation of which has enabled the country to significantly reduce the debilitating national hygiene and sanitation-related disease burden and, in so doing, attain key outcomes in efforts to achieve the MDG targets not only for water supply and sanitation, but also poverty reduction outcomes.’ [24].

CBEHPP in Rwanda, having reached most villages across the country, has now been extended into a well-resourced USAID-funded Integrated Nutrition–WASH program which aims to reduce the prevalence of stunting in eight districts using existing CHCs to roll out a Food Security and Nutrition program in line with the ‘full’ four-stage AHEAD Model, thus providing a valuable example of CHCs being taken to scale.

3. Cost effectiveness

The rationale for providing water and sanitation initiatives has been based on the need to control diarrheal diseases, which still claim the life of one in every nine children before their fifth birthday [25]. Whilst many diseases can be fairly easily controlled by a single action (e.g. the use of insecticide treated bed-nets to prevent malaria), the control of diarrhea is more challenging because there are at least five main transmission routes through which feces reach the mouth. These are known as the ‘5 “F’s” – Flies, Fluids, Fingers, Food, and Fields [26] - all of which have to be safely controlled if the prevalence of diarrhea is to decrease. It has long been understood that if only one “F” component is addressed alone, without the other 4 “F’s” then diarrhea is unlikely to be successfully reduced. Research has shown that safe drinking water is estimated to reduce diarrhea by only 15%, safe sanitation by 35%, hygiene promotion by 33% [27] and regular handwashing with soap by 47% [28]. The training in the CHC tackles all 5 “Fs” over a 6 month period and therefore theoretically (if over 80% of CHC members respond and improve their hygiene) diarrhea should be decreased.

However, diarrhea accounts for only 11% of death globally among children under five in developing countries: pneumonia accounts for 18%; complications

during pregnancy for 14%; death in childbirth 9% and malaria for 7% of child deaths [25]. The most effective intervention to prevent infant deaths would be to improve nutrition because malnutrition (miasma) accounts for 33% of all the deaths mentioned above i.e. Children who have pneumonia, diarrhea, and malaria have less chance of survival if they are malnourished and stunted. Many of these child deaths could be prevented with little cost, if mothers were properly trained in CHCs, enabling them to improve their understanding of disease prevention, to protect their children by safer hygiene in the home and ensure early treatment to reduce child mortality.

However, there is a caveat – as public health relies on reaching the critical mass in a population, we maintain that at least 80% of the CHC members should conform to the recommended practices if any impact is to be found on prevention of diarrhea. This critical assumption is highlighted in the recent debate [29, 30] as to whether CHCs in Rusizi District in Rwanda, achieved sufficient quality and quantity of training to bring about the prevention of diarrhea let alone control stunting.

Although much research has been done in WASH literature on a *single* aspect of ‘effectiveness’ (i.e. water *or* sanitation *or* hygiene) there are few peer reviewed papers that address *all three* of these essential aspects of WASH. This may be because few programs are sufficiently integrated to *provide* all three inputs. A review of a Cost-Effectiveness Analysis [31] found only six studies, of which, only three, met the minimum level of methodological soundness. Two of these referred to our own work in Zimbabwe [4, 32] and the other to a study in Bangladesh [33]. In this review, ‘Effectiveness’ was defined as ‘*the adoption of specific recommended hygiene practices by those exposed to a health promotion programme*’, whilst ‘Cost’ was calculated roughly by taking the monetary expense of only the *field* inputs divided by the number of people benefitting, giving a ‘*cost per person per year*’. In this paper we use the same definition of ‘cost-effectiveness’ as it is measured in monetary terms (US\$) – i.e. the production of ‘*a unit of effect through an intervention*’. The term ‘Value for Money’ is similar but emphasizes the *quality* of services.

This paper looks at the cost-effectiveness of two interventions which use the CHC Model: an intervention in Rusizi district in Rwanda implemented between 2014 and 2017 which was part of the National CBEHP Programme, and a project in Mberengwa District in Zimbabwe implemented in partnership with an NGO between 2012 and 2014. We assess the different inputs and analyze the cost-effectiveness of the two different strategies against intermediate outcomes of hygiene behavior change.

The field cost includes all training expenses of personnel but does not include costs of direct inputs in the form of subsidy for cement for sanitation nor water hardware, i.e. filters or handpumps. Neither were the indirect costs for the NGO management nor research costs included in this calculation of cost-effectiveness. Indirect beneficiaries, (i.e. those outside the program that might benefit incidentally by diffusion of innovation or emulation) were not counted, as we only monitor the households who are registered CHC members and their immediate family living within the household (defined as ‘those eating from the same pot’).

4. Description of the interventions

4.1 Mberengwa District, Zimbabwe

The CHC approach in Zimbabwe has been adopted into both the National Water Policy [34] and the National Sanitation and Hygiene Policy [35], although the Government of Zimbabwe has not yet been able to launch a national CHC program

to coordinate the sector as has been so effectively done in Rwanda. In Zimbabwe, NGOs are largely coordinated through UNICEF which heads the WASH Cluster. Zimbabwe AHEAD (ZA) partnered with Action Contre la Faim (ACF) to implement the Public Health Promotion and Community Livelihoods Improvement Program in Gutu and Mberengwa Districts [9]. Midlands Province is one of the most arid areas of Zimbabwe with a low rainfall of 150–250 mm. Literacy is over 80% for both men and women. ZA was responsible for the ‘software’ (meaning mobilization and training of people) in Stage 1 (Health Promotion), whilst ACF managed the implementation of the ‘hardware’ component (i.e. infrastructure) for the Stage 2 (Water and Sanitation) and Stage 3 (Food, Agriculture & Nutrition) (FAN) in the two subsequent years.

The main task for ZA was to mobilize the community and to start up and train CHCs, in order to promote full community participation and inculcate increased responsibility to ensure strong community ownership for the water provision programme. Most people in the area are subsistence farmers, but as many men are away from home all year working in South Africa, their wives remain to run their farms. The year 2012 was not an enabling period in which to run a program in a remote rural area, as the economy had collapsed with hyperinflation, political tensions were high, and Zimbabwe had dropped to the 14th lowest in Human Development Index in the world [36] with a critical scarcity of fuel, banknotes and electricity.

Stage 1 of the program ran for 24 months, from February 2012 to January 2014. This was a well-staffed programme with 6 field officers stationed across 8 wards, supervised by a programme manager based in the District Office (**Table 1**). The aim was to achieve blanket coverage of households in these wards, so that all available households were within in a CHC.

