THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 13 Issue 5

RESEARCH ARTICLE

Effectiveness of the Youth-Led COVID-19 Technologically Innovative Interventions in Zimbabwe

Denford M. Chuma [1], Amos Milanzi [2], Naomi N. Wekwete [2], Tatenda Songore [3], Nokuphiwa Moyo [3], Tafadzwa Mutiro [3], James Munamati [2], Juliet T. Milanzi [4], Lovemore Makurirofa [2]

[1] United Nations Children's Fund (UNICEF)
[2] Department of Demography Settlement and Development, Faculty of Social and Behavioural Sciences, University of Zimbabwe
[3] Youth Advocates Zimbabwe
[4] Department of Mathematics and Computational Sciences, Faculty of Science, University of Zimbabwe

OPEN ACCESS

PUBLISHED
31 May 2025

CITATION
Chuma, DM., Milanzi, A., et al., 2025. Effectiveness of the Youth-Led COVID-19 Technologically Innovative Interventions in Zimbabwe. Medical Research Archives, [online] 13(5). https://doi.org/10.18103/mra.v13i5.6428

DOI
https://doi.org/10.18103/mra.v13i5.6428

ISSN
2375-1924

ABSTRACT

Background: As part of the response strategy towards the third wave of the COVID-19 pandemic, Youth Advocates Zimbabwe (YAZ), with funding from UNICEF Zimbabwe, capacitated adolescents and young people to use innovative technology and community approaches for 6 months with particular interest in response recovery, vaccine awareness and resilience building. The study sought to assess the effectiveness of the Youth Helpline on knowledge, self-confidence, stigma and practices including vaccination for COVID-19 among adolescents and young people in Harare, Gweru, Bulawayo and Masvingo Provinces/Districts.

Methods: The study used a before-and-after survey design to assess the effectiveness of the Youth Advocates COVID-19 Programme on Adolescents and Young People in Harare, Gweru, Bulawayo and Masvingo Provinces/Districts. A survey, using a questionnaire, was undertaken with 342 and 419 school children aged 10-24 years at baseline and endline, respectively. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed. Additionally, first-order analyses, such as chi-square tests, were conducted, and a z-test was used to compare proportions between baseline and endline data (p-values) to assess statistical significance.

Results: The project effectively increased awareness of all prevention methods, with all participants frequently mentioning avoiding crowded places and sanitizing hands (100%). Nearly all participants were aware of symptoms of COVID-19, such as fever and headache (99%) and coughing (98%). Key times to wash hands nearly doubled to 98% for 'After coming from outside/touching things from outside', 'after touching common surfaces and objects' (96%), and 'before eating' (96%). Participants who were confident that they could care for a family member/friend with mild COVID-19 increased from 46.8% at baseline to 87.4% at endline. There was reduced stigma with participants who reported that a person who would have been infected with COVID-19 and fully recovered would be treated just like before, increasing from 28.6% at baseline to 83% at endline. The proportion of participants who would take the vaccine when offered increased from 62% at baseline to 90% at endline.

Conclusion: Overall, the project was effective in improving knowledge, self-confidence, practices on COVID-19, and reducing stigma among adolescents and young people. Continuous education and peer-led initiatives are critical for reinforcing COVID-19 preventive behaviours among adolescents and youth. High willingness to vaccinate among young people highlights the need for active facilitation and encouragement at local health facilities. Technologically innovative approaches have successfully improved health knowledge and practices in both rural and urban communities.

Introduction

The novel coronavirus (SARS-CoV-2) that causes COVID-19 was first detected in China in December 2019. The virus spread rapidly across countries, prompting the World Health Organization (WHO) to declare COVID-19 a global pandemic on March 11, 2020. Governments worldwide had to rapidly adapt and implement measures to curb the transmission of COVID-19. These included restrictions on human movement and social interactions, as well as efforts to provide medical care for those infected[1]. In Zimbabwe, authorities introduced various preventive and control measures, such as social distancing (including bans on large gatherings and advice against socializing outside households), border closures, school shutdowns, isolation of symptomatic individuals and their contacts, and large-scale lockdowns[2]. The COVID-19 outbreak has placed significant strain on health systems and has adversely affected sexual and reproductive health (SRH) in developing countries. Moreover, the pandemic threatens to derail progress toward the Sustainable Development Goals (SDGs), particularly those related to health, HIV prevention, and socioeconomic advancement[3].

