




## Evaluation of the Control of Water Sanitation and Hygiene-Related Disease Through Community Hygiene Club Intervention in Rwanda

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## Abstract

This article consists of a review article reporting the results of previous evaluations of the control of water, sanitation, and hygiene (WASH) related disease through the Community Hygiene Club (CHC) intervention from 2010 to 2020. CHC constitutes the main intervention for the control of WASH-related disease in Rwanda and is implemented countrywide. The study objective was to evaluate if the CHC intervention significantly reduced the prevalence of WASH-related disease after 10 years of its implementation in Rwanda. The study utilized online existing policy documents, research reports, and experiences on the CHC intervention in Rwanda published between 2010 and 2020. We selected and reviewed 12 published documents, and the evaluation followed the steps proposed by ACHI (2020) Health Impact Assessment (HIA) and related frameworks of effective implementation of community health interventions. The primary outcome measure used was the reduction of WASH-related disease while the secondary outcome measure used was the increase of household WASH practices at less than a 5% level of statistical significance. We also described the structure and the implementation process of the CHC intervention. From the case studies where frameworks of effective implementation of community health interventions were applied, the study results showed the intervention significantly (a) increased households' WASH practices and (b) reduced WASH-related disease. Due to limited publications in the research area and the lack of association of the WASH-related diseases and practices to the CHC intervention's evaluation for most of published research reports, we recommend additional field data for an extended conclusion and its generalization in Rwanda. The study highlights the need to use appropriate frameworks in the evaluation of community health interventions to (a) attribute the outcome to the intervention and (b) easily identify the shortcomings in case of failure to get expected outcomes.

**Keywords:** Community Hygiene Club intervention, disease control, implementation process, intervention's adoption, health effect

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## Introduction

Water Sanitation and Hygiene (WASH)-related disease including diarrheal diseases, soil transmitted helminths (STHs), and schistosomiasis, among others, continue to be a burden mostly among children under 5 years old in developing countries despite ongoing initiated control and prevention interventions (Darvesh et al., 2017; Kanda et al., 2021; National Institute of Statistics Rwanda [NISR], 2012; NISR, 2021; Rwanda Ministry of Environment [RMOE], 2018; Rujeni et al., 2022). In Rwanda, the Rwanda Ministry of Health (RMOH) adopted the Community Hygiene Club (CHC) intervention in 2010 as an integrated intervention to reduce WASH-related disease countrywide (RMOH, 2010). The present study aimed to evaluate the control of WASH-related disease after 10 years of the CHC intervention's implementation. The CHC intervention covers health education and recommended household WASH practices to prevent related disease and has been implemented gradually to cover all 14,837 villages of the country since 2010 (RMOH, 2010; RMOH, 2017). The condition for the intervention efficacy was at least 80% of its adoption by households at the village level, meaning the percentage of households that completed all recommended intervention practices (household WASH practices) out of the households reached by the intervention (Dearing & Cox, 2018; RMOH, 2010).

By 2017, for half of covered villages, little was known about the effect of the intervention's adoption vis-à-vis the trend of WASH-related disease prevalence (RMOH, 2017). In 2020, health facilities reported more cases of diarrhea (52.8%) than in 2010 (50.1%) among children under 5 years old and soil transmitted helminths and schistosomiasis remained a burden (NISR, 2012, 2021; Rujeni et al., 2022). Concomitantly, there is an observation of a higher risk of neglected tropical diseases (NTDs) transmission in some places with increasing socio-economic activities such as rice farming, which exposes people to contaminated water and places of work without latrines meant for safe defecation (Nyandwi et al., 2020; RMOE, 2018; Rujeni et al., 2022). Controlling those disease can be particularly challenging and would need additional specific WASH solutions in an environment with increased human exposure to contaminated water and lack of sanitation in households and paddy fields (Mwangangi et al., 2013). The present study constituted an evaluation of the control of WASH-related disease through the ongoing CHC intervention at the community level including areas of high endemicity. The results of this study are expected to contribute to the improvement of the control of WASH-related diseases in Rwanda for maximum health effect.