Unlike other CHC programmes where CHCs have around 100 members, ACF was adamant that to ensure better quality of training, the size of the CHC membership should be restricted to between 40 and 50 members in each CHC. Therefore, to enable the whole village to join, a second CHC would be formed if there was enough demand from the community. In fact, such was the popularity of the CHCs that the target of 8208 possible members was exceeded with a total of 9615 members registered resulting in universal coverage within 2 years (**Table 1**). To achieve more gender balance, it was strongly advocated by the project officers in mobilizing the community, that the CHC was not only a woman’s concern, but that husbands as well as wives should be members. As a result, there were 1196 male CHC members (18% of the total membership), resulting in 1407 households where both husband and wife attended the CHC together. Blanket coverage was achieved with the total number of members being 17% more than number of households. As for compliance with training, with sufficient time and personnel, all of the CHCs managed to complete the required number of 20 training sessions, with 4864 sessions being held in total. Mberengwa had an exceptional completion rate, with 77% of CHC members graduating with full attendance, which is higher than many other CHCs project in Zimbabwe.

Ministry of Health had three Environmental Health Technicians (EHTs) stationed in the project area who were meant to be involved in the programme but had no transport: they relied on the NGO which effectively managed the program, with all field officers having their own motorbike. To understand the scale of the project, mobilization details can be compared between Mberengwa in Zimbabwe and Rusizi in Rwanda (**Table 1**).

4.2 Rwanda: Rusizi District

In 2012, a cluster Randomized Controlled Trial (cRCT) was proposed to establish the cost-effective of the CHC model within CBEHPP. Rusizi District was

Mobilization targets	Rusizi, Rwanda		Mberengwa, Zimbabwe	
	Actual achieved	Expected target	Actual achieved	Expected target
# Community Health Clubs (CHC)	50	50	243	237
Average # of members/CHC	81	70	40	34.6
# households in all villages	6942	n/a	8208	n/a
Mean of family in a household	4.7	n/a	4.4	n/a
# CHC members in all CHCs	4056	5000	9615	8208
Ratio female: male members in CHC	58:42	60:40	80:20	60:40
% of CHC coverage in a village	63%	80%	117%	100%
Number beneficiaries (family)	19,063	23,500	42,595	36,115
# NGO field officers in field	1	1	6	6
# Motor bikes for NGO field officer	0	2	6	6
# Environmental Health Officers	10	50%	3	6
# Motorbikes for MoH	5	50%	0	0%
# Weeks of training	16	24	24	24
# Health sessions held in all CHC	718	1200	4860	4860
Mean # health sessions / CHC	14.5	24	20	24
Mean attendance of members /CHC / session	41	50%	26	34
Literacy level women (men)	73%	n/a	80 (85%)	80%
# (%) of CHC members graduating	1703	42.4%	6335 (77%)	8208
Cost of Project (field costs only) US\$	250,325	n/a	193,529	n/a
Cost in US\$ per beneficiary	13.13	5	4.5	5
Cost in US\$ per family	61.71	25	22	25

Table 1.

Comparative summary of community mobilization of 50 classic villages in Rusizi District, Rwanda in 2014 with 243 classic CHCs in Mberengwa District, Zimbabwe in 2012.

selected for the intervention as it was one of the least developed areas of Rwanda with one of the highest levels of diarrhea and stunting in the country. There were 79,880 households in 596 villages with a total population of 375,436. Most of the population are subsistence farmers or fisherman with some trading across the nearby border to Burundi and the Democratic Republic of Congo [37]. The total population for the 50 Classic villages was 32,313 people within 6866 households, with an average of 646 people and 137 households per village, and an average of 4.7 people per household. Literacy is 73% for men and women over the age of 15 [38]. Rusizi has a tropical climate and rainforest with heavy annual rainfall of over 1400 mm per annum, with most falling between February and May.

The start-up of the CHC intervention was delayed by 6 months whilst the baseline and randomization of villages was being completed. By November 50 CHCs were formed (**Table 1**), one in each intervention village. The engagement of village leaders in the start-up was neglected due to difficulty with transport as the short rains had already just begun, making many villages inaccessible in tropical mountainous terrain. Nevertheless, the intervention was expected to continue despite the season, and facilitators were selected and trained in February 2014. Training took place from March to June during the long rains, and the period was curtailed to 5 months when

the intervention had to wind up activities according to the research protocol. For a full one year after the training ended (July 2014 to June 2015), the cRCT permitted no follow up by project implementation staff: there was no opportunity for revision of sessions, no model home competitions and very few graduations held as promised to reward those who had completed the training. After this year, without any external support to the community, the post intervention survey for the cRCT was undertaken. It was estimated that the intervention had only a 54% fidelity to protocol [30].

Of the possible 6942 households in the 50 villages, 4056 were enrolled in CHCs (50.7%) and of these 3144 CHC members (62.8%) attended weekly sessions with 42.4% competing all 20 sessions. Due to shortage of training period, and lack of monitoring and supervision by Ministry of Health, only 10 CHC came near to meeting mobilization targets: 76% had over 100 CHC members, only 50% reached over 80% coverage of households in a CHC in 1 year. Only 6% of CHC met the required target of providing 20 sessions of training within the intervention period—the mean being 14 meetings. The average attendance of all registered members at CHC sessions was 41 members per meeting. Although the 10 Environmental Health Officers had been expected to implement the intervention, they were grounded with no transport for the duration of the project. Africa AHEAD had only one monitoring officer but she did not have a dedicated vehicle, having to hire a motorbike taxi to monitor the whole district of 960 sq.km of challenging terrain during the heavy rains [30].

4.3 Methodology of training in a community health Club

The CHC methodology of training in both Zimbabwe and Rwanda is considered to be the ‘Classic’ CHC training (**Table 2**): although the CBEHPP Manual [40] was adapted to the Rwandan context, it was based on the original manual produced by the architects of the approach in Zimbabwe in 2009 [39]. In both countries CHC facilitators are given visual aids known as a ‘Tool Kit’ of illustrated A5 cards, which help to stimulate discussion in a variety of activities. CHC facilitators are usually nominated by the village leader from each village. They are voluntary and do not receive any financial incentives for the time they give the community although they receive basic equipment (a T-shirt, hat, boots, rucksack, raincoat and possibly a bicycle). CHC Facilitators are then trained by Ministry of Health extension staff or by the implementing NGO in a five-day training workshop, during which they acquire participatory facilitation skills as well as learning the transmission routes and basic information about prevention of common diseases addressed in the various sessions. When the facilitator returns to the village she registers as many members as possible to form up a CHC with a member from every household in the village and issues each member with a membership card (See CHC. **Figure 1**).

A health club can be compared to a religious group or a Scout meeting which assembles regular members together every week for a couple of hours. With a program to address local health and hygiene challenges, the regular opportunity to gather provides much team-building with songs and slogans that help to reinforce the knowledge which is gained through the ‘dialogue sessions’. Much use is made of key messages in visual aids, as well as being acted out in drama and role play. ‘Participatory activities’ such as the ‘*Three pile sorting*’, or ‘*Blocking the Route*’ activity are used to engage members. These games were originally developed to engage community in the ‘Participatory Hygiene and Sanitation Transformation’ (PHAST) training methodology for the maintenance of water and sanitation facilities [26].

The CHC aims to produce a cohesive community where there is genuine ‘common-unity’ of understanding, belief and practice. The group itself makes the rules which influence individual behavior and practices similar to the iterative process of peer learning pioneered in the education sector [41]. Each topic focuses on a *single*

	Key components of a classic CHC intervention	Zimbabwe classic	Rwanda classic
1	District Ministry of Health (MoH) is fully involved/supportive/funded directly	Yes	Partially
2	Politically enabling environment through a national policy	Yes	Yes
3	A CHC Manual, customized to national conditions	Yes	Yes
4	A tool kit of culturally appropriate visual aids	Yes	Yes
5	All sessions are participatory/dialog not didactic	Yes	Yes
6	24 × 2 h participatory sessions are provided	Yes	Partially
7	One topic per session with a recommended preventive practice	Yes	Partially
8	CHC Facilitator is local volunteer/Community Health Worker	Yes	Yes
9	All CHC facilitators have a thorough 5 day training	Yes	Yes
10	Environmental Health Officers monitor CHC and assist facilitator	Yes	10 EHOs but no transport
11	Enough dedicated NGO Project Officers (PO) supports MoH monitoring	Yes. 10x POs	No. Only 1 PO
12	24 session last for 6 consecutive months in dry season	Yes	4–5 months in wet season
13	All members have a membership card signed on attendance	Yes	Yes
14	A certificate is awarded at a graduation ceremony for full attendance	Yes	Not all CHCs had graduation
15	Monitor with household inventory at base and end line	Yes	Yes
16	Model Home Competitions held at the end of training	Yes	No, none held
17	There is no material subsidy for water/sanitation	Yes	Yes
18	CHCs aim to have 50–100 members who are registered	Yes	Yes
19	CHCs aim to have >50% members complete all 24 sessions	Yes	Yes
20	Household Coverage of CHCs in a village should be over 80%	Yes	Only 10% of CHC reached 80%

Table 2. Specifications for a Classic CHC Intervention, showing fidelity to protocol in Zimbabwe and Rwanda interventions.

aspect of hygiene, with a *single* activity recommended as homework, which does not incur much cost for the household (e.g. covering stored drinking water, constructing a pot rack). Incremental change is seen gradually over time, but it is our belief that at least 24 sessions over 6 months are needed to be sure that knowledge and practice are sufficiently reinforced (**Figure 1**).

CHC members receive no material incentives or food for attending health sessions, and the lack of “hand-outs” is made clear at the start of the program, ensuring that there are no false expectations of material gain. Despite this lack of material incentive, CHCs invariably attract a consistently high attendance rate at health sessions over an extended period, and there has seldom been any difficulty attracting a large crowd of 50–100 people in the many projects discussed above.

A membership card is given to each member when they join the club (**Figure 1**). This card gives confidence to members that the facilitators will provide the specified number of sessions, so providing a psychological guarantee that the training will, in fact, be completed. Members appear to value their membership cards highly

	Topic of the Session	Homework for the session
1.	What is a Community Health Club	Bring Friends and family next time
2.	Common Preventable Diseases	Be able to identify preventable disease
3.	Superbugs (antimicrobial resistance)	Build a handwashing facility
4.	Handwashing & Personal Hygiene	Build a family bath shelter
5.	Skin Diseases (Scabies & ring worm)	Ensure all kids treated for skin disease
6.	Diarrhoea/cholera, dysentery)	Clean up the yard regularly
7.	Infant Care & Immunisation	Ensure all kids are immunised
8.	Intestinal Parasites (worms)	Treat all kids for skin disease
9.	Food & Kitchen Hygiene	Build a pot rack for drying plates
10.	Nutrition & Balanced Diet	Start having a balanced diet
11.	Food Security & Food processing	Build a food drying rack
12.	Protected Water Sources	Ensure protected water source
13.	Storage/handling of drinking water	Ensure containers clean & covered
14.	Safe & Hygienic Sanitation	Ensure zero open defecation
15.	Solid Waste Management	Separate, Recycle and Reuse waste
16.	Safe Environment Management	Woodlot/fruit tree/organic fertilizer
17.	Safe Animal Management	Management of parasites & waste
18.	Criteria for a Model Home	All of the above, in each home
19.	Good parenting /child development	play with kids each day
20.	Youth issues (alcohol/drug abuse)	Talk to teenagers about their issues
21.	Combating Malaria	All use insecticide treated nets
22.	Pneumonia	Correct use of antibiotics
22.	Bilharzia (schistosomiasis)	Don't go in infected water
23.	Combating HIV/AIDs & Tuberculosis	Abstain, one partner or use condom
24.	Fertility and Reproductive Health	Know contraceptive methods

Figure 1.

Inside of a typical membership card showing topics and homework for each session.

keeping them carefully wrapped in plastic at home like their cards from a clinic. They enjoy the challenge of completing their cards, by attending all sessions [8]. They are then rewarded with a certificate, and this aspect of the CHC model may be the key to high attendance rates.

Seeking to understand the popularity of the CHCs, we found from interviewing CHC members in Zimbabwe that the principle attraction of CHCs, is their perceived need for knowledge, especially related to the health and wellbeing of their family. This love of learning appears to be one of the principle drivers of the CHC Model [8].

4.4 Context of the two interventions

The key components for a CHC intervention were very similar in both Rusizi and Mberengwa, aiming to meet all the specifications for the 'Classic' CHC Training (Table 2). In both interventions the key messages in 24 topics on the Membership Card were similar and local villagers were used as community-based facilitators to run the weekly health sessions, whilst Environmental Health Staff were expected to help *monitor* the intervention whereas in Rusizi they were meant to *implement* the program. An important difference between Zimbabwe and Rwanda, is that whereas the Mberengwa project was *community-led* and could expand to respond to the demands of the CHC members, being unconstrained by programme length or design, the Rwandan programme in the Rusizi trial was tightly controlled by the *research* protocol and had no flexibility to adjust timing or scope as the end line survey had to be completed before registered toddlers grew out of the cohort.

Hygiene and sanitation standards between the two countries vary considerably. In Zimbabwe the Government recommended standard for sanitation is a Blair Ventilated Improved Pit (BVIP) latrine which usually has brick lined pit with

cement slab, whilst the superstructure is likely to be permanent constructed in bricks, often plastered with cement with a tin roof and vent pipe with a fly gauze at the top to trap flies, thereby preventing breeding, as well as reducing smell.

For many years the building of BVIP latrines for the community was extensively subsidized by NGOs in WASH programs in Zimbabwe, but with the political turmoil and resultant socio-economic collapse of the country in 2000 when most donors withdrew, there has been little sanitation subsidy. As a result, the high coverage of improved sanitation which climbed rapidly during the 1990's and reached over 63% by 2000, had, a decade later, plummeted to around 25% in most areas, with a return to much open defecation [42]. Without such support, householders tended to build temporary latrines until they could afford the better standard of a BVIP. Instead of a brick wall and tin roof householders would sometimes use traditional mud and pole for walls with a thatch roof to save costs, but invest in lining the pit, having a cement slab and most importantly a vent pipe as is shown in **Figure 2** above. Research shows that it is the cost of a BVIP that prevents quicker uptake, but that with time CHC members do aim for this high government standard [43]. If they cannot afford to construct a proper latrine, CHC members are encouraged to practice 'cat sanitation' (i.e. the burial of their feces in a hole). This simple method is in fact more hygienic than an uncovered pit latrine which can add to the spread of diarrhea by becoming a breeding site for flies. A hand washing station known as a 'Tippy tap' is common practice in Zimbabwe, made from a jerrycan strung from local branches with a foot operated method for tipping out water.

In Rwanda, over 90% of households have their own latrine and there is little defecation in the surrounding bush [30]. The superstructure is usually made of mud/pole walls and thatch roof. The norm is an unlined pit latrine, with poorly fitting logs with gaps between them, straddling the pit and the smell is always unpleasant and there are frequently feces on the floor (See **Figure 2**). As the pit is not properly sealed flies breed in great numbers and the pits are often thick with maggots making this method highly unsanitary. This could be called 'fixed point open defecation' as it is no more sanitary than open defecation on the ground. The level of handwashing with soap is extremely low in Rwanda, and there are seldom handwashing facilities outside such latrines although most households have soap and wash hands in a common bowl before eating.

Zimbabwean households usually have a dedicated kitchen with an open fireplace in the centre of the round thatched cooking hut. Seating for men is a molded bench around the walls, whilst women and children sit on the ground by the fire, and chickens enter freely. The hut is usually very smoky causing a high rate of acute respiratory infections (See **Figure 2**). Traditionally, cooking huts were highly decorated with built-in clay shelving in the walls and this practice has been reinvigorated by the CHCs with all members upgrading their kitchens in ever increasing levels of excellence.

Water is stored in well covered containers and food is kept in containers to protect from flies and rodents. Many now use fuel-efficient stoves built in clay, and have seats for women on a par with men, thus showing increased gender equity. All food and utensils are stored in this kitchen hut which is kept locked (**Figure 3**).

Cooking in Rwanda, as in many East African countries, is done outside on an open fire (**Figure 3**). There is no culture of a dedicated kitchen hut as in Zimbabwe, and therefore the storage of utensils is haphazard, with no special place to store cooking pots, plates or food. Sometimes this is kept in the main house in boxes or baskets but almost always open to vermin. There is usually a shelter outside where goats are tied and this often doubles to provide shelter for cooking in the rains. Water is collected in a jerry can and stored unsystematically often without a cover. Filtration of water and fuel-efficient stoves are being promoted by government but uptake is still relatively low.



Figure 2.
Left: Subsidized ventilated improved pit latrine (VIP) in a CHC home in Zimbabwe with lined pit, concrete slab and vent pipe - a fly trap which eliminates smell and a hand washing facility. Right: An unsubsidized traditional pit latrine in Rwanda, unlined and open pit, log floor giving open access for flies. Photographs courtesy of J. Waterkeyn.



Figure 3.
Left: A model CHC kitchen hut in Zimbabwe showing shelving made of clay, individual family utensils and covered drinking water with ladle. Right: In Rwanda, a traditional cooking shelter outside, with no CHC improvements. Photographs courtesy of J. Waterkeyn.

5. Methods

5.1 Data collection

5.1.1 Popularity

Popularity of the CHC can be measured by the ability of the facilitators to attract many members and retain their attendance for the duration of the intervention. The Membership Cards of all members were collected at the end of the training and this was triangulated with project records to ascertain overall number of members in the

intervention, percentage of households within a CHC in each village and number of members completing the training i.e. graduating. This enabled us to have exact numbers of *active* members to calculate cost per beneficiary.

5.1.2 Effectiveness

Effectiveness was demonstrated by the *community response to the training* as measured by the percentage of members adopting each of the recommended practices. The observation check list, known as the 'Household Inventory', was used to conduct spot surveys which uses proxy indicators of hygiene behavior change which can be empirically observed first-hand by the enumerator. We did not use self-reported data as we are skeptical of the value of this method given the well-known effect of observer bias. For example: although we can observe the presence of handwashing facility (HWF) and whether soap was present, the calculation of regular usage over time is not observable. To overcome this monitoring challenge, all members are required to place a pot plant beneath their HWF. If the pot plant has been regularly receiving water from the HWF, and is alive, we know the HWF is likely to be in use. Similarly, we do not place much credibility on reported behaviour, as householders when asked this question, are likely to answer that they are in compliance with handwashing methods and use soap. To avoid such interviewer bias, we simply ask a child to demonstrate how they wash their hands and we note whether soap is used. Observations in Rwanda were conducted by Environmental Health Officers (EHOs) and trained enumerators drawn from teachers and students for a random selection of CHC member households. In Zimbabwe CHC facilitators, CHC chairpersons and Environmental Health Technicians (EHTs) collected data.

5.2 Data analysis

5.2.1 Quantitative analysis of cost-effectiveness

Project Records and accounts were used to ascertain field costs. An Analysis of Cost-Effectiveness was done by dividing the field costs by number of direct beneficiaries within a one-year time frame and was calculated, giving a 'cost per direct beneficiary per year' for improved hygiene [31]. Direct beneficiaries are taken to be all those within the household of a CHC Member, estimated at 4.7 people per household in Rwanda, and 4 people per household in Zimbabwe based on local census.

5.2.2 Analysis of community response: hygiene behavior change

In Rwanda a custom-made digital application for mobile phones was designed for CBEHPP which enabled data to be entered directly online thus eliminating most human error, through instant processing online using Open Development Kit (ODK) a free application for data analysis. This data was downloaded into excel and then analyzed in SPSS.

In Zimbabwe the data was collected by Project Officers and CHC facilitators and entered into excel computer program manually and analyzed in excel to generate a bar chart of before and after (at least 6 months after training) for each program.

5.2.3 Qualitative analysis of value for money

In Rusizi, the results were provided to all stakeholders involved in the training with Ministry of Health and 25 EHOs through Focus Groups Discussions at District Level. The EHOs were asked to identify and discuss reasons for the variation

between CHCs and to provide contextual rational for some of the anomalies, or where targets were under or over-reached. These insider observations from the grass roots provides the explanation for various challenges and shortcomings, as well as reasons for success of the CHC Model allowing some recommendations to achieve better Value for Money in future CHC programs based on the CHC Theory of Change [30].

In Mberengwa, an in-depth observation was taken on a small sub-set of six CHCs using an interpretivist approach. This was triangulated with participant observation, key informant interviews and focus group discussions involving Environmental Health staff, local leaders, CHC members and others. Field work was done over 2 weeks in Ward 19, which had 39 CHCs in the 43 villages and a population of 9245, in 1481 households. In addition, two villages without CHCs were sampled to serve as control groups to enable comparison [10].

5.3 Limitations and possible sources of bias

We use project monitoring data which, we accept could be open to interviewer bias as the field officers who managed the programme also assisted the facilitators in the collection of the village data. However, an effort has been made to minimize this bias, by using an external researcher in each country to clean data, excluding all incomplete data and verifying all records and findings in Rwanda [32, 45] and Zimbabwe [44] through spot observations. It is also not ideal that all that co-authors of this paper have been associated either with the design of the CHC approach and the implementation of the intervention in both Zimbabwe and Rwanda and may not be strictly impartial. However, in the interests of our genuine concern to improve learning in the sector, we have attempted to provide only such programming evidence which has been verified by external observers conducting research for their own theses which have subsequently been properly peer reviewed.

6. Results

6.1 Mobilization of community

6.1.1 Mberengwa District, Zimbabwe

The completion rate of the CHC training was exceptionally high in Mberengwa with full attendance of all 20 sessions by 6335 (77%) of CHC members. With sufficient time to repeat many of the session for a second time, all members had the opportunity to complete the training if they had missed the original session due to other commitments. The CHC training was well-timed by the NGO to coincide with the dry season (March – December 2012) to coincide with the 8 months of the year when there is little demand from farming to distract members from the training. All CHCs did more than 20 sessions properly, providing only one topic only per session of at least 2 hours of participatory activities. All the mobilization targets were not only achieved but surpassed during the first year, with follow-up by Project Officers, who arranged model home competitions. All CHC held their Graduation ceremonies properly with CHC members receiving certificates with due recognition. Those who did not finish in Year 1 had a second chance to complete their training and graduate in Year 2, while the water and sanitation component of the project was being done. However, as the number of members was limited to 50 per CHC, we could not judge the popularity of a CHC by the number of members

in the normal size of CHCs as is routinely expected in Zimbabwe, where CHC can reach over 100 people. Instead we ascertain the level of popularity by the fact that there was universal coverage with over 1407 households (17%) having two members in the CHC. Therefore, the CHC model in Mberengwa was clearly very popular.

6.1.2 Rusizi District, Rwanda

The completion rate of the training in Rwanda was not as high as had been hoped with only 41% of CHC members attending all 20 sessions in 5 months. However, this appeared to be, not because they did not *want* to attend sessions, but because they did not want to get wet in the torrential rain! In addition, the training was held during the season that farmers were at their busiest in the fields, planting and weeding crops. Not as many members completed as was expected because the training was shortened by a full month and they had no opportunity for repeating any sessions. Crucially there was no time for Graduation Ceremonies and no “Model Home competitions” were held as had been planned. However, monitoring records show that in the post research intervention, all CHCs continued to meet and over 6 sessions were done per CHC after the official end of the cRCT [30]. This demonstrates the demand for CHC activities. As attendance continued without external support, we would take this as an indication of a high level of sustainability. In Rusizi District, despite the constraints encountered by the community, the large size of the CHC in terms of memberships with an average of 80 members per CHC which exceeded the expected target of 70 members per CHC demonstrates popularity of the CHC. At the end of the cRCT intervention (i.e. after the first year), the spread of the intervention had only reached 58%. However, by the end of 3 years, the spread of CHC households had increased to 80% with CHC members ranging from 40 to 100% in 50 villages.

Our monitoring data shows that the uptake of the CHC model in Rusizi, although it was slow initially, did eventually meet all targets. Therefore, we would consider the CHC project to be a popular intervention in Rusizi District, and that what appears to have been community resistance was mainly due to external constraints imposed by the research and implementing team. Once Ministry of Health had clearly endorsed the intervention, the village leaders whole heartedly led the CHC with much interesting anecdotal evidence of community-led initiatives.

6.2 Hygiene behaviour change

6.2.1 Mberengwa District, Zimbabwe

The household observation included 7477 households in the end line survey (**Figure 2**) in Mberengwa District, with a clear pattern of community effort being evident in all indicators ($p > 0.001$).

Of the 21 indicators, 12 were found in over 90% of CHC households, and three indicators were found in over 80% of households after 8 months. To measure the effect of the CHC it is important to note which indicators have made the most change. The most impressive change from baseline to the post intervention 8 months later, was in the use of hand washing facilities in the home which increased by 85.4% (from 6.4 to 91.8%), the use of ladles to draw water from a bucket increased by 65% (18–83%), bathing rooms increased by 51% (16–67%), the use of pot racks to dry plates increased by 51% (46–97%), the use of refuse pits to ensure fly control increased by 39% (58–97%), decorated kitchens increased by 30% (66–95%), Blair Ventilated Improved Latrine (BVIP) for a household increased by 27% (from

14–41% households), the use of protected water sources for drinking water increased by 23% (61–84%), ventilation of housing increased by 21% (65–86%). Use of mosquito nets whilst still low (8.9–19.8%) increased by 11% and fuel-efficient stoves increased by 14% (4.2–18.2%) (**Figure 4**) [46]. The effect of the improved hygiene could be quantified by the condition of the children. Over 90% of CHC households could demonstrate children with no skin diseases, no worms, and a complete immunization card for all children. Mothers in over 90% of CHC homes could demonstrate how to treat dehydration with a Sugar salt rehydration solution.

It is noteworthy that changes which required purchasing were on the lower end of the scale with BVIP latrine construction, buying mosquito nets and fuel efficient stoves being the least amount of change. As this was during a time when Zimbabwe was completely dysfunctional economically and while there was over 75% unemployment in the country, with over 3 million Zimbabweans living abroad as economic migrants, it is not surprising there was little affordability. Indeed given this context it is impressive that 2108 high quality BVIP latrines which cost at least US\$100 at the time (when cement was in short supply nationally) were built by self-supply by households in some of the most challenging areas in the country.

After only 8 months, the post intervention survey showed that compliance level was over 80% of the registered CHC members in 15 indicators (**Figure 4**), of which 12 were over 90%, which leaves little doubt as to the effectiveness of the CHC training to stimulate exceptional levels of community response in Mberengwa District.

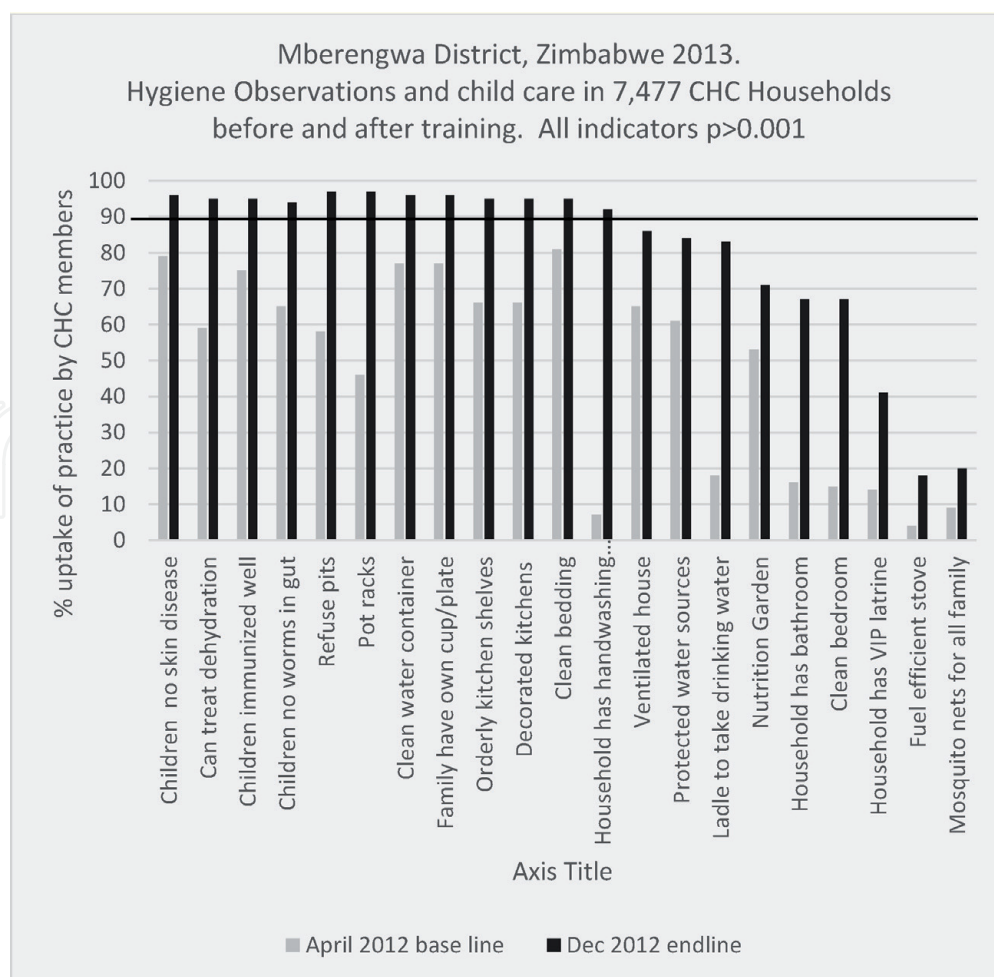


Figure 4. Percentage hygiene behaviour change of 7477 CHC members in Mberengwa District, Zimbabwe. 2012 [46].

6.2.2 Qualitative study

In one ward of Mberengwa a qualitative study was conducted in three villages [10] which established that CHC members were considerably more knowledgeable than non CHC members. Understanding the cause of diseases was claimed by CHC members to be the reason for their increased use of safe borehole water and the construction of latrines raising coverage in a village from 36.6–53%, and hand washing facilities by 22.1% (from 5 to 27.1%).

The study states in the conclusion,

‘As community members reflected on the impact of CHCs on their lives, the increases in their health knowledge was evident and participatory practices were prevalent across the CHCs. CHCs are currently bringing about a multitude of positive change, as the activities initiated by their members are practiced at the community level. Not only have health indicators changed, but more importantly, village member’s perceptions of their capacity have increased; they feel more able to control disease and improve their lives. More importantly, they are taking action to prevent disease and sharing what they have learned with other communities’ [10]

6.2.3 Rusizi District, Rwanda

Safe hygiene correlated positively in all but three of the 24 indicators with the number of sessions attended by members (p-value <0.001) (**Figure 5**).

To demonstrate an impact on sanitation in Rwanda was complicated by the fact that four of the indicators did not change significantly simply because, even *before* the start of the intervention, compliance was already exceptionally high - meaning little

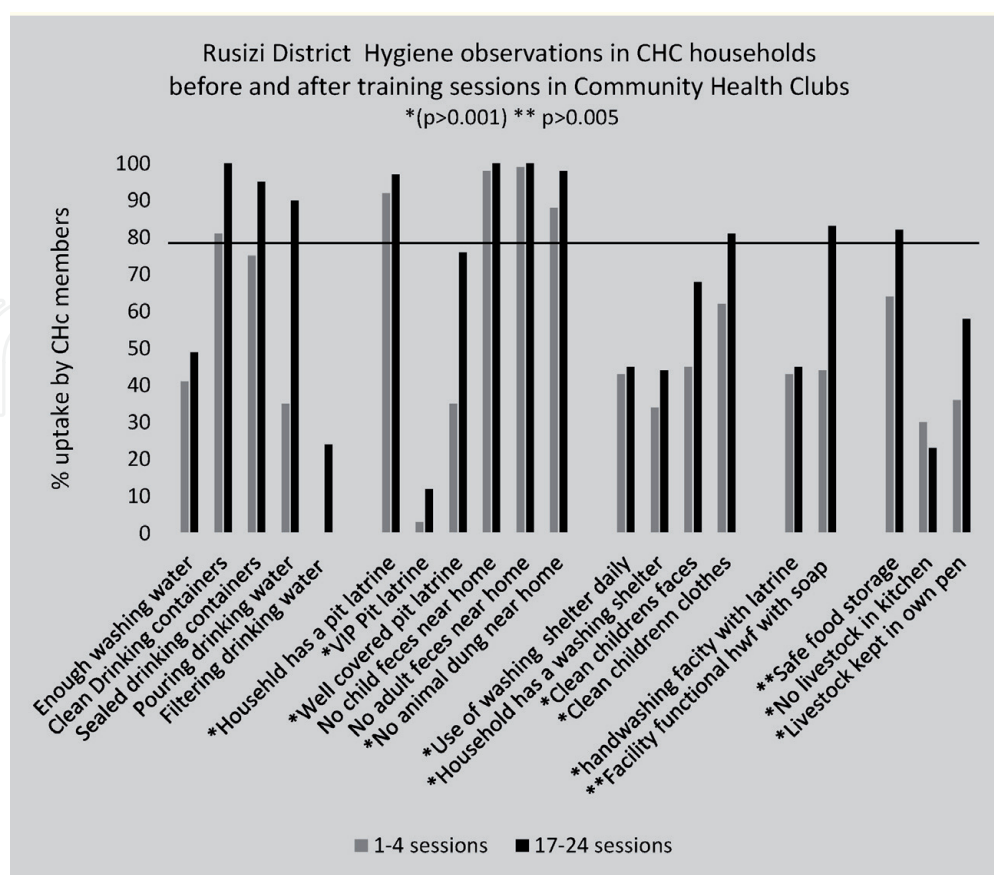


Figure 5. Percentage hygiene behaviour change of all CHC in Rusizi District, Rwanda. 2017 [45].

improvement could be expected as a result of the CHC training: 91% of households already had their own latrine, 98.5% households showed no child feces, 99.6% showed no adult feces and 90% showed no animal feces in the yard. With this exceptionally high level of latrine ownership, sanitation indicators were altered after the baseline, to an observation of the *hygienic standard* of the open pit latrines, with the recommendation that there should now be a well-fitting foot-operated cover for the squat hole to prevent fly access and breeding. Monitoring data showed a 40% increase in ‘*having and using a well-fitted cover for the squat hole of latrines*’ which increased from 35.5 to 76.5% [46]. The indicator “cover for the squat hole” is the most important indicator of the research, because unlike all other indicators, it was completely unique to the intervention and therefore unlikely to be confounded by previous initiatives [46] (**Figure 4**). This indicator showed that a 41% uptake of covered squat holes may be taken as a proxy indicator of the effect of the CHC on hygiene practice.

Thirteen of the most important indicators showed a significant increase of $p > 0.001$ (Pearson Chi-Square Asymptomatic Significance) and these are strong indicators of the high level of compliance shown by CHC members in relation to the training: a 5-fold uptake increase from those attending only 1–4 sessions as compared to those who have completed 17–20 sessions [45].

The quality of drinking water has been improved by a combination of improved practices for serving drinking water: 18% more households were making sure that jerry cans used to store drinking water were clean inside (81.9–100%) and that they were closed with lids (from 76.1–95%). A massive rise of 55% in the non-risk practice of the family taking drinking water by *pouring* from a jerry can rather than *dipping* into an open container (34.8–90%) would also decrease risk of contamination of drinking water in the home. The practice of using a (plastic) water filter increased by 24.2% from zero to 24.2% of families who had taken advantage of a district wide distribution of water filters to increase safe water consumption in Rusizi District [45] (**Figure 5**).

Personal hygiene improved slightly with the construction of more bath shelters in yard that increased by 10% (from 34.1 to 44.1%). The construction of a Tippy Tap in the yard increased by 35% (48.3–83.3%) as functional hand washing facility (with soap) were observed, of which 45.3% were situated near latrines. Overall child cleanliness increased enormously with the awareness of the danger of flies spreading Trachoma. The data show 23.1% increase (50–73.21%) in children having clean faces as indicated by no flies on their faces although this gain was not sustained and reverted back to 52.6%. In an increased effort to prevent skin diseases, CHC mothers were washing children’s clothes more often. Children with clean clothes on the day of the observation increased by 18% from 63.3 to 81.3% but then dropped to 76.3%, Although this indicator could have been associated with muddier clothes during the wet season [45] it is clear that mothers need continual encouragement to keep their children cleaner (**Figure 5**).

Most importantly for the transmission of germs by the fecal oral route, the ‘safe storage of food’ improved by 24% from 63.6 to 81.8%, but also recessed later to 71.8% [45] (**Figure 5**).

As regards the prevention of zoonotic diseases, 22% of households (36–58%) had constructed livestock pens away from the kitchen area, and less animal dung was seen in 7% more yards (88.3–90.9%) which were free from animal dung, decreasing further ingestions of germs spread by flies [45] (**Figure 5**).

6.2.4 Qualitative study

A small qualitative study [47] was also conducted in two CHC Villages in Rusizi District and compared with two non CHC villages to ascertain the perception of the community towards the CHC project.

“They testify to have seen the difference between villages with and without CHC and that 90% of sanitation and hygiene improvement can be achieved through CHC implementation. Community members appreciate the strategies of the CHC approach as it raised spontaneously project initiatives and tangible achievements including, but not limited to, making roads, proper nutrition through balanced diet, mutual assistance, saving and loans and tontine strategies, Kitchen garden, water treatment, as well as being a role model in the community. The village members of Kakinyaga and Kareba villages not exposed to CHC activities wish to have CHCs and think their sanitation and hygiene practices would improve through CHCs. Community members of the exposed villages confirmed CHC implementation facilitated mutual assistance so that even vulnerable households can have sanitation and hygiene facilities. “We have been engaged more with CHC and we believe everything is possible” said the head of village of Nyambeho and the president of the CHC committee in Kanyetabi separately. During the focus group discussions, the following was the statement in Rusizi: “we have been always sick but CHC has been a solution to prevent hygiene related disease.” [47]

As the CHC model in CBEHPP was being implemented by around 15 NGOs in Rwanda, there was data from monitoring programs in other Districts such as Bugasera [48] where experience by WaterAid confirmed extensive community response [49] reinforcing much of the positive community feed-back received in Rusizi District. When the disappointing result of the cRCT in Rusizi was presented at the 3rd national CBEHPP Conference in 2017, experienced practitioners of CBEHPP were skeptical of the results as the findings did not tally with other experience of CHC outputs in Rwanda. At the same time the cautious academic conclusion of the cRCT was questioning ‘the value of implementing this intervention at scale with the goal of improving health outcomes’, the MoH was convinced that the CHC model worked and government was expanding the programmes into the Integrated Nutrition and WASH Program which was to use CHCs in 8 new districts to address stunting with support from UNICEF and USAID [50].

6.3 Comparative cost-effective analysis of Rusizi and Mberengwa districts

6.3.1 Rusizi District, Rwanda

In Rusizi District, the cost of implementing the cRCT intervention in 50 villages over 12 months amounted to US\$208,204. These costs were for the setting up of the intervention, and interface with the community, with the main activity being the training and monitoring of 50 CHCs. It was a very low budget operation with only a small support staff in the country (one field officer, one monitoring officer in Kigali, a part time programme manager and an accountant) with minimal support of external consultants. With a total of 4056 CHC members in the Classic Villages we calculate 19,096 beneficiaries i.e. family members in the household who have benefited directly from improved living conditions over 50 different indicators. The program is calculated to have cost US\$13.13 per beneficiary or US\$ 61.71 for an average family of 4.7 people. This figure does not include research costs of the cRCT Evaluation costs.

6.3.2 Mberengwa District, Zimbabwe

In Mberengwa District, the cost of the whole programme for 1 year was one fifth less expensive than the Rwandan intervention, at US\$193,529 for a programme of 1 year, which reached five-fold more CHC villages, and with 42,959 beneficiaries

had twice as many beneficiaries as Rwanda. The costs included the operational support for 6 field officers and a programme manager, with part time administrative costs for the organization headquarters in Harare, and a shared office in the field. The program is estimated at only US\$4.5 per beneficiary, or US\$22 per household.

7. Discussion

7.1 Spread of the intervention

The two case studies show that the most successful villages are those where high level of diffusion of innovation has taken place with at least 80% of the households being included within a CHC. Mberengwa District achieved blanket coverage and were able to show over 90% uptake across most indicators. In Rusizi, it was found that villages which had less than 100 households were able to achieve 80% CHC training across all households in the village but only after 3 years. This is a realistic target if sufficient personnel and transport are available to run the program to its best level. The *size of CHCs* seems less relevant than the importance of reaching *all households* in a village, within one or two CHCs. In small villages of under 100 households this can realistically be achieved in the first year, but larger villages need another year to achieve blanket coverage. Perhaps a standard target would be 70 households per year per CHC facilitator. This shows that *village size* should be considered when selecting intervention area so as not to over work each facilitator. A critical mass is likely to be more successful to prevent the spread of diseases such as cholera and diarrhea and malaria, and so this becomes the ultimate test of effectiveness.

7.2 Quality of the intervention

The cost-effectiveness of a program depends not only on the Value for Money it can achieve (i.e. how *many* benefits it can deliver, and the *quality* of those benefits), but also on the way the program makes the most of scarce resources and takes advantage of *economies of scale*. The more CHCs that each officer can supervise the less the cost for personnel. We have seen that the size of a CHC can vary from 30 to 100 people. Although Mberengwa demonstrates that a greater number of smaller CHCs (with around 40–50 members) may be more manageable, this may not be the most cost-effective method, as the more people per CHC facilitator, the less the program will cost per beneficiary. Typically, an EHO should be able to monitor one or two CHCs per day, traveling constantly between villages. Therefore, the most cost-effective design is to have at least 100 CHCs in a program monitored by 10–20 EHOs, depending on the transport. Critically, each EHO should have a motorbike with a dedicated fuel allowance, supplied directly to the district.

7.3 Dedication of Environmental Health staff

While EHOs in both countries showed complete personal commitment, they were almost always frustrated by the lack of transport in the Ministry of Health, preventing such staff from reaching out and supporting Community Health Club facilitators in distant villages. Those CHCs which were situated near where Environmental Health Officers resided did much better than those in remote villages which were left to their own devices. Although the CHC enables even poorly educated facilitators to run the CHC, they do need strong support from the Ministry of Health with regular back-up of Environmental staff monitoring.

7.4 The importance of transport

The investment in transport is one of the key inputs required for a health promotion programme which is less about the provision of facilities and more essentially about training with a high level of face-to-face time of project facilitators with the community. However, providing money for transport is one of the least popular budget items considered by donors investing in many African countries. This may be due to the notorious costs of keeping transport functional, yet this is the single most urgent need to build the capacity of Environmental Health side of the Ministry of Health.

CHCs in Rusizi were unable to fulfill their role because their motorbikes only arrived after the intervention was complete: their fuel allowance *never* reached the district from the headquarters of MoH. By contrast, in Zimbabwe the NGO programme was properly resourced with each of the 6 full-time project officers stationed in the field with motorbikes who were thus each able to supervise 5 CHCs properly, even though none of the EHOs from MoH were mobile. Therefore, although the supervision of CHCs was more expensive in Zimbabwe, it was cost-effective because more beneficiaries could be reached.

By providing motorbikes, a donor is enabling those field officers who are responsible for ensuring safe water sanitation and hygiene throughout the country to be properly mobile. Our research convinces us that if Environmental Health Department of the Ministry of Health was adequately supported to train and monitor CHCs in every village, under 5 deaths would be likely to decrease.

7.4.1 Sustainability of hygiene behaviour change

The main way to assess cost-effectiveness must be the *duration* of the benefits, because if hygiene behaviour back slides and diseases resurge, the intervention has failed to deliver long term sustainability. There are two kinds of sustainability: the behaviour of the individual and the CHC itself. If improving family health, is the main objective, then it is more important that hygiene behaviour changes endure permanently rather than that the CHC, which was purely a conduit of information, survives as a structure. The CHC might not continue as an active group after the initial training, but if hygiene behaviour has changed the individuals within this group permanently, then this is a public health triumph.

We have demonstrated the two main ways that a CHC program can be implemented: either directly by government in a national program supported by NGOs or implemented mainly by NGOs with some government support. Below we show the different advantages and disadvantages to both methods in terms of scaling up.

7.5 Monitoring community

Monitoring people regularly tends to encourage higher levels of behaviour change—people often improve their behaviour even if they receive nothing material as a reward, simply because they know they are being watched (monitored)—the so-called ‘Hawthorn Effect’. The institution that should be undertaking this monitoring role (from village to district, through to Provincial and National levels) is, of course, the Ministry of Health, mandated as it is to ensure the public health standards are maintained. Increasing the capacity to monitor is where funding of resources are most needed. Tempting as it is to achieve higher results by more efficiently using NGO supervision (as they are probably more effective in monitoring and implementing WASH programmes) this can never be a long-term solution. If a programme is not sustainable after the NGO has left, then it is not cost-effective. Although the ACF/Africa AHEAD program in Zimbabwe may have been

more cost-effective per beneficiary, that programme has ‘come and gone’, whereas the national CBEHPP under MoH continues to slowly transform every village in Rwanda, going from strength to strength on an upward trend.

7.6 Scaling up the CHC model

Schools are an expected resource in every village, but this was not always the case. A few decades ago, education was recognized as a fundamental human right. Despite the huge challenge, Ministries of Education throughout Africa have almost succeeded in providing schools in most villages and as a result literacy is increasing annually. CHCs provide an informal *adult* education system filling in the gaps that remain in community knowledge and ensuring that communities are health conscious and coordinated to manage their health challenges. Scaling up CHCs to every village takes time, but as there is little infrastructure needed, it is comparatively cost-effective relative to the buildings needed by schools. If Rwanda has been able to coordinate community efforts through CHC in a national structure leading from Village to the President, this can surely be emulated by other countries.

Is scaling up the CHC model possible in those countries that have already missed their MDG targets and are now being challenged to meet the SDGs as well? We suggest that it is indeed possible through three distinct stages: Advocacy, Policy and Program.

- by Regional bodies such as AMCOW advocating at a high level to replicate successful programs across the continent using such declarations as the Kigali Action Plan;
- by ensuring that the CHC model is adopted into policy, so the Ministry of Health can use its existing structures and resources with very little additional cost to organize the Environmental Health Department to start up and monitor CHCs throughout the country;
- by coordinating multiple and diverse efforts by numerous development partners and INGOs into a single national Environmental Health Promotion Program to avoid duplication of efforts and multiplicity of conflicting approaches through a myriad of small NGO projects.

8. Conclusion

The CHC Model ‘works’. Community Health Clubs are indeed capable of stimulating public health action cost-effectively. The Model deserves to be replicated in other countries in Africa as soon as possible to alleviate poverty and tackle many preventable diseases in a sustainable, holistic and integrated way. A national Environmental Health program using Community Health Clubs as a vehicle for change in every village, can be reasonably predicted to deliver a wide range of community-led hygiene behavior changes which will ultimately improve family health, social capital and living standards throughout the country. What is badly needed is a clear vision by Governments to adopt the CHC model systematically and invest in building the capacity, not only of the curative wing of Ministry of Health but also the Environmental Health systems which can prevent disease. Countries which adopt the Rwandan approach at national scale are more likely to meet at least Goal 6 of the Sustainable Development Targets by 2030.

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Conflict of interest

The corresponding author was the original designer of the CHC Model and all co-authors have been associated with research or implementation of the CHC program in Rwanda and Zimbabwe, as employees, volunteers or Trustees of Africa AHEAD.

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