COVID-19 has exposed existing fault lines of inequity in Zimbabwe and has exacerbated stigma. While the country focuses on emerging disease outbreaks and redirects its limited resources to contain the epidemic, other essential health needs are often neglected. The public health disruption caused by COVID-19 has been linked to an estimated 10% annual decline in access to sexual and reproductive health (SRH) services, particularly for girls and women[1]. The gendered impact of COVID-19 is evident in the rise of violence against women and girls[4], including increased cases of sexual and gender-based violence and unintended pregnancies[5]. Under strict lockdown measures, women and girls have faced limited access to social protection, further threatening their SRH rights[9]. Many health centres that typically provide essential care were not easily accessible. Additionally, a recent mathematical modelling study predicted that disruptions in the supply of antiretroviral therapy (ART) for individuals in need could result in over 500,000 additional deaths in sub-Saharan Africa between 2020 and 2021[6].

Since the first wave of the COVID-19 pandemic in mid-2020, Zimbabwe has experienced three waves to date. The second wave, driven by a more transmissible South African variant of COVID-19, began in November 2020 and peaked in January 2021. During this period, several schools and colleges reported COVID-19 cases among students. John Tallach, a boarding school in Matabeleland, recorded 184 cases among its learners, while Chinhoyi High reported 57 cases, and Matopo High School recorded 10 cases. Additional cases were reported at Prince Edward High School in Harare, Anderson High School in Gweru, and Girls College in Bulawayo. Bonda High School in Manicaland and Sacred Heart in Matabeleland South also confirmed positive cases among students."

In response, Youth Advocates, with support from UNICEF, visited affected schools and conducted a rapid assessment through the Youth Helpline to identify key drivers of COVID-19 transmission and explore opportunities for co-creating interventions with young people. According to the Ministry of Health and Child Care, as of November 23, 2020, there was a notable surge in COVID-19 cases among adolescents and young people, with a 30% increase in infections, a positivity rate exceeding 16.3%, and over 50% of cases occurring in individuals under the age of 24. In just two months, a total of 338 new cases were reported among students. The situation worsened in January 2021, with a significant rise in fatalities. January 5, 2021, was the deadliest day, recording 1,365 new cases and 34 deaths in a single day.

The third wave, driven by the fast-spreading B.1.617 Delta variant first detected in India, led to a rapid increase in new cases and a high number of deaths. As a result, localized lockdowns were implemented in initially identified hotspot districts, including Kwekwe, Kariba, Hurungwe, Makonde, Harare, Chiredzi, and specific suburbs in Bulawayo. Between May and June 2021, Bondolfi Teachers College reported more than 100 students testing positive for COVID-19. In response to the rising cases, a nationwide lockdown was announced in mid-June 2021, leading to the closure of universities and tertiary colleges. The reopening of schools, initially scheduled for the end of June 2021, was postponed to a later date. By the end of June 2021, Zimbabwe had recorded a total of 49,864 cumulative cases and 1,789 cumulative deaths, with a national case fatality rate of 3.7%."

During this time, Zimbabwe introduced COVID-19 vaccines. By the end of June 2021, a total of 777,161 people had received their first dose, while 555,277 had received their second dose. However, by June 30, 2021, the numbers had significantly increased, with 3,794,549 people receiving their first dose and 2,816,543 receiving their second dose. Initially, frontline workers, adults aged 60 and above, and individuals with underlying conditions such as diabetes and hypertension were prioritized for vaccination. As more vaccine doses became available, eligibility was expanded to include young people aged 18 and above. However, vaccine uptake among young people remained low due to widespread myths and misconceptions. Rapid assessments conducted in urban areas revealed that many young people in cities distrusted the COVID-19 vaccine. They questioned why they were not initially prioritized and expressed concerns fuelled by misinformation on social media, conspiracy theories, and fears related to fertility and interactions with contraceptive methods. Many adopted a 'wait-and-see' approach, wanting to observe the long-term effects of vaccination over the next two years before making a decision.

Similar initiatives have been conducted in African countries and other countries where young people have developed and pioneered different information-sharing initiatives and platforms to educate others on protection and mitigation measures against COVID-19 and to halt the dissemination of misinformation[7]. In Kivu, Eastern DRC, young leaders from civil society mobilised and enlisted young volunteers to visit public areas such as markets, town squares, and businesses and distribute informational

pamphlets on how to curb the spread of the virus[8]. In Burkina Faso, a training programme focused on building capacity in the fields of health, sanitation, and social measures against COVID-19 resulted in 1,500 young Burkinabes volunteering to work in various communities across the country[9]. In Nigeria, young people, in their volunteer-driven Slum and Rural Health Initiative, created and distributed 'Stop COVID-19' infographics translated into more than sixty local African languages, which was crucial in spreading accurate information about the pandemic and combating misinformation, ensuring that messages were delivered in languages understood by local communities at the grassroots level[10].

