Short Communication

Use of group maturity index to measure growth, performance, and sustainability of community health clubs in urban water, sanitation and hygiene (WASH) program in Zimbabwe

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ABSTRACT

Zimbabwe experienced an unprecedented cholera outbreak in 2008 and 2009. Reduced access to water, sanitation and hygiene, delayed community health education, and limited knowledge on cholera prevention were the major risk factors of this outbreak which were addressed by urban WASH interventions. Health and hygiene promotion through community health clubs (CHCs) is a cost-effective strategy to reduce the risk of cholera. In 2013, UNICEF Zimbabwe launched the Small Towns WASH Program (STWP) and used the CHC approach for hygiene promotion. To monitor the growth, performance, and sustainability of CHCs, STWP employed the Group Maturity Index, which measures the status of CHCs in five domains: objectives, governance, resources, group systems, and impacts. This study described the maturity status of CHCs as measured by GMI as a new monitoring tool and assessed if CHCs' performances in GMI's output domains are associated with the impact domain. The results suggested that over 75% of CHCs had reached the managed stage or the mature stage by 2018. Three of the GMI's output domains were independently associated with the overall impact domain after controlling for potential confounders. CHCs and club members may experience overall positive impacts by developing their governance, resource, and group system domains.

Key words | community health, hygiene, hygiene promotion, WASH

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HIGHLIGHTS

- The United Nations Children's Fund (UNICEF) and the Government of Zimbabwe used the Group Maturity Index (GMI) as an innovative tool to monitor the maturity status of community health clubs in the Small Towns WASH Program.
- The GMI measured the status of community health clubs in five domains including objectives, governance, resources, group systems, and impacts.
- The GMI provides insights into what aspects of community health clubs can be monitored and how programs can identify areas of improvement for each club.

- This study demonstrated the potential utility of GMI as a useful monitoring tool to assess the growth, performance and sustainability of community health clubs.

GRAPHICAL ABSTRACT
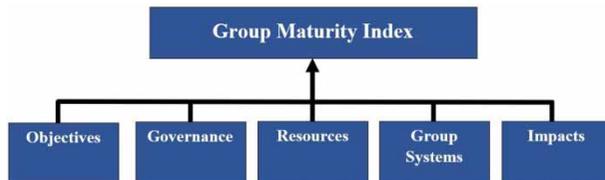
INTRODUCTION

Cholera is an infectious disease caused by the bacterium *Vibrio cholerae* and characterized by severe acute watery diarrhea (Harris *et al.* 2012). In 2008 and 2009, Zimbabwe experienced an unprecedented cholera outbreak with 98,592 suspected cases and 4,288 deaths (World Health Organization 2009). Limited access to water, sanitation and hygiene (WASH), delayed community health education, and low levels of knowledge on cholera prevention were highlighted as some of the major risk factors associated with the 2008/2009 cholera outbreak (Kone-Coulibaly *et al.* 2010; Brocklehurst *et al.* 2013).

One potential strategy to reduce the risk and spread of cholera is health and hygiene promotion through community health clubs (CHCs). The CHC approach is based on behavior change theories (e.g., Health Belief Model, Social Learning Theory) and provides a platform for community members to enhance their knowledge and self-efficacy to achieve healthy behaviors through peer support and reinforcement (Rosenstock *et al.* 1988). In Zimbabwe, CHCs have been field-tested and implemented mainly in rural districts since 1994 (Waterkeyn & Waterkeyn 2013). Previous studies highlighted that CHCs are cost-effective and contribute to improving sanitation and hygiene practices (Waterkeyn & Cairncross 2005; Whaley & Webster 2011; Waterkeyn & Waterkeyn 2013).

Although CHCs have been recognized as a useful intervention for health and hygiene promotion, a recent cluster randomized controlled trial in Rwanda reported that CHCs had no effect on a child diarrhea outcome despite some improvement in sanitation practices (Sinharoy *et al.* 2017). A process evaluation of this intervention highlighted low program fidelity due to various contextual factors (e.g., limited CHC monitoring conducted to comply with a research timeline) as a plausible reason for the limited impact on health outcomes (Waterkeyn *et al.* 2020). Moreover, CHCs' effects on health outcomes may not be observed within a short period of time and require a more realistic timeline (Waterkeyn *et al.* 2020). It is therefore of vital importance to monitor CHCs over time to overcome any issues with program implementation for CHC sustainability and potential health benefits.

In 2013, the United Nations Children's Fund (UNICEF) and the Government of Zimbabwe launched the Small Towns WASH Program (STWP) in 14 towns including Bindura, Chipinge, Chiredzi, Chivhu, Gokwe, Gwanda, Hwange, Karoi, Mutoko, Mvurwi, Plumtree, Rusape, Shurugwi and Zvishavane. The STWP adopted a multi-thematic approach with three program components: (1) rehabilitation of water and sewerage infrastructure; (2) hygiene promotion and customer care; and (3) institutional strengthening. Under the STWP, the CHC approach was adapted to urban settings and contributed to hygiene promotion activities, such as cleaning campaigns and participatory hygiene and health education (e.g., road shows, door to door hygiene education). Although no direct funding was provided to CHCs, visibility and cleaning materials and hygiene training were available for club members. A recent evaluation of STWP confirmed that CHCs were favorably perceived by community residents,

and key informants stressed the importance of creating more CHCs and sustaining them (UNICEF 2019).

What previous CHC programs and research have not elucidated is how CHCs can be monitored over time and what information may be collected. To address this knowledge gap, the CHC monitoring under STWP was conducted with the Group Maturity Index (GMI), a monitoring tool originally developed by GRM International Zimbabwe (Cole *et al.* 2018). GMI provides insights into what aspects of CHCs can be monitored and how programs can identify areas of improvement for each CHC. This study aimed to describe the maturity status of CHCs as measured by the GMI tool and assess if CHCs' performances in GMI's output domains are associated with the impact domain.

METHODS

GMI approach

The GMI tool measures the growth or maturity status of CHCs in five domains: objectives, governance, resources, group systems, and impacts. The first four domains focus on output measures of CHC development while the last domain addresses the outcomes. These domains were selected to monitor CHCs' capacity to sustain their activities with clear goals, management structures and systems, financial resources, and positive outcomes even after the STWP implementation period. Each GMI domain includes several topics to provide insights into what aspect of CHCs can be further developed (see Figure 1).

GMI domains

The objective domain includes the rationale and process of club formation, objective development status, participation in participatory health and hygiene training, plans to meet objectives, alignment between objectives and activities, and frequency of updating objectives. The governance domain assesses the development, adherence, and enforcement of club constitution, leadership structure, selection process, and training, knowledge of leadership and management, decision making processes in the club, group cohesion, and transparency and accountability. The resource domain monitors the status of asset ownership, resource mapping, stewardship of resources, and asset
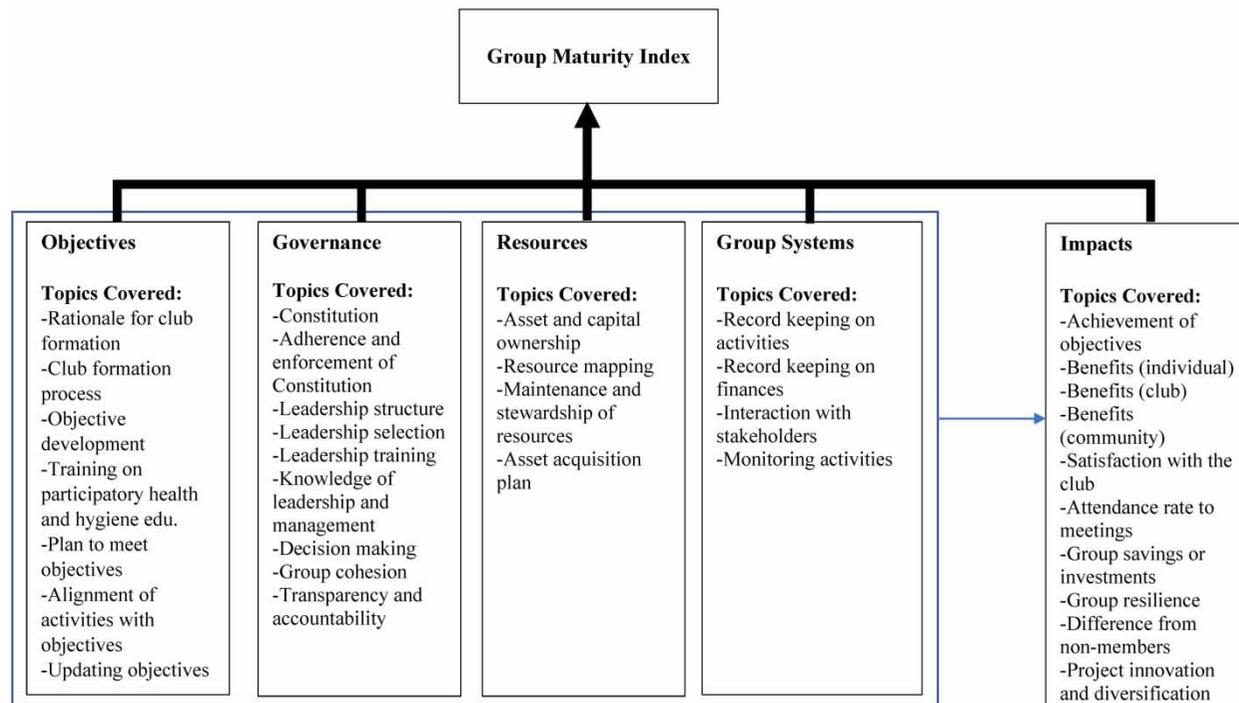

Figure 1 | Conceptual Model of Group Maturity Index.

acquisition plans. The group system domain covers the status of record keeping on activities and finances, interaction with stakeholders, and monitoring activities. The impact domain includes the status of achievement of objectives, benefits, satisfaction with the club, attendance rates to club meetings, group savings, group resilience, perceived difference between club members and non-members, and project innovation and diversification. Additional background of the GMI tool was described elsewhere (Cole *et al.* 2018).

Data collection

GMI data collection took place in 2018 through a group survey with CHC members as part of STWP program monitoring. A structured questionnaire was employed to assign a score to each element or topic of GMI domains with a five-point Likert scale. For each question, participating CHC members had a discussion if necessary and provided one response as a club. The assignment of score was conducted by enumerators from Non-Governmental Organizations (NGOs) and local authorities who received training for data collection and standardized scoring. The sum of scores for GMI domains was calculated as index scores.

Data analysis

Index scores were subsequently converted to a percentage to classify each club into four maturity stages: infancy stage (0–39%), growth stage (40–59%), managed stage (60–89%), and mature stage (90–100%). For example, the group system domain includes four topics, and the highest score for the domain would be 20 if a community health club scores the maximum of 5 points in each topic. The percentage was calculated by dividing the summed scores by the possible highest score for each domain. In this example, it would be 100% by dividing 20 (summed scores) by 20 (possible highest score). By using this approach, we estimated the maturity stage of CHCs for each GMI domain and the GMI as a whole.

In total, data for 158 clubs in 13 towns were available for analysis. Data for Hwange town were not available, and four clubs were removed from analyses due to insufficient data for many variables. Univariate analyses were conducted to describe the number of health clubs by project towns, year of establishment (e.g., 1 = before 2012, 2 = 2013–2015, 3 = 2016–2018), and GMI domains. Bivariate analyses assessed the correlation between the impact domain and other GMI domains by plotting index scores and estimating Pearson's correlation coefficient. Multivariate analyses employed a multiple linear regression and assessed the association of objectives, governance, resources, and group systems index scores with impact index scores after controlling for towns, years of establishment, and number of club members. All analyses were performed with STATA 14.

Ethical approval

This study analyzed secondary data, which did not include any personally identifiable information or individual data. The primary purpose of GMI data collection was to monitor STWP implementation. In accordance with the ethical requirements for human research in Zimbabwe, this study was not required to obtain a formal ethical approval.