## Methods

We reviewed and reported findings of the evaluations of the control of WASH-related diseases through the CHC intervention in Rwanda. We gathered, through online search, research articles and reports on the implementation and evaluation of the control of WASH-related disease through the CHC intervention in Rwanda. Our online search focused on Google searches, Scopus, PubMed, and CNHL databases and used WASH interventions, Community Hygiene Club approach, Community Health Club approach, and WASH-related disease as keywords. We gathered 12 evaluations of the CHC intervention. The WASH-related disease of interest included diarrhea, schistosomiasis, and intestinal worms, while the WASH practices of interest included home-based drinking water treatment and storage, use of improved latrine, clean latrine, and hand washing with soap. The temporal scope was between 2010 and 2020. This period was considered because the CHC intervention was implemented to reduce WASH-related disease in Rwanda starting 2010.

We used a descriptive design to summarize and assess the structure and the planned implementation process of the CHC intervention in Rwanda from three policy documents, following the main elements of effective implementation framework of community health interventions. Those elements included the target audience/beneficiaries, the intervention products defined as “innovation” delivered to beneficiaries, and how the intervention products are delivered to beneficiaries (Dearing & Cox, 2018; Rogers, 1983).

The evaluation of the control of WASH-related disease through CHC intervention from 12 previous evaluations of CHC intervention focused on the objective, the methodology of the evaluation, and the results on the effect of the intervention on the study population using pre- and post-intervention prevalence. Retained measurements of the effect as used in the 12 previous evaluations included risk difference, risk reduction and relative risk reduction of diseases, and WASH practices of interest (ACHI, 2020). The reduction of WASH-related disease was taken as the primary outcome while the increase in household WASH practices was taken as the secondary outcome of the CHC intervention.

The implementation process of the CHC intervention was assessed to attribute the outcome to the intervention and/or identify any gap in the intervention's implementation process. Three main frameworks have been used to assess the implementation of the CHC intervention. The assumption is that public health interventions based on social and behavioral science theories are (a) more effective than those lacking a theoretical base, (b) transferable, and (c) facilitate the appropriate indicator-based monitoring and evaluation (Kwan et al., 2019; Durlak & DuPre, 2008; Glanz & Bishop, 2010; Golden & Earp, 2012). The first framework, the social ecological model (SEM), which is used to guide public health practice and helps describe the interactive characteristics of individuals and environments (institutional, community and policy), has been

used to assess the implementation of the CHC intervention through five nested, hierarchical levels of individual, interpersonal, community, organizational, and policy/enabling environment. This model is the most effective approach to support and assess the implementation of public–community health interventions (Glanz & Bishop, 2010; Golden & Earp, 2012). The second framework, the framework of effective implementation of community health interventions, which recognizes the influence of (a) community level factors, (b) intervention provider characteristics, (c) the innovation, (d) the organizational capacity, and (e) the support system used to assess the implementation of the intervention (Durlak & DuPre, 2008). The third framework, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) model, which consists of a planning and evaluation model that addresses the dimensions of individual- and setting-level outcomes was also used (Kanda et al., 2021).

For triangulation purposes, we followed Farmer et al. (2006) and O’Cathain et al. (2010) to interpret and integrate key findings from reviewed studies in terms of effect on WASH-related practices and diseases, which were harmonized into absolute risk reduction (ARR) or risk difference (RD) (O’Cathain et al., 2010; Ranganathan et al., 2015). For the intervention potential, we focused on the implementation structure and process as well as associated results, and we constructed a matrix to create a single list of potential and shortcomings of the CHC intervention based on the individual study results (Farmer et al., 2006; Hopf et al., 2016; Ranganathan et al., 2015)

## Results

The study results comprised findings on the structure and the implementation process of the CHC intervention, the monitoring of the intervention, the outcomes of the intervention, and shortcomings to improve the control of WASH-related disease through the CHC intervention in Rwanda. In total, 15 documents qualified to be included in this review and comprised 3 policy documents and 12 previous evaluations including 6 peer review research articles, two conference papers, two masters theses, and two research reports.

### Description of the Structure and the Implementation Process of the CHC Intervention

The CHC intervention is implemented at the village level and consists of organizing households into groups of 50 to 100 households each called a “club.” For a village with 300 households, there can be 1 or 2 or 3 clubs, depending on the number of households that joined the intervention as the adherence is voluntary (RMOH, 2010). Households’ representatives that make up a club meet once a week for a 2-hour session on health education on WASH-related disease and their control and prevention. Hence, the name of Community Hygiene Club. After each session, a consensus is made on a practice (recommended practice) to be implemented in their respective households. A Community Health Worker (CHW) and an elected committee from the households’ representatives facilitate the health education for at least 6 months to complete the planned topics on WASH-related disease control and prevention. Gradually, the households’ representatives work with their respective household members to implement the recommended practices. The village CHW, the CHC committee, the head of the village, and the Community Environmental Health Officer (CEHO) from the health center serving the area monitor the implementation of the household WASH-recommended practices. The participation in CHC is voluntary and a membership card is used to record the attendance of the participants and the accomplishments of the recommended practices. Households are not financially supported to accomplish their tasks. Instead, some have links with income-generating activities and village savings groups to help them get money to implement the required tasks. Others get support from mutual assistance from the CHC members, and vulnerable households get assisted from CHC members on their own initiative. At the end of the 6 months, households that implemented all the recommended practices graduate, receive a certificate of completion, and are expected to sustain the acquired healthy lifestyle in their respective villages (Ekane et al., 2020; Ntakarutimana et al., 2021; Ntakirutimana et al., 2017; RMOH, 2010).

The description of the implementation process of the CHC intervention using the already defined frameworks of effective implementation is presented in Table 1 and includes (a) the target audience, (b) the intervention products defined as “innovation” delivered to beneficiaries and (c) how the intervention products are delivered to beneficiaries (Dearing & Cox, 2018; RMoH, 2010; Rogers, 1983). While the implementation process describes how the CHC intervention is implemented at the village level, the CHC intervention products include knowledge on WASH-related disease and recommended behavior and practices that the intervention intends to transfer for adoption to the target audience through phases of dissemination known as “diffusion of innovation” (Dearing & Cox, 2018; Rogers, 1983).

**Table 1.** Description of the Implementation Process of the CHC Intervention in Rwanda

Elements of effective implementation framework	Description (as described in the RMoH CBEHPP/CHC roadmap 2010)	Level of description/Clarity
Target audience (intervention beneficiaries)	The primary beneficiaries are households’ representatives in the village who later teach their respective entire household members, the secondary beneficiaries.	Clear
CHC intervention products “the innovation” delivered to the beneficiaries		
The topics covered from CHC weekly meeting sessions and discussions (Knowledge on control of diseases—intervention products)	Diarrhea, skin diseases, worms, respiratory diseases, malaria and bilharzia, village needs assessment, water sources for domestic use, safe drinking water, household sanitation, personal hygiene, hand washing, food hygiene, infant care, good parenting, nutrition, food security	Clear
The recommended behavior change and practices in respective homes from CHC (Practices—intervention products)	Covered & treated water, clean drinking water container, use of ladle & individual cups for drinking water, use of clean water source, clean-up of water source, rubbish management, zero open defecation, clean yard, drainage, compost and recycle pits, washing clothes & blankets, hand washing at critical times, pot rack & hanging baskets, individual plates and shelves, wear self-protective equipment including shoes, immunization, making oral rehydration solution (ORS), treatment of skin diseases, growth monitoring card, medical insurance, exclusive breastfeeding, balanced diet, village saving and loan	Clear
The CHC recommended facilities in respective homes (Facilities—intervention products)	Functional hand wash facility, pot rack & hanging baskets, improved clean latrine, compost pit, bath shelter, drying rope, clean and covered drinking water container, kitchen-garden, mosquito net	Clear
How were the intervention products delivered and system support?		
The channels of communication and types of appeal	Weekly meeting of 2 hours with presentations, discussions and consensus, images, songs, slogans	Clear
	Rational appeal: Presentations, discussions, & consensus Emotional appeal: Images, songs, slogans, & drama	Clear
The diffusion of innovation (Strategies to maximize the intervention’s adoption)	<ul style="list-style-type: none"> <li>• Joint planning with CHC household representatives</li> <li>• CHC households’ visits by CHC committee</li> <li>• Competition and graduation ceremony activities</li> <li>• No strategies to reach all village households</li> <li>• No strategies for late adopters</li> </ul>	Not clear
The role of the local/village leadership in CHC implementation	Communiqué on CHC activities Participation in CHC activities not talked about	Not clear

The influence of health professionals (CEHOs) on the CHC implementation	Support supervision through visits to the CHC weekly meetings Monitoring and reporting activities & indicators not talked about Details on the frequency of the above activities not described	Not clear
The role of CHW and CHC committee at village level	Facilitation of CHC weekly meetings and households' visits Monitoring and reporting frequency details are not described	Not clear
Time	The intervention period is 6 months for the CHC recommended practices to be adopted	Clear

*Note:* This table results from the policy documents and the research reports reviewed.

The implementation process of the CHC intervention is theory based (Kanda et al., 2021; Dearing & Cox, 2018; Proctor et al., 2011; RMoH, 2010; Rogers, 1983). The description of the elements of effective implementation framework of the CHC intervention are assessed against 3 criteria: “effective,” “understandable,” and “measurable” in a way to determine the fidelity in terms of quality and quantity. The qualification of each element is “clear” if the element is “effective,” “understandable,” and “measurable,” and “not clear” if at least one of the criteria is missing (National Committee for Quality Assurance, 2016). Table 1 shows that the target audience or the intervention’s beneficiaries and the intervention’s products are clear. However, the diffusion of innovation process needs more strategies to reach all village households including late adopters to maximize the adoption of recommended households’ practices in targeted villages/communities. Income generating initiatives, mutual assistance, savings and credits groups, assistance to the vulnerable, and use of innovators are part of the community-borne strategies that can be made mandatory to ensure that no one is left behind from accessing the intervention’s promise, including vulnerable households (Ekane et al., 2019, Nkurunziza et al., 2013, Ntakarutimana et al., 2021).

Based on the documents reviewed, the participation of heads of village and the CEHOs in the CHC intervention activities was not standardized and occurred unevenly across various villages during the intervention’s implementation, which can affect the intervention results (Ntakarutimana et al., 2021; Waterkeyn et al., 2020). The monitoring of the intervention’s implementation and the intervention’s outcomes lacked standards in terms of frequency of (a) the CEHO visits to the CHC activities including session meetings at the village level and (b) the households’ visits by the CHW and the CHC committee for support supervision and monitoring. The CEHO visits to back up and monitor the progress of the CHC intervention activities varied between 1 and 12 visits per village in 6 months and the implementation pattern was uneven across studied villages where attendance at meeting sessions ranged between 9 and 20 out of 20 across the villages (Ntakarutimana et al., 2021; Sinharoy et al., 2017; Waterkeyn et al., 2020).

## **Documented Effects of the CHC Intervention on WASH Practices and Related Diseases**

Tables 2 and 3 show the findings from each of the 12 studies reviewed. Table 2 presents the findings on the effect of the CHC intervention on household WASH practices estimated in Absolute Risk Reduction (ARR) or Risk Difference (RD). Table 3 presents the findings on the effect of the CHC intervention on WASH-related diseases estimated in Relative Risk Reduction (RRR).



**Table 2.** Effect of the CHC Intervention on Household WASH Practices Estimated in Absolute Risk Reduction (ARR) or Risk Difference (RD)

Study	Study area, population, and sample size	Study objective	Methodology	Household WASH practices of interest					Comparison
				Improved latrine structure	Latrine cleanliness	Hand washing (facility)	Hand washing facility +	Drinking water	
Water Aid (2017)	Bugesera (households = 8,223)	Assess the achievements and sustainability aspects of CHC in Bugesera District	Household survey	82%		67%		58%	Pre & post intervention
Ntakarutimana & Ekane (2017)	Rusizi district (households = 230)	Assess the performance of the CHC intervention in transforming household sanitation and hygiene conditions	Case control, mixed method research	30.66%	54.05 %	12.6%	80.24%	-	Pre & post intervention in intervention and control villages
	Kicukiro District (households = 550)			80.24%	60.48 %	41.49%	14.87%	-	
Pantoglou (2018)	Rusizi 50 villages (households = 5,000)	Evaluate hygiene behavior change within CHCs in Rusizi District of Rwanda	Descriptive study using secondary data	30%	-	40%	-	50%	Pre & post intervention
Sinharoy et al. (2017)	Rusizi district (households = 8,000)	Assess the effect of CHC intervention on diarrhea and nutrition status of children in Rwanda	RCT, mixed method	8.5%	-	-	-	8.6%	cRCT, mixed method
Nkurunziza et al. (2013)	Bugesera, Karongi, Gatsibo, Gicumbi Districts (households = 63,050)	Assess the importance of CHC in addressing sanitation and hygiene problems	Household survey	20.75%	-	10.79%	-	-	Pre & post intervention
Waterkeyn et al. (2019)	Rusizi (households = 4,056)	Assessment of the hygiene behavior change and cost-effectiveness of community health clubs	Household survey with quantitative and qualitative data	41%	-	35%	-	18.1%	Pre & post intervention

For household WASH practices, the sample population consisted of households (Table 2) while for WASH-related diseases, the sample population consisted of children under 5 years old (Table 3).

**Table 3.** *Effect of the CHC Intervention on WASH-related diseases Estimated in Relative Risk Reduction (RRR)*

Study	Study area, population, and sample size	Study objective	Methodology	Implementation status (intervention's adoption rate)	Household WASH practices of interest		
					Diarrhea	STHs	Stunting
Sinharoy et al. (2017)	Rusizi (children under 5 years old = 10,793)	Assess the effect of CHC intervention on diarrhea and nutrition status of children in Rwanda	RCT, mixed method	18.5%	No effect	-	No effect
Ntakarutimana et al. (2021)	Rusizi (children under 5 years old = 120)	Assess the potential of the CHC intervention in reducing WASH-related diseases	Case control, mixed method	91%	82.8%	74.2%	96%

Among the 12 study evaluations that reported on the implementation of CHC intervention, only three, including one cluster randomized control trial (cRCT) and two case control studies, estimated the effect of the CHC intervention based on exposed and control villages. In general, the adoption of the CHC intervention by households varied between 93% and 11% and only 10% of villages achieved 80% of the intervention's adoption (Ntakarutimana et al., 2021; Pantoglou, 2018; Sinharoy et al., 2017; Waterkeyn et al., 2019, 2020). The cRCT with 50 exposed and 50 control villages found a positive effect of the CHC intervention on home-based drinking water treatment of 20% increase and use of improved latrine of 14% increase, measured using risk difference ( $p < 0.5$ ) for villages whose households attended the planned 20 CHC weekly meetings. The case control study with 2 exposed and 2 control villages showed a positive effect of 80.24%, 54.05%, and 12.6% increase respectively for use of improved latrine, clean latrine, and hand washing facility in rural areas and 30.66%, 60.48%, 41.49% increase respectively for use of improved latrine, clean latrine, and hand washing facility in peri-urban areas, measured using risk difference ( $p < 0.5$ ). In terms of WASH-related disease, the cRCT did not find any effect on diarrhea among children under 5 years old, measured using risk difference ( $p < 0.5$ ), while a case control study showed a positive effect of the intervention on diarrhea, soil transmitted helminths, and malnutrition respectively of 82.8% ( $p = 0.057$ ), 74.2% ( $p = 0.016$ ), and 96% ( $p < 0.001$ ), measured using relative risk reduction. The reported CHC intervention adoption for the two types of studies was 18.5% for the cRCT and 91% for the case control study (Ntakarutimana & Ekane, 2017; Ntakarutimana et al., 2021; Sinharoy et al., 2017). According to the study results, the CHC intervention has the potential to improve households' WASH practices and reduce WASH-related diseases and the intervention's adoption influenced the intervention's outcome (Cassar et al., 2019; Ntakarutimana et al., 2021). Nine out of 12 evaluations could not associate the research results to the CHC intervention and 4 out of 12 reported the intervention's implementation shortcomings.



## Appreciation of Intervention's Potential and Implementation Shortcomings

**Table 4.** *Appreciations on The Potential of the CHC Intervention and Implementation Shortcomings*

Study	Study area, population, and sample size	Study objective	Methodology	Appreciations of interest	
				Potential of the CHC intervention	Shortcomings of the CHC intervention
Water Aid (2017)	Bugesera (households = 8223)	Assess the achievements and sustainability aspects of CHC in Bugesera District	Household survey, mixed method	Source of innovation and initiatives, social support to solve WASH problems Promote ownership of problems and solutions	Knowledge of facilitators (CHW + CHC committee) Training and education materials Funding for training and monitoring Involvement of the village leadership
Ntakarutimana & Ekane (2017)	Rusizi and Kicukiro districts (households = 680)	Assess the performance of the CHC intervention in transforming household sanitation and hygiene conditions	Case control, mixed method	CHC structure eases its implementation CHC triggers innovation and initiatives, and social support to solve WASH problems at 90%	
Ndayambaje (2016)	Rusizi (households = 144)	Measure the cost effectiveness of two community health interventions, CHC Classic and CHC Light, while focusing on costs and health promotion practices in regard to community mobilization strategy, hygiene behavior change and reduction of diseases.	Cross sectional study with quantitative and qualitative methods	CHC is potential to increase safe WASH related behavior and practices  CHC is a cost-effective intervention in enhancing health promotion practices	Capacity and involvement of local leaders
Waterkeyn et al. (2019)	Rusizi (households = 4,056)	Assess the Hygiene Behavior Change and cost-effectiveness of community health clubs	Household survey with quantitative and qualitative methods	CHC is potential to solve sanitation and hygiene related issues at 90%  CHC is cost effective as the intervention has strategies that trigger spontaneously community initiatives	Local facilitators' capacity Coordination Monitoring

Waterkeyn et al. (2020)	Rusizi (households = 5,745)	Assess the monitoring data in a process evaluation of hygiene behavior change in Community Health Clubs	Review of monitoring records	Potential to increase safe WASH practices and ensure their sustainability	Monitoring Funding Program implementers' leadership
Ekane et al. (2019)	Southern Province (35 experts)	Assess the implementation challenges for Community Health Clubs in Rwanda	Analysis of views of EHOs, Policy makers, and program implementers	Potential to increase safe WASH practices CHC is strongly supported by decision makers & partners	Monitoring, Funding Coordination Sustainability aspects
Sinharoy et al. (2017)	Rusizi district (households = 7,934)	Assess the effect of CHC intervention on diarrhea and nutrition status of children in Rwanda	cRCT, mixed method	Potential to increase safe WASH practices	Not fit for health gains
Ntakarutimana et al. (2021)	Rusizi (33 household representatives)	Assess the implementation of the CHC intervention using qualitative research methods	Qualitative methods	Intervention structure and content (products) Government supported intervention	Diffusion of innovation Village organization, Leadership skills and capacity of implementers and local leaders
Nkurunziza et al. (2013)	Bugesera, Karongi, Gatsibo, Gicumbi Districts (population = 290,031)	Assess the importance of CHCs in addressing sanitation and hygiene problems	Household survey	CHC is an entry point for the communities to address socio-economic problems including WASH issues	
Ekane et al. (2020)	Rwanda (policy and program report documents and 30 key informants)	Examine the implementation of community-based approaches to sanitation, notably Community Health Clubs (CHCs) in Rwanda and Community-Led Total Sanitation (CLTS) and sanitation marketing (SanMark) in Uganda	Document review and key informant interview from central to community level	CHC is a good tool for sanitation policy implementation CHC intends to promote inclusive development within existing local structures, building on the trust, collaboration and mutual benefits that characterize networks	