In Kenya, after receiving messages about COVID-19, the majority of youth adopted positive behaviours to avoid infection, avoiding unnecessary travel, washing their hands more frequently, and using masks[11]. Another study in Kenya confirms that households were already engaging in risk-reduction behaviours, including increased handwashing with soap when available, using hand sanitizer, and staying home more frequently[12]. However, a similar study in Northwest Ethiopia reported low adherence to COVID-19 preventive measures among high school students[13]. Another study that evaluated the youth-led vaccination campaign in KwaZulu-Natal, South Africa reported that the intervention led to significant increases in vaccine intent and uptake compared to a control community[14]. The study underscores the effectiveness of community-based, youth-led initiatives in enhancing vaccine uptake and combating misinformation.

A study on medical students from Iran indicated that these students had an average of 96% correct answers, with 79.60%, 13.8%, and 6.7% demonstrating high, moderate, and low levels of knowledge, respectively[15]. In Jordan, medical and non-medical students achieved an average score of 0.81 ± 0.15 (SD), with 90% of participants having good knowledge of COVID-19 symptoms and more than 80% aware of the lack of vaccines and treatments for COVID-19. The cited sources of knowledge about COVID-19 included social media (34%), the WHO (19.9%), television (17.6%), the Internet (13%), the Ministry of Health (10.1%), and colleagues (5.4%)[16]. A study conducted in Kenya showed high levels of knowledge about COVID-19 symptoms and prevention practices among the youth, reporting that 90% of young people can correctly identify at least three symptoms of COVID-19[17].

Research with students from Jordan indicated that these students possessed a high level of positive attitudes, with an average score of 0.82 ± 0.07 (SD)[16][18]. The study revealed that nearly all participants (99.7%) agreed on the importance of regular handwashing for personal hygiene, 68.4% believed that using masks can prevent viral infections, 81.8% and 79.4% recognized that smoking and antibiotics cannot prevent infection, while 94.6% stated they would disclose if infected, and 93.6% indicated they would visit hospitals if infected[16]. The students displayed favourable practices toward COVID-19 prevention, such as handwashing, refraining from shaking hands, and following proper etiquette for coughing and sneezing[16].

During the COVID-19 lockdown, a sharp rise in teen pregnancies and child marriages was reported in Parliament by the Minister of Women Affairs, Community, Small and Medium Enterprises. She highlighted that between January and February 2021, at least 4,959 girls had fallen pregnant, while 1,174 cases of child marriage were recorded. Additionally, the Helpline received at least 208 calls seeking emergency contraception and abortion services during the same period, indicating unprotected sexual activity and limited access to contraceptives, including emergency contraception.

This trend aligns with insights from a rapid assessment Focus Group Discussion (FGD), where one girl remarked, "The country was on lockdown, but our feelings as young people were not on lockdown." The FGDs with young people living with HIV further revealed that access to HIV testing and an uninterrupted supply of lifesaving antiretroviral medication had been disrupted. As the country redirected healthcare resources to combat COVID-19 and implemented social distancing measures, delays in the supply chain of essential drugs and materials became evident. These disruptions pose serious risks, as uninterrupted HIV services are crucial for preventing disease progression, vertical HIV transmission, and severe health outcomes. A recent analysis by Avenir Health warned that if service disruptions affected 100% of the population over six months between April and September 2020, new HIV infections among young children and adolescents could double.

There is overwhelming evidence highlighting the need to reach adolescents and young people with accurate and reinforcing information on COVID-19, sexual and reproductive health (SRH), gender-based violence (GBV), and HIV. This includes providing counselling and referrals to relevant services. As COVID-19 cases continue to rise among Adolescents and Young People (AYP), Youth Advocates aims to engage both in-school and out-of-school youth in Harare, Gweru, Bulawayo, and Masvingo with updated, accurate, and consistent information. The initiative will address stigma, precautionary measures, adherence to health guidelines, debunking vaccine myths and misconceptions, and the risks associated with unprotected sex.

To effectively engage AYP, innovative motivational strategies such as quizzes, competitions, and rewards (including face masks) were utilised. A blended approach combining digital platforms (Call Centre and Youth Advocates Leadership Programme (YALEP) with community engagement will be implemented to strengthen the integrated management of HIV, SRH, GBV, and COVID-19. This project aligns with Zimbabwe's National Development Strategy 1 by promoting positive health outcomes for children and young people. It also plays a role in the national COVID-19 response strategy, particularly within the Risk Communication and Community Engagement (RCCE) Strategy and the Vaccine Demand Generation Strategy. Additionally, it supports the broader health agenda, including the Zimbabwe National AIDS Strategic Plan (ZNASP) and the Adolescent Sexual and Reproductive Health (ASRH) Strategy within the National Health Strategy 2021–2025.

As part of the response strategy to the third wave of the COVID-19 pandemic, Youth Advocates empowered children and adolescents to utilize innovative technology and community-based approaches over six months, focusing on response recovery, vaccine awareness, and resