BMC Primary Care

RESEARCH

Open Access

Factors associated with perceived health of school-aged children in rural Rwanda: an opportunity to leverage community health workers to enhance school health promotion and primary healthcare systems linkages

Anatole Manzi[1,2,3*], Daniel Nguyen[3,4,8], Benjamin Katz[3,4,9], Clara Agyapomaa Michel[5], Theophile Nilingiyimana[6], Titien Sendarasi[6], Joseph Niyonzima[6], Olive Nyiraneza[6], Norbert Blaise Bimenyimana[6,7] and Elizabeth Bloom[5]

Abstract

Background In many low-income countries, enhancing the health of school-aged children is often impeded by insufficient or limited knowledge regarding their health status. Further, hands-on health promotion interventions are nearly non-existent due to the lack of designated health workers. The disconnection between schools and primary care facilities further exacerbates this issue. To address these challenges, the World Health Organization has introduced the Health Promoting School (HPS) framework, a comprehensive model designed to integrate health into all aspects of school life and promote physical, mental, and social well-being. We sought to assess the perceived health status of school-aged children, identify associated factors, and explore the role of community health workers (CHWs) in public schools in rural Rwanda.

Methods We carried out a convergent mixed methods study among teachers and community members in rural areas of Musanze, Rwanda. Data collection instruments were adapted from the World Health Organization's HPS framework and the literature. We conducted six in-depth interviews and three focus group discussions. We performed a logistic regression analysis to examine the factors associated with perceived health. Thematic analysis was used to analyze the qualitative data.

Results A total of 479 individuals participated in this survey. Of these, 425 (89%) were community members, while 54 (11%) were employed as teachers at Nyabirehe or Rwinzovu public schools. Almost half of respondents 221 (46%) described the children's health as poor. Many factors were associated with perceived children's health, including having an established leadership team for school-based health promotion (OR = 1.97, 95%CI: 1.01,3,84), and being familiar with school-based health promotion (OR = 4.77, 95%CI: 2.27,10.0). Qualitative results described the CHW as a bridge between communities, schools, and primary healthcare centers.

*Correspondence:
Anatole Manzi
mangano2020@gmail.com

Full list of author information is available at the end of the article

Conclusion This study revealed that the health of schoolchildren needs particular attention. In resource-limited settings, HPS presents a promising opportunity to address the health and well-being of children at rural public schools. However, adapted policies, the establishment of health promotion teams, and hands-on orientation for teachers and community members are necessary to ensure an effective implementation of HPS. In Rwanda and other low-income countries where public schools lack nursing staff, CHWs could play a vital role in enhancing HPS and the linkage between schools and primary healthcare facilities.

Keywords School-aged children, Health promoting schools, Health systems, Community health workers, Rwanda

Background

The interrelationship between education, health, and economic productivity at the individual and societal level is well documented in past literature [1, 2]. Children who are sick are more likely to be absent from school, which can result in grade repetition or school dropout, reducing graduation rates and overall educational achievement [1]. Investing in measures to improve child health and wellness is crucial for developing capacity building and ensuring economic prosperity [3]. Schools can be leveraged to reach a significant portion of the population (children, parents, and community members), playing a central role in improving health and educational achievement across the lifespan [4, 5]. A number of studies have shown that school-based interventions are cost-effective, scalable, and sustainable approaches for advancing national health agendas and improving health outcomes [5, 6]. This approach is particularly important in low- and middle-income countries (LMICs), such as Rwanda, with limited access to healthcare facilities and a high percentage of school-aged children [7].

The World Health Organization'(WHO) developed the Health Promoting School (HPS) framework to promote health and learning and improve health outcomes among students, staff, and community members through community participation and intersectional collaboration [4, 6]. The HPS model (whole-school approach) aligns with the Social Ecological Model framework, as it employs a multifaceted approach (individual, organizational, community, and structural) to promote sustainable behavior change rather than focusing solely on individual factors that influence behaviors [4]. The framework highlights the need to implement healthy school policies, provide health education, and school health programs and services such as nutrition and food safety, counseling, social and mental health support, and recreation. This is coupled with school and community-based projects through the active involvement of staff, parents, students, and community members [8].

While the HPS framework shows promise in improving health outcomes, inconsistency in implementing the components of the framework prevents a comprehensive assessment to determine the overall effectiveness of the model. For example, family and community components are sometimes minimally addressed or not at all [6, 9]. The need for more evidence related to outcomes such as sexual health, substance use, violence, and mental health has also been documented [6].

Efforts to achieve Sustainable Development Goal (SDG) 3—to ensure healthy lives and promote well-being for all ages—have typically focused on health facility-based interventions with limited involvement of schools and learning centers. Globally, non-communicable and infectious diseases kill 41 million and 17 million people, respectively, each year [10]. While health promotion and education could prevent risk factors associated with these diseases, the scarcity of health workers, among other resources, limits access to timely education and prevention [11].

In Rwanda, despite significant advancements in public health, school-aged children remain impacted by preventable conditions. Notably, neglected tropical diseases remain a substantial challenge. According to Ruxin J et al., 66% of schoolchildren are afflicted with intestinal worm infections [12]. In addition, there is a growing concern about substance abuse among these children. In a study involving 3,301 Rwanda children, Gishoma et al. found that 28.5% were using alcohol. Other substances used include cannabis (4.4%), cigarettes (2.9%), opiates (0.2%), and cocaine (0.1%) [13]. Mental health is also a critical issue, with 27.4% of Rwandan youth aged 14–25 experiencing common mental health disorders such as trauma, depression, anxiety, fear, and social isolation [14].

Recent reports highlighted high rates of obesity among children and the school-aged population in Rwanda, suggesting the need for proactive interventions to supplement health facility-based health promotion efforts [15]. WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Health Promoting School (HPS) model as a strategic vehicle to promote positive development and healthy behaviors, with the potential to improve health and well-being. The HPS model, a whole-school approach, aligns with the Social Ecological Model framework, as it employs a multifaceted approach to promote sustainable behavior change rather than focusing solely on individual factors that influence behaviors.

The HPS framework consists of three interrelated components, including the curriculum, teaching, and learning, providing students with the knowledge, skills, and

attitudes that enable them to make healthy choices and adopt healthy behaviors. It also involves training teachers and other staff to deliver effective health education and promote a positive learning environment. Furthermore, HPS fosters school policies, practices, and environments that involve developmenting and implementing measures that support health and well-being in the school setting, such as ensuring safe water and sanitation, preventing violence and bullying, promoting physical activity and nutrition, and providing health services and referrals. Other components of the HPS framework are partnerships and services capitalizing on the involvement of parents, families, community members, health professionals, and other stakeholders in planning, implementing, and evaluating health-promoting activities in the school. This also involves linking the school with external resources and services to enhance its capacity to address health issues.

Schools have the potential to reach a substantial segment of the population and enhance health outcomes across the lifespan, alongside educational achievements. However, in low-income countries, there is limited knowledge regarding the current health status of schoolchildren in accordance with HPS guidelines. Further, in LMICs, community health workers (CHWs) have effectively promoted health and managed childhood illnesses. Studies have reported the effect of CHW-led and community-based interventions to improve care-seeking behavior and overall health outcomes [16–18]. However, it is crucial to investigate the role of CHWs in addressing public health challenges within public schools.

We assessed the perceived health status of school-aged children, identified associated factors, and explored the role of community health workers at public schools in rural Rwanda. The findings from this study will inform strategies for effective implementation of the HPS framework and guide the integration of CHWs agents to enhance health-promoting schools and primary healthcare systems linkages.

Methods

Study design and setting

This cross-sectional study was conducted among teachers, education administrators, and community members who reside in Musanze district, Rwanda. We collaborated with three schools to conduct this study: (1) Nyabirehe K-9, which has a population of 1,229 students and 25 teachers; (2) Rwinzovu Primary, which has a population of 1,013 students and 26 teachers; and (3) Rwinzovu High School, which has a population of 21 teachers and 587 students. The quantitative part of the study involved 479 participants. The qualitative assessment included six in-depth interviews (IDIs) with school principals and administrators. We also conducted three focus group discussions (FGDs) with teachers and community members.

Data collection

Participants who were eligible for this study were Rwandans aged at least 18 years of age, employed by either Nyabirehe or Rwinzovu schools in Musanze district (teachers and administrators), or a community member who resides in Musanze district for at least one year and has at least one child attending either Nyabirehe or Rwinzovu in their household. A five-member Rwandan study team (three study coordinators and two interviewers) was trained to implement the study in Rwanda. Team members promoted the study within the schools and the Musanze community, including school administration, community members during home visits, and distribution of study flyers at schools, churches, and homes. This approach ensured a diverse representation of teachers, administrators, and community members, resulting in a total sample size of 479 participants. Participants were invited to complete an interviewer-administered questionnaire. The key variables included sociodemographic characteristics, participants' perceptions of HPS, students' health, school health problems, and strategies for implementing the HPS framework. The questionnaire was developed in English, translated, and administered in Kinyarwanda. Two Rwandan interviewers conducted the survey by reading the questions aloud and recording the verbal responses using the CommCare application on a tablet.

We used the purposive sampling method to select participants for qualitative evaluation. We also leveraged school meetings and community gatherings to identify eligible individuals to participate in the qualitative evaluation. Based on their key role in promoting school health initiatives, two principals and four school administrators were invited to take part in in-depth interviews (IDIs). Additionally, we conducted focus group discussions (FGDs) with three groups of ten participants, comprising a balanced mix of teachers and parents from different grade levels and genders. This allowed us to collect perspectives from the teachers and community members, with the ultimate goal of understanding participants' perceptions of children's health and the role of school-based CHWs. The duration of IDIs varied between 60 and 75 min long, while FGDs took between 60 and 85 min. The data collector recorded all IDIs and FGDs. All audio tapes were transcribed verbatim and translated into English. All questionnaires were administered in a private room at school.

Confidentiality was maintained to protect participants' privacy. As such, the research team implemented several measures to ensure that personal information remained secure and anonymous. Each participant was assigned a

unique code; no personal identifiers were captured. All collected data, including interview recordings and questionnaire responses, were securely stored and only accessible to authorized research personnel. Participants were fully informed about these confidentiality measures and assured that their information would be used exclusively for research. The data was collected between October 2022 and August 2023.

Data analysis

Study measures

Outcome variable The perceived health of school-aged children, defined as participants' subjective assessment of the overall health of children, encompasses physical, mental, and social well-being. In this study, school-aged children imply all children 6–12 years old, enrolled at targeted schools. Perceived health was assessed using a single-item measure: How would you describe the health of the children attending school in general? The response options included excellent, very good, good, fair, poor, and don't know/not sure. Participants who reported excellent, very good, and good were assigned a score of 1, while those who reported fair or poor were assigned 0. A conceptual framework (Fig. 1) was developed to guide the understanding of the core components of HPS and CHW systems and their relationship with the outcome of interest.

Explanatory variables ***Health promoting school components***.

We adopted questions from the WHO's HPS assessment guidelines to measure participants' perceptions related to health promotion at local schools. Specifically, we assessed 16 domains in the HPS: [1] promotion of a hygienic environment; [2] school's physical environment; [3] provision of a healthy eating environment; [4] addressing the needs of students and staff; [5] basic health care services for students; [6] creating an environment of friendliness and care in school; [7] establishment of an inclusive environment of value and mutual respect; [8] comprehensive curriculum with health-related issues for students to acquire health skills; [9] infectious disease control; [10] proactive linkage with other community bodies; [11] proactive linkage with other community bodies; [12] family involvement in school affairs; [13] related health skills for family members and the community (all participants); [14] staff are well-equipped to promote health; and [15] strategic approaches for students to acquire health skills. Response options for all questions included were yes, no, and don't know.

Perceived health problems at schools.

Participants were asked to rate common health problems (e.g., infectious diseases, chronic diseases, sanitation, mental health, violence, injuries, helminth infections, etc.) and harmful behaviors among school children. Each condition or behavior was rated using a 5-point scale 1=not a problem, 2=a fairly small problem, 3=somewhat of a problem, 4=a serious problem, and 5=a very serious problem. We converted this Likert scale into a binary variable (*no* for not a problem and *yes* for a fairly small problem, somewhat of a problem, or serious problem) prior to the analysis.

Background factors

Participants were asked questions about their age, gender, marital status, residence, level of education, employment, and household income.

Data analyses

Descriptive statistics were used to characterize the study sample stratified by the outcome (perception of students' health). Categorical variables were assessed using Chi-square or Fisher's exact test while continuous variables

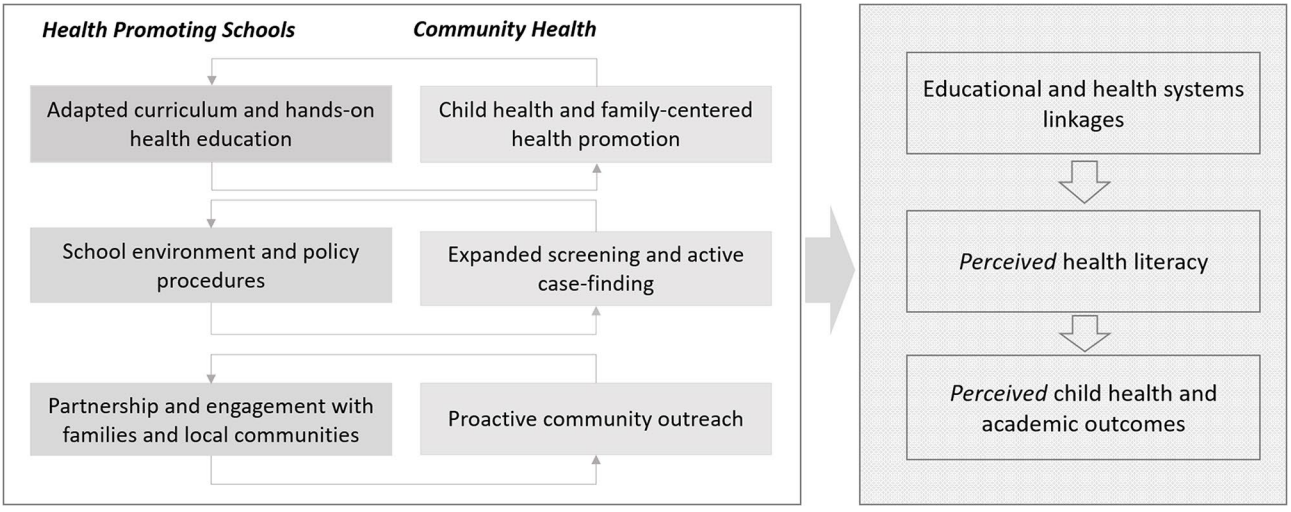

Fig. 1 Integration of health-promoting schools and community health systems integration: A conceptual framework

were assessed using Student's T-test if normally distributed or the Mann-Whitney Wilcoxon test if not normally distributed. Bivariate analyses were used to identify the factors associated with the outcome. The core factors included demographics, common health problems and risk behaviors, and HPS-related characteristics. The multivariable logistic regression model included measures with a two-sided p-value <0.05 in the unadjusted logistic regression model. Odds ratios (ORs) and 95% confidence intervals were computed and presented, except for age, which was considered a potential confounder. We analyzed the data using Stata v15.1 (College Station, TX: StataCorp LP). We performed a rapid qualitative data analysis following Qureshi's four-step instrument for grounded theory [19]. Using open coding, we identified initial concepts and categories from the transcript. We refined the categories through axial coding which enabled us to examine the relationships between categories and subcategories. Finally, we used selective coding to integrate and refine the categories into a coherent theoretical framework. Throughout this process, we performed constant comparisons to ensure that emerging themes were consistently validated against new data on HPS and the role of community health workers. Emerging themes were compared and contrasted with the quantitative findings.

Results

A total of 479 individuals participated in this survey. Of these, 425 (89%) were community members, while 54 (11%) were employed as teachers at Nyabirehe or Rwinzovu public schools. Almost half of the respondents (46%) reported poor overall quality of the children's health. Table 1. Describes the bivariate relationships between participant characteristics and perceived health of children. Several variables were related to perceived children's health, including the level of education ($p=0.01$), the residence being remote versus nearby ($p=0.016$).

Table 2 describes the relationship between the common health problems and risk behaviors and perceived health of children. Overall, various problems and behaviors including HIV/AIDS ($p<0.001$), malaria ($p<0.001$), unintended teenage pregnancy ($p<0.001$), unsafe water ($p=0.002$), helminth (worm) infections ($p=0.026$), poor eating/feeding practices ($p=0.040$), malnutrition ($p=0.010$) and unsafe water ($p=0.002$), lack of exercise or physical activities ($p=0.050$). There was a modest association between Marijuana use and the perceived health of children. While alcohol use and unsafe sex emerged as common risk behaviors, they were not associated with perceived school children's health.

Table 3 presents the relationship between HPS characteristics and the perceived health of schoolchildren. Overall, the perceived health of children was strongly associated with familiarity with health promotion ($p<0.001$) and having an established leadership for health promotion at local public schools ($p=0.002$). However, there was no relationship between perceived health and HPS policy ($p=0.242$).

Table 4 describes the findings from the multivariate regression analysis. After controlling for confounders, several factors remained associated with the perceived health of the children, including having an established leadership or team for school-based health promotion (OR=1.97, 95%CI: 1.01,3,84) and being familiar with school-based health promotion (OR=4.77, 95%CI: 2.27,10.0). Unsurprisingly, positive perceptions of a child's future and better quality of life were associated with perceived children's health (OR=2.28,95%CI:1.18,4.37) and (OR=6.77,95%CI:3.75,12.20), respectively. However, participants who responded that children had no access to health care were less likely to admit a positive perception of children's health (OR:0.54, 95%CI:0.31,0.95).

In our qualitative analysis, three themes emerged from IDIs and FGDs: (1) health as stability, (2) CHWs as a bridge between communities, schools, and primary healthcare centers, and (3) structural barriers as major hindrances.

Health as stability

According to WHO, health is "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." The teachers' responses focus on the absence of disease or pain, the ability to function and meet basic needs, and the quality of family and social relationships. Participants emphasized the absence of disease and the ability to afford primary needs such as housing and schooling.

> *"Health means that you are not sick, that you have the ability to educate your participant child or treat yourself, and that you have a known place of residence," said a teacher, FGD participant, when she was asked to define health.*

Another teacher described health as:

> *"Living without worry and illness at home in a person's family."*

While these are essential components of health, respondents did not capture the full scope of well-being that the WHO definition implies. For example, the participants did not mention the emotional, psychological, or spiritual dimensions of health, nor did they consider the impact of environmental, political, or economic factors on health. However, their definitions and perceptions of health are consistent with the standard definition of health. A more

Table 1 Bivariate relationships between participant characteristics and perceived health of children

Demographic characteristics	*N*	%	OR		95%CI	*P*-value
Age						0.579
< 30	84	18	1			
30–39	185	39	1.05	[0.62	1.77]	
40–49	114	24	0.87	[0.49	1.54]	
> 50	92	19	0.75	[0.41	1.36]	
Residence						0.016
Nearby villages	393	82	1.00			
Remote villages	86	18	1.77	[1.10	2.86]	
Level of education						0.010
≤Primary	393	82	1.00			
≥Secondary	86	18	1.87	[1.15	3.06]	
Marital status						0.433
Married	252	53	1.00			
Not married	227	47	0.86	[0.6	1.24]	
Primary Work Language						0.006
Kinyarwanda	429	89	1.00			
English	50	11	2.75	[1.26	5.98]	
Employment status						0.074
Unemployed	403	84	1.00			
Employed	76	16	1.57	[0.95	2.61]	
Employed as a teacher or educator						1.010
No	425	89	1.00			
Yes	54	11	1.79	[3.17	0.04]	
Gender						0.557
Male	144	30	1.00			
Female	330	69	0.88	[0.59	1.31]	
Prefer not to say	4	1	Omitted			
Monthly income						0.156
≤ 50,000 RWF/ ≤40 USD	420	88	1.00			
50,000-100,000 RWF/ 40–80 USD	26	5	1.05	[0.47	2.32]	
> 100,000 RWF/ >80 USD	33	7	2.07	[0.96	4.46]	
Children under 18 in household						0.872
None	19	4	1.00			
1–3 children	331	69	1.02	[0.40	2.58]	
≥ 4 children	129	27	1.14	[0.43	2.98]	
Perceptions						
Future of children						0.023
Not good	68	14	1.00			
Good	411	86	1.82	[1.08	3.06]	
Quality of life						
Not good	353	74	1.00			<0.001
Better	126	26	6.54	[3.91	10.92]	

comprehensive and holistic understanding of health would encompass the multiple and interrelated dimensions of human existence and the challenges and opportunities that affect health outcomes.

CHWs as a bridge between communities, schools, and primary healthcare centers

The respondents' views reflected the important role of CHWs in promoting child health and well-being. They described how CHWs act as a bridge or interface between the communities, schools, and primary healthcare centers, providing regular monitoring, reporting, and advice on child health issues.

> *"Community health workers monitor how children grow, and if there is a problem, they report to the village chief and the health center. When there is a problem with these children, the village's leader reports to his superiors and gives advice to those parents on what to do to make his life healthy. Com-*

Table 2 Bivariate relationships between common health problems, behaviors, and perceived health of children

Health problems and risk behaviors	*N*	%	OR	95%CI	*P*-value
Common and serious health problems					
Alcohol and other substances					0.320
No	325	58	1.00		
Yes	154	32	1.22	[0.83 1.79]	
Injuries					0.789
No	403	84	1.00		
Yes	76	16	1.07	[0.65 1.75]	
Helminth (worm) infections					
No	141	29	1.00		0.026
Yes	338	71	0.64	[0.43 0.95]	
HIV/AIDS and STIs					<0.001
No	297	62	1.00		
Yes	182	38	2.07	[1.41 3.02]	
Malaria					
No	320	67	1.00		< 0.001
Yes	159	33	2.20	[1.49 3.28]	
Mental health problems					0.944
No	433	90	1.00		
Yes	46	10	1.02	[0.56 1.88]	
Oral health problems					0.100
No	433	90	1.00		
Yes	46	10	1.68	[0.89 3.18]	
Protein-energy malnutrition					0.010
No	162	34	1.00		
Yes	317	66	0.59	[0.40 0.87]	
Respiratory infections					0.922
No	432	90	1.00		
Yes	47	10	0.97	[0.53 1.77]	
Unsafe/inadequate sanitation					0.234
No	321	67	1.00		
Yes	158	33	0.79	[0.54 1.16]	
Tobacco					0.084
No	413	86	1.00		
Yes	66	14	1.60	[0.93 2.73]	
Unintended pregnancies					
No	323	67	1.00		0.001
Yes	156	33	1.86	[1.26 2.76]	
Unsafe water					
No	81	17	1.00		0.002
Yes	398	83	0.46	[0.28 0.77]	
Violence					0.135
No	399	83	1.00		
Yes	80	17	0.69	[0.43 1.12]	
Immune diseases					0.067
No	400	84	1.00		
Yes	79	16	0.12	[0.23 0.00]	
Vision and hearing					0.546
No	454	95	1.00		
Yes	25	5	0.78	[0.35 1.75]	
Harmful behaviors					
Alcohol abuse					0.892
No	265	55	1.00		
Yes	214	45	1.03	[0.71 1.47]	

Table 2 (continued)

Health problems and risk behaviors	N	%	OR		95%CI	P-value
Dropping out of school						0.241
No	156	33	1.00			
Yes	323	67	0.79	[0.54	1.17]	
Drug abuse						0.705
No	169	35	1.00			
Yes	310	64	0.93	[0.64	1.35]	
Lack of exercise or physical activities						0.050
No	85	18	1.00			
Yes	394	82	0.62	[0.38	1.00]	
Poor eating/feeding practices						0.040
No	221	46	1.00			
Yes	258	54	1.45	[1.01	2.09]	
No immunization						0.094
No	89	19	1.00			
Yes	390	81	0.67	[0.42	1.08]	
Marijuana use						0.057
No	129	27	1.00			
Yes	350	73	0.17	[0.02	1.45]	
Unsafe sex						0.433
No	178	37	1.00			
Yes	301	63	0.86	[0.59	1.25]	

Table 3 Bivariate relationships between HPS characteristics perceived health of children

HPS Characteristics	N	%	OR		95%CI	P-value
Health promotion policy, health literacy						
Health education sessions per month						0.242
≤ 10 h	16	29.63	1.00			
> 10 h	38	70.37	2.25	[0.54	9.35]	
Main Source of Drinking Water						< 0.001
Open Water Sources	295	61	1.00			
Rainwater catchment	90	19	1.64	[1.02	2.65]	
Tap water	94	20	3.93	[2.32	6.68]	
Familiarity health promotion model						
No	397	83	1.00			< 0.001
Yes	82	17	5.30	[2.88	9.72]	
Leadership for health promotion						0.002
No	221	46	1.00			
Yes	258	54	2.30	[1.32	4.01]	
Children receive health care when needed						< 0.001
No	221	46	1.00			
Yes	258	54	0.41	[0.26	0.65]	

munity health workers work with community leaders to make children healthy," said a school administrator and member of the FGD.

Respondents also highlighted the responsiveness and support of CHWs, who visit the children at home and help them address any problems they face. The respondents portrayed CHWs as valued and trusted members of their communities who contribute to improving the health outcomes and quality of life of the children and their families.

"When we need him, we call to tell him what the problem is and how it is. He follows up on the child at home because it is his duty, then identifies some problems at the child's house, informs us on time, and helps us fix it," said a teacher and member of the FGD.

As they expanded on this, respondents described CHWS as community protectors.

Table 4 Multivariate logistic regression model with odds ratios, confidence intervals, and *P*-value for perceived health at public schools and local communities in rural Rwanda

Characteristics	OR		95%CI	*p*-value
Age				
< 30				
30–39	1.28	[0.66	2.48]	0.468
40–49	0.85	[0.41	1.77]	0.670
> 50	1.08	[0.50	2.31]	0.847
Residence				
Nearby villages	1.00			
Remote villages	1.48	[0.81	2.72]	0.205
Level of education				
≤Primary	1.00			
≥Secondary	1.52	[0.82	2.84]	0.183
Primary Work Language				
Kinyarwanda	1.00			
English	1.02	[0.38	2.77]	0.969
Unsafe water				
No	1.00			
Yes	0.55	[0.27	1.12]	0.100
Main Source of Drinking Water				
Open Water Sources	1.00			
Rainwater catchment	1.03	[0.56	1.89]	0.920
Tap water	2.24	[1.19	4.18]	0.010
Poor eating/feeding practices				
No	1.00			
Yes	1.17	[0.74	1.86]	0.500
Helminth (worm) infections				
No	1.00			
Yes	0.95	[0.55	1.63]	0.840
HIV/AIDS and STIs				
No	1.00			
Yes	1.56	[0.65	3.79]	0.650
Malaria				
No	1.00			
Yes	0.92	[0.37	2.31]	0.870
Protein-energy malnutrition				
No	1.00			
Yes	0.74	[0.43	1.26]	0.270
Unintended pregnancies (education)				
No	1.00			
Yes	1.32	[0.79	2.21]	0.280
Lack of exercise				
No	1.00			
Yes	0.86	[0.45	1.62]	0.640
Marijuana use				
No	1.00			
Yes	0.08	[0.01	0.88]	0.040
Familiarity health promotion model				
No	1.00			
Yes	4.77	[2.27	10.00]	< 0.001
Leadership for health promotion				
No	1.00			
Yes	1.97	[1.01	3.84]	0.050
Children receive health care when needed				

Table 4 (continued)

Characteristics	OR		95%CI	*p*-value
No	1.00			
Yes	0.54	[0.31	0.95]	0.030
Perceived quality of life				
Not good	1.00			
Good	6.77	[3.75	12.20]	< 0.001
Perceived future of children				
Not good	1.00			
Good	0.2.28	[1.18	4.37]	0.010

"The community health worker's job is to protect people's lives, from children, reports he [the CHW] shares to make the village he represents have better life conditions," said a parent and community leader, an FGD participant.

Participants repeatedly evoked the fact that the CHWs collaborate with teachers and parents in the community. Teachers explained the unique ability of the CHWs to reach households and have a thorough follow-up of children in need. One teacher said:

If they see a child who looks bad, they seem like a teacher who sees a child and sends a message to the parent to take care of the child's health. If a teacher teaches a child to clean himself, he will not go to the house to give soap or fetch water; what should he do? He would send the message to the community health workers so they go and tell the people to clean themselves and the children we teach.

In addition to school-based health promotion activities, CHWs play a vital role in community sensitization.

"...community health workers, [he] sensitizes us on how to build smaller farms. If they taught you, you should not throw them away like that, but you should change the vegetables if they are old and life continues," said a parent, a member of the FGD.

Respondents explained that CHWs facilitate learning. They help teachers to translate theoretical knowledge into practice. They also help communities get the necessary resources so that the children are in safe conditions. The respondents commended such hands-on health promotion.

"Both theory and practice are important; if we teach about sanitation, there must be sanitary papers in the toilet; if not, it would be like we did the theory only without practice. Better both theory and practice," said one school principal during the IDI.

Further, participants highlighted the fact that having a CHW grants them access to care. A school administrator said:

"When the government distributes medications for worm infections to people, the community health worker does it too to students so they can have a healthy life."

Structural barriers are major hindrances to CHW integration

Persistent structural barriers constitute a major setback to the CHW integration. Respondents described the need for more communication between schools and the community health program coordination team. In one of the IDIs, a school administrator said:

"The problem is that there isn't a mechanism for formal collaboration among stakeholders. Each one is helping in his own way, but that help should be coordinated among the stakeholders."

One teacher said:

"The community health worker must have an official position at the school. There is no rule that he works at the school; he only does it out of a feeling of duty. It is not mentioned that the CHW will come to school except when we ask for help. But saying he will mingle himself with the school is written nowhere."

Another school administrator attending an IDI said:

"The community health worker must have a room in the school that would be important, and they can replace each other in villages, and then they can exchange time or rotate at school. They should also have first aid medications if a child has a problem before the situation gets complicated."

Discussion

This study shed light on the perceived health of children at public schools in rural Rwanda. Almost half of the study population's health was poor, suggesting the need to invest in strategies to reach children through decentralized, community, and school-based interventions. The findings of this study emphasize the importance of HPS as a viable approach to enhancing children's health in public schools. This aligns with prior research interventions that have validated and advocated for the HPS model [20–22]. In Rwanda, where 98% of children are enrolled in elementary school [23], HPS could transform public health programming and improve overall child health outcomes.

CHWs were regarded as important for the health of children. However, our study's findings suggest that the role of CHWs is beyond the conventional role of detecting and managing cases at the community level or referring sick children. CHWs are regarded as community leaders who play a role at the intersection between the community, schools, and health facilities. Further, they were referred to as agents for family health promotion. This reputation affirms the rationale for leveraging CHWs as change agents to strengthen community health systems.

This study's findings depict the intersectionality between health education and community engagement as an essential consideration for the effective implementation of HPS interventions in resource-limited settings. As such, in addition to formalizing the role of the school-based CHWs, schools should be equipped with essential supplies and tools to address health needs. Further, referral pathways should be developed to streamline the collaboration between schools and health facilities.

Despite the common desire to adopt integrated approaches to improve health and educational outcomes, only some countries have successfully implemented HPS, especially in resource-constrained settings [4]. This may be due in part to the fact that the model has yet to be adapted to local contexts in many cases. Efforts to adapt HPS should address structural and system bottlenecks. Previous evaluations noted that tackling organizational and structural changes was vital to ensuring the success of the HPS model [24, 25]. Expanding the scope of CHWs to include school-based screening and case management could bring about remarkable improvements in children's health and well-being.

This study's findings are consistent with previous evaluations, highlighting the importance of strong leadership, clear goals and objectives, and effective stakeholder communication and collaboration. Community stakeholders, including parents and teachers, should have an equal voice in implementing and monitoring HPS programs. Creating a network of active champions of this information will help to disseminate information throughout the community more effectively and efficiently than attempting to reach every community member with direct education.

These results highlighted that having a school-based CHW was not an official appointment. The lack of space at school may limit their motivation and visibility. All structural and administrative challenges should be addressed in order to leverage CHWs in school-based interventions to improve the health and well-being of school-aged children.

While the Rwandan Ministry of Education and Rwanda Education Board have produced a high-quality national competence-based curriculum [26], its implementation depends on getting students to attend and stay in school. This challenge depends, in turn, on resolving several impediments to consistent school attendance, including sickness, water and sanitation, and school supplies among vulnerable children. Implementing the HPS framework will transform schools into one-stop centers to address the identified needs while improving academic and health outcomes.

There was a modest association between the primary work language and the perceived health of children. Educators and parents use different languages when communicating various health topics. It is hard to come to an agreed-upon language to present the information to constituents productively and effectively. It was appreciated that the translated version of the surveys was administered in accordance with the participant's native language. This challenge can be easily avoided by using CHWs and teachers who use the local language to tackle health promotion and other health-related needs.

This study has a number of limitations. First, any community members, teachers, and parents who participated in the study may aspire for improvements in their health and education system. This may have subconsciously led to expectation bias whereby study participants could have been influenced by the need for a school-based CHW, possibly leading to biased perceptions. However, this confounding effect might have been minimal as data collectors were instructed to provide ample information on the study's objectives.

This study did not include schoolchildren as participants, which may have limited our ability to compare and contrast perceptions across different groups. However, we believe that parents, teachers, and school administrators thoroughly understood children's health and provided relevant information. Future research should aim to include school-aged children to enhance the comprehensiveness of the findings.

Further, data collection instruments were adapted from the WHO's HPS framework (see additional file 1) [27]. A limited understanding of a typical HPS framework may

have affected their perceptions and accuracy of provided responses. However, data collectors used WHO's definition to explain the concept and checked their understanding before formal data collection.

Finally, this study occurred in a non-controlled environment. Like any observational study, this may have affected the study's external validity. Therefore, the interpretation and generalizability of these findings should be assessed with caution. However, a methodological rigor was adopted to control potential confounders. These findings inform the needs and best practices for practical implementations of HPS. Further studies are needed to use experimental design to assess the impact of HPS and school-based CHWs on academic and population health outcomes in resource-limited settings.

Conclusion

The study depicts the health of school-aged children as a critical area requiring attention. These findings highlight HPS as a promising strategy to improve children's health and well-being. However, establishing the leadership for school-based health promotion and further orientation of community members and teachers in HPS could enhance their perceptions and confidence regarding children's health.

Although most public schools in Rwanda and other low-income countries lack nursing staff, CHWs present a valuable opportunity to enhance HPS implementation and improve the well-being of school-aged children. Teachers could collaborate with CHWs as resources to improve health education and behavior change communication. This study demonstrates that CHWs are crucial in strengthening collaboration between schools and primary healthcare facilities, particularly in rural and remote areas. The evidence from this study provides valuable insights for policymakers, practitioners, and researchers interested in implementing the HPS framework and leveraging CHWs at rural public schools within resource-limited settings.

Abbreviations

CHW	Community Health Workers
HPS	Health Promoting Schools
WHO	World Health Organization
UNICEF	United Nations International Children's Emergency Fund

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-024-02645-5.

Supplementary Material 1

Acknowledgements

This research was conducted with the invaluable support of community members, educators, and school leadership, including principals and administrators. We sincerely thank Dr. Melonie Walcott for her insights and feedback during the study design and manuscript preparation phases.

Author contributions

AM and EB conceived the study. TN, TS, ON, and JN participated in data collection. AM, DN, BK, and LRH participated in the data analysis and interpretation. AM, DN, BK, CAM, JN, TN, TS, ON, NBB, and LRH participated in the manuscript preparation. All authors read and approved the final manuscript.

Funding

None.

Data availability

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The Rwanda National Ethics Committee approved this study (N°302/RNEC/2022). We obtained informed consent from all study participants. Names and other personal identifiers were excluded from datasets extracted for the analyses.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]University of Global Health Equity, Kigali Heights, Plot 772, KG 7 Ave., 5th Floor, PO Box 6955, Kigali, Rwanda
[2]Partners In Health, Kigali, Rwanda
[3]Move Up Global, Kigali, Rwanda
[4]Tufts University, Medford, USA
[5]Hartwick College, Oneonta, USA
[6]Ireme Education for Social Impact, Musanze, Rwanda
[7]Ministry of Infrastructure, Kigali, Rwanda
[8]Tufts University School of Medicine, Boston, USA
[9]Warren Alpert Medical School of Brown University, Providence, USA

Received: 12 May 2024 / Accepted: 28 October 2024
Published online: 08 November 2024

References

1. Zajacova A, Lawrence EM. The Relationship between Education and Health: Reducing Disparities Through a Contextual Approach. Annu Rev Public Health. 2018 Apr 1 [cited 2024 May 15];39:273–89. https://pubmed.ncbi.nlm.nih.gov/29328865/
2. Balaj M, Henson CA, Aronsson A, Aravkin A, Beck K, Degail C et al. Effects of education on adult mortality: a global systematic review and meta-analysis. Lancet Public Heal. 2024 Mar 1 [cited 2024 May 15];9(3):e155–65. https://pubmed.ncbi.nlm.nih.gov/38278172/
3. Kolbe LJ. School Health as a Strategy to Improve Both Public Health and Education. Annu Rev Public Health. 2019 Apr 1 [cited 2024 May 15];40:443–63. https://pubmed.ncbi.nlm.nih.gov/30566386/
4. Lee A. Health-promoting schools: Evidence for a holistic approach to promoting health and improving health literacy. Appl Health Econ Health Policy. 2009 [cited 2024 May 15];7(1):11–7. https://pubmed.ncbi.nlm.nih.gov/19558191/
5. Pulimeno M, Piscitelli P, Colazzo S, Colao A, Miani A. School as ideal setting to promote health and wellbeing among young people. Heal Promot Perspect. 2020 Nov 7 [cited 2024 May 15];10(4):316–34. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7723000/.
6. Langford R, Bonell C, Komro K, Murphy S, Magnus D, Waters E et al. The Health Promoting Schools Framework: Known Unknowns and an Agenda for

Future Research. Heal Educ Behav. 2017 Jun 1 [cited 2024 May 28];44(3):463–75. https://pubmed.ncbi.nlm.nih.gov/28504062/
7. Rusatira JC, Dusabejambo V, Vincent N, Haake A, Gonsalves S, Savant A. Enabling Access to Medical and Health Education in Rwanda Using Mobile Technology – Preliminary Results. 2015;18–21.
8. Lee A, Lo A, Li Q, Keung V, Kwong A. Health Promoting Schools: An Update. Appl Health Econ Health Policy. 2020 Oct 1 [cited 2024 May 15];18(5):605–23. https://pubmed.ncbi.nlm.nih.gov/32291699/
9. McHugh C, Hurst A, Bethel A, Lloyd J, Logan S, Wyatt K. The impact of the World Health Organization Health Promoting Schools framework approach on diet and physical activity behaviours of adolescents in secondary schools: a systematic review. Public Health. 2020 May 1 [cited 2024 May 15];182:116–24. https://pubmed.ncbi.nlm.nih.gov/32259722/
10. World Health Organization (WHO). Noncommunicable diseases: Mortality. the Global Health Observator. 2019 [cited 2024 May 28]. https://www.who.int/data/gho/data/themes/topics/sdg-target-3_4-noncommunicable-diseases-and-mental-health, https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/ncd-mortality
11. Kacholi G, Anasel MG. Health Workforce. Leadership and Governance in Primary Healthcare: An Exemplar for Practice in Resource Limited Settings. 2023 [cited 2024 May 28];43–54. https://www.who.int/health-topics/health-workforce#tab=tab_1
12. Ruxin J, Negin J. Removing the neglect from neglected tropical diseases: the Rwandan experience 2008–2010. Glob Public Health. 2012;7(8):812–22.
13. Gishoma Darius JSREIJD, Public Health Bullitin. Drugs and Substance Abuse Amongst Adolescents- A Pilot Study in 7 Districts ct. 2023 [cited 2024 Aug 13];2663–4651:7–31. https://rbc.gov.rw/publichealthbulletin/articles/read/98/Drugs and Substance Abuse Amongst Adolescents - A pilot Study in 7 Districts.
14. UNICEF. Adolescent mental health landscape assessment in Rwanda. Final Report. 2020 [cited 2024 Aug 13]. https://www.unicef.org/rwanda/reports/adolescent-mental-health-landscape-assessment-rwanda
15. Tiruneh SA, Gebremariam AD, Engidaw MT, Tesfa D, Dagnaw FT, Zewde EA et al. Overweight and/or obesity and its determinants among under-five children in East African countries: A multilevel analysis using Bayesian approach. Heliyon. 2021 Dec 1 [cited 2024 May 15];7(12). https://pubmed.ncbi.nlm.nih.gov/35005288/
16. Idriss-Wheeler D, Ormel I, Assefa M, Rab F, Angelakis C, Yaya S et al. Engaging Community Health Workers (CHWs) in Africa: Lessons from the Canadian Red Cross supported programs. PLOS Glob Public Heal. 2024 Jan 1 [cited 2024 Aug 20];4(1):e0002799. https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0002799
17. Oliphant NP, Manda S, Daniels K, Odendaal WA, Besada D, Kinney M et al. Integrated community case management of childhood illness in low- and middle-income countries. Cochrane Database Syst Rev. 2021 Feb 10 [cited 2024 Aug 20];2021(2). Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC8094443/.
18. Raniti M, Evans N, Dumuid D, Maher C, Yuen WS, Peacock A. How school systems can improve health and well-being. 2023 [cited 2024 May 15];1–8. https://www.who.int/publications/i/item/9789240064751
19. Qureshi HA, Ünlü Z. Beyond the Paradigm Conflicts: A Four-Step Coding Instrument for Grounded Theory. Int J Qual Methods. 2020 Jun 2 [cited 2024 Aug 20];19. https://journals.sagepub.com/doi/10.1177/1609406920928188
20. Assemblée mondiale de la Santé. Vol. 46, Revue Internationale de la Croix-Rouge. 1964 [cited 2024 May 15];319–20. https://www.who.int/fr/about/accountability/governance/world-health-assembly
21. SAÚDE OM DA. Situação Atual da Segurança e disponibilidade de sangue na região africana da OMS. Brazzaville. 2017 [cited 2024 May 28]. http://apps.who.int/bookorders
22. Sawyer SM, Raniti M, Aston R. Making every school a health-promoting school. Vol. 5, The Lancet Child and Adolescent Health. 2021 [cited 2024 Aug 13];539–40. https://www.who.int/publications/i/item/9789240025431
23. UNICEF, Education, UNICEF Rwanda. UNICEF Rwanda | For Every Child. 2022 [cited 2024 Aug 20]. https://www.unicef.org/rwanda/education
24. Lee A, Lo ASC, Keung MW, Kwong CMA, Wong KK. Effective health promoting school for better health of children and adolescents: Indicators for success. BMC Public Health. 2019 Aug 13 [cited 2024 May 28];19(1). https://pubmed.ncbi.nlm.nih.gov/31409312/
25. Nörmark SW, Mukabahire B, Danielsen B, Lempert susanne M. Evaluation of a school based oral health promoting programme in Rwanda. African J Oral Heal. 2021 Nov 24 [cited 2024 May 28];10(2):37–49. https://ajoh.oauife.edu.ng/index.php/ajoh/article/view/123
26. Rwagatare J. Better teachers, more schools, new curriculum: Rwanda's education looks bright. Www.Mineduc.Gov.Rw. 2020 [cited 2024 May 28]. Available from: https://mineduc.gov.rw/index.php?id=113&tx_news_pi1%5Bnews%5D=1193&tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&cHash=aa8abf69015aaf34027111222272ad0e, https://www.mineduc.gov.rw/news-detail/better-teachers-more-schools-new-curriculum-
27. Raniti M, Aston R, Bennett K, Izquierdo C, de Fridgant N, Cehun M. E, Global Standards and indicators for Health promoting schools. Glob Stand Heal Promot Sch. 2020;(March):1–59.

Publisher's note