The CHC intervention is a potential cost-effective intervention in improving community WASH practices. The revealed implementation shortcomings include the intervention's adoption, the involvement of local leaders, the skills and capacity of the intervention facilitators, as well as the monitoring of the intervention's implementation activity to ensure that none of the village households are left behind including the vulnerable (Adams et al., 2017; Ekane et al., 2019; Ntakarutimana et al., 2021; Waterkeyn et al., 2020). For the intervention's effective implementation, the study revealed the need for increased diffusion of innovation process including more strategies for maximum adoption. Based on the review results, poor community organization prior to the intervention's implementation, mistrust, and lack of equal consideration among intervention beneficiaries affected the CHC intervention's adoption. The non-involvement of local leaders as well as the lack of skills for the CHC intervention's facilitators have contributed to the low rates of the CHC intervention's adoption observed in the villages covered by the reviewed evaluation studies (Adams et al., 2017; Ekane et al., 2020; Ntakarutimana et al., 2021, 2021; Ntakarutimana & Ekane, 2017; Pantoglou, 2018; RMoE, 2018; Sinharoy et al., 2017; Waterkeyn et al., 2019, 2020).

Based on the reviewed evaluation studies, the CHC intervention's evaluation in many cases (Ndayambaje, 2016; Nkurunziza et al., 2013; Ntakarutimana et al., 2017; Pantoglou, 2018; Waterkeyn 2019, 2020) failed to thoroughly describe the CHC intervention's implementation process and/or show a valid association between the CHC intervention and the reported evaluation results, which revealed the evaluation gap. In addition, the CHC intervention in many cases was not assessed using related social environmental and behavioral science frameworks of community health interventions for a valid conclusion though the implementation process design of the intervention is theory based.

## Discussion

Based on the review results, the CHC intervention is a well-structured, community-based health intervention and fits in the local community health organization for impact and sustainability since it is implemented by CHWs at the village level (Glanz & Bishop, 2010; Golden & Earp, 2012; RMoH, 2010, 2018). In terms of the implementation process, the review results showed the need for a comprehensive strategy for (a) the intervention to reach the totality of households at the village level and (b) a maximum adoption of the recommended behavior and practices. A focus must be on the vulnerable households with limited means and capacity while involving the late adopters (early majority, late majority, and laggards) using clear strategies to help them adopt the recommended behavior and practices. Addressing the intervention's implementation shortcomings in relation to the intervention's adoption requires (a) leadership skills and capacity of the implementers and (b) the standardized involvement of stakeholders at the village level through participation and/or monitoring and supportive supervision to influence positively the CHC intervention's adoption (Adams et al., 2017; Durlak & DuPre, 2008; Ntakarutimana et al., 2021; Sinharoy et al., 2017; Waterkeyn et al., 2020). The CHC intervention's stakeholders at the community/village level include village leaders, the implementing organization, health professionals, community-based organizations, private actors, CHWs, and the beneficiaries. Clear tasks and standards guidelines for community stakeholders in terms of monitoring, supervision, and reporting are important support factors for the intervention's total coverage, maximum implementation fidelity, and adoption (Alemu et al., 2017; Dearing, 2009; Rogers, 1983).