RESULTS

Table 1 summarizes locations, year of establishment, and group maturity status of community health clubs. The number of community health clubs by towns ranged from 3 in Mutoko to 28 to Zvishavane. Over 80% of community health clubs were established between 2013 and 2015.

In all of the GMI domains except for the resource domain, the majority of community health clubs were in the maturity stage. In the resource domain, approximately 47% of the clubs were in the infancy stage while less than 28% of them were in the mature stage. For the overall GMI, one club (0.65%) was in the infancy stage, 34 clubs (22.08%) were in the growth stage, 115 clubs (74.68%) were in the mature stage, and four clubs (2.6%) were in the mature stage.

Figure 2 presents the scatter plots of GMI scores comparing the impact domain and other GMI domains. The impact domain had a significant correlation with the objective domains ($r = 0.5216$, $p < 0.0001$), the governance domain ($r = 0.6805$, $p < 0.0001$), the resources domain

Table 1 | Locations, year of establishment and group maturity status of community health clubs in urban areas of Zimbabwe

Variables	n	%
Towns		
Bindura	19	12.34
Chiredzi	8	5.19
Chivhu	5	3.25
Chipinge	9	5.84
Gokwe	13	8.44
Gwanda	14	9.09
Karoi	8	5.19
Mutoko	3	1.95
Mvurwi	9	5.84
Plumtree	11	7.14
Rusape	14	9.09
Shurugwi	13	8.44
Zvishavane	28	18.18
Year of Establishment		
2012 or before	9	5.84
2013	25	16.23
2014	36	23.38
2015	63	40.91
Between 2016 and 2018	21	13.64
Average number of CHC members	22.7	18.7 (std)[a]
Objective Domain		
Infancy	3	1.95
Growth	17	11.04
Managed	121	78.57
Mature	13	8.44
Governance Domain		
Infancy	2	1.3
Growth	12	7.79
Managed	136	88.31
Mature	4	2.6
Resource Domain		
Infancy	72	46.75
Growth	38	24.68
Managed	43	27.92
Mature	1	0.65
Group System Domain		
Infancy	13	8.44
Growth	39	25.32

(*continued*)

Table 1 | continued

Variables	n	%
Managed	92	59.74
Mature	10	6.49
Impact Domain		
Growth	23	14.94
Managed	120	77.92
Mature	11	7.14
Group Maturity Index		
Infancy	1	0.65
Growth	34	22.08
Managed	115	74.68
Mature	4	2.6

N = 154.
[a]std = standard deviation.

(r = 0.5253, $p < 0.0001$), and the group systems domain (r = 0.7092, $p < 0.0001$). Among the GMI domains, the group systems domain had the highest correlation with the impact domain. For additional information, Supplementary Figure 1 shows the distribution of GMI domain scores in histograms.

Table 2 presents the results of multiple linear regression on impact domain scores. An increase of governance index scores by one point was associated with an increase of impact index scores by 0.393 (95% CI: 0.199–0.588, $p < 0.001$) after controlling for towns, year of club establishment, and number of club members. A one-point increase in resource index scores and group system index scores was also associated with an increase of 0.256 (95% CI: 0.028–0.485, $p = 0.028$) and 0.520 (95% CI: 0.244–0.796, $p < 0.001$) in impact index scores, respectively. Objective index scores did not have a significant association with impact index scores by accounting for potential confounders.

DISCUSSION

This study employed a new monitoring tool – GMI – to assess the maturity status of CHCs and revealed that over 75% of CHCs had reached the managed stage or the mature stage by 2018. Approximately 80% of CHCs in this
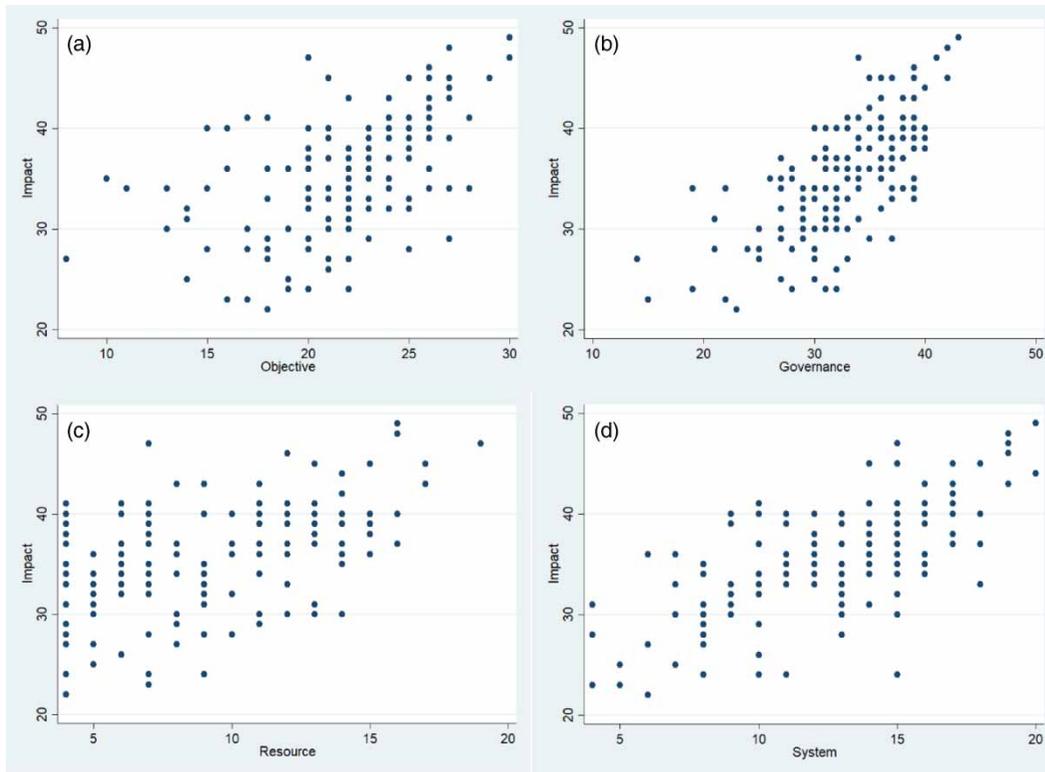
Figure 2 | Scatterplots of Impact Domain Scores and Objective Domain Scores (a), Governance Domain Scores (b), Resource Domain Scores (c), and Group System Domain Scores (d).

study were established between 2013 and 2015, which suggests that the majority of CHCs successfully moved from the infancy stage to a higher maturity stage. Governance, resource, and group system domains were independently associated with the overall impact domain after controlling for potential confounders. This finding suggests that CHCs and club members may experience overall positive impacts by developing these three domains. While the objective domain was positively correlated with the impact domain at the bivariate analysis, a significant association was not confirmed at the multivariate analysis. Based on this result, developing CHC objectives alone may not be adequate to produce positive impacts.

While the overall maturity of CHCs was high, less than 30% of CHCs were at the managed or mature stages for the financial resource domain. As financial resources are crucial to develop and sustain CHCs, financial management needs to be carefully planned and implemented. Under the STWP, UNICEF observed that some CHCs have successfully implemented income-generating activities, such as production of detergents for toilet and house cleaning and

reuse of recyclable waste (Cole *et al.* 2019). One CHC has established a private company, which has explored approaches to generate electricity from waste materials. Additional efforts and approaches to ensure financial sustainability of CHCs can be further explored by future studies.

The scale-up of CHCs requires a careful review of evidence. A cluster randomized controlled trial suggested that CHCs did not improve child health outcomes in rural Rwanda (Sinharoy *et al.* 2017). Another study from Haiti also reported that CHC implementation led to limited hygiene behavior changes in urban settings (Brooks *et al.* 2015). Based on these studies, the CHC approach does not seem to influence behavioral and health outcomes by itself and may need to be considered as a contributing factor to reduce health risks. A recent process evaluation of the same CHC intervention in Rwanda, however, revealed low program fidelity as a key limitation to assess the impact of CHCs on health outcomes (Waterkeyn *et al.* 2020). Moreover, previous studies did not adequately monitor the process or output measures, such as objective, governance, resource, and group system domains in this study. To

Table 2 | Results of multiple linear regression on impact index scores

	Coef.	Std. Err.	t	*p*-value	[95% Conf. Interval]	
Objective Domain Scores	0.064	0.124	0.52	0.605	−0.181	0.309
Governance Domain Scores	0.393	0.098	4.00	**<0.001**	0.199	0.588
Resource Domain Scores	0.256	0.115	2.22	**0.028**	0.028	0.485
Group System Domain Scores	0.520	0.139	3.73	**<0.001**	0.244	0.796
Town (Ref = Bindura)						
Chiredzi	1.552	1.623	0.96	0.341	−1.659	4.762
Chivhu	1.281	1.867	0.69	0.494	−2.412	4.973
Chipinge	−0.100	1.515	−0.07	0.947	−3.096	2.896
Gokwe	−0.399	1.336	−0.30	0.766	−3.042	2.244
Gwanda	0.550	1.345	0.41	0.683	−2.109	3.210
Karoi	−0.645	1.592	−0.41	0.686	−3.793	2.503
Mutoko	−5.615	2.303	−2.44	**0.016**	−10.171	−1.060
Mvurwi	2.401	1.588	1.51	0.133	−0.741	5.542
Plumtree	−2.550	1.388	−1.84	0.069	−5.296	0.197
Rusape	2.983	1.532	1.95	0.054	−0.048	6.013
Shurugwi	1.072	1.381	0.78	0.439	−1.659	3.802
Zvishavane	−0.453	1.151	−0.39	0.695	−2.729	1.823
Year of Est. (Ref = before 2012)						
Between 2013 and 2015	−0.478	1.341	−0.36	0.722	−3.130	2.174
Between 2016 and 2018	−0.674	1.555	−0.43	0.665	−3.749	2.401
Number of club members	0.004	0.017	0.21	0.830	−0.029	0.036
Constant	12.586	3.309	3.80	**<0.001**	6.042	19.130
Adjusted R-squared	0.612					
F statistic (degrees of freedom)	13.72 (19, 134)					

Notes: bolded = $p < 0.05$.

better understand how CHCs contribute to health outcomes, future studies may consider using the GMI tool or an alternative tool to monitor the maturity status of CHCs and assess if mature CHCs experienced any health benefits. The applicability and effectiveness of CHCs in urban settings can also be investigated as the CHC model has been mostly implemented in rural areas.

This study includes a number of limitations and opportunities for further development. First, the structured survey instrument only defined the first and fifth response categories of a five-point Likert scale for certain questions. Consequently, GMI score was measured with some subjective judgment by study participants and enumerators. Each response category could be clearly defined for all GMI measurement to ensure standardized measurement for future investigations. Second, temporality of independent and dependent variables was not definitively established due to the cross-sectional study design. For instance, club members who are generally satisfied with CHC activities may have contributed to further development of their clubs. Thus, a reverse relationship among study variables remains as a possibility. Third, this study assessed the overall impact by combining specific impact areas into one variable. Thus, the effects of GMI's output domains on specific impact areas were not examined. Fourth, this study could not control for some potential confounders, such as club members' socioeconomic status and education. Lastly, this study selected GMI domains for programmatic reasons rather than taking a theory-driven approach. Additional monitoring efforts can be made with a theoretical

framework to assess CHCs more systematically. To explore a future research topic, this study conducted a post-hoc analysis to examine if having a small number of CHCs in a town may improve the maturity status of CHCs. This analysis did not find any major difference in the maturity status by the number of CHCs per town.

Despite the limitations, this study demonstrated the potential utility of GMI as an innovative monitoring tool to assess the growth, performance and sustainability of CHCs. The Government of Zimbabwe, non-governmental organizations, and other public health organizations may consider the GMI for future monitoring. By refining the GMI tool, future WASH and public health interventions may efficiently assess the status of CHCs and expand the evidence base to inform program implementation. Ways to strengthen the GMI tool include the development of clear definitions for each response category of the five-point Likert scale and the assessment of specific impact areas to better guide public health actions.

DISCLAIMER

The contents and perspectives of this paper are solely the responsibility of the authors and do not necessarily represent the official views of the United Nations Children's Fund or Government of Zimbabwe.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

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