The review results from the previous evaluation studies described the potential effect of the CHC intervention on WASH practices and related diseases. The study results showed that the effect is related to the CHC intervention's adoption, which varied between 93% and 11% (Ntakarutimana et al., 2021; Ntakarutimana & Ekane, 2017; Sinharoy et al., 2017; Waterkeyn et al., 2020). The potential effect was high for high intervention's adoption (Ntakarutimana et al., 2021; Ntakarutimana & Ekane, 2017; Sinharoy et al., 2017). Three research studies out of 12 reviewed had an exposed (intervention) and a control and relied on the pre-post intervention with the implementation process considered. Those studies revealed that the intervention's adoption variation is due to (a) the diffusion of innovation process and strategies, (b) the intervention provider (implementer or

facilitator at village level) characteristics, (c) the level of involvement of local leaders, and (d) the level of monitoring of the intervention's implementation activity (Adams et al., 2017; Kanda et al., 2021; Durlak & DuPre, 2008; Ekane et al., 2019; Garcia-Huidobro et al., 2022; Kilbourne et al., 2007; Ntakarutimana et al., 2021; Waterkeyn et al., 2020). Nine research studies out of 12 reviewed relied on the pre-post intervention data on WASH practices but did not consider the implementation process or context and did not have a control. Such data present a risk of attributing health outcomes to the quality of the implementation process rather than to the intervention (Fry et al., 2018; Koelen et al., 2001; Moore et al., 2014).

The evaluation studies, which did not thoroughly describe the CHC intervention's implementation process and did not either associate the intervention's adoption to the intervention results, proved the common problem of evaluation of public–community health interventions (Fry et al., 2018; Glasgow et al., 1999; Kwan et al., 2019). Since the CHC intervention is based on social environmental and behavioral science theories, its efficiency should be assessed against the elements of related frameworks for (a) a valid conclusion but also (b) an easy identification of the implementation shortcomings to be addressed in case of failure to get expected outcomes (Kanda et al., 2021; Glasgow et al., 1999; RMoH, 2010). Indeed, according to the frameworks of effective implementation of public/community health interventions, the community environment, the target audience, the marketing appeals, and the diffusion of innovations have influence separately or together on the interventions' implementation outcomes including the interventions' adoption and their health effect (Dearing & Cox, 2018; Durlak & DuPre, 2008; Glanz & Bishop, 2010; Koelen et al., 2001; Moore et al., 2014; National Academies of Sciences, Engineering, and Medicine [NASEM], 2017).

To extend the revealed effect of the CHC intervention on the control of WASH-related diseases, there is a need for an in-depth evaluation using an appropriate framework with first-hand data collected from communities, preferably in areas of high endemicity of WASH-related diseases since there was not enough of such scholarly and professional publications on the intervention in Rwanda during the period of this review.

## Study Limitations

The limited number of publications in the area of CHC intervention's implementation and evaluation on the one hand and the lack of use of CHC intervention's implementation related theories and frameworks in evaluation on the other hand are the study limitations to extend the conclusion of this review in Rwanda.

## Conclusion

The control of WASH-related diseases through CHC intervention is structured for its easy implementation, monitoring, and evaluation. The study results showed the CHC intervention has the potential to significantly (a) improve households' WASH practices and (b) reduce WASH-related diseases. Additional guided diffusion of innovations strategies, a systematic involvement of community stakeholders, a capacity building of program implementers and facilitators, a harmonized and consistent support supervision at the community level and standard monitoring indicators are needed for the intervention's maximum coverage, adoption, and health effect. The implementation and the evaluation of the CHC intervention, like other public community health interventions, must use related theories and frameworks of effective implementation. The outcomes must be related to the intervention—not to the implementation process—for a valid recommendation on the intervention but also for easy identification of the implementation shortcomings to be addressed in case of failure to get the expected health effect. We recommend an in-depth evaluation of the control of WASH-related diseases through an extended mixed method study for more insight and an extended conclusion on the health effect of the control of WASH-related diseases through CHC intervention in Rwanda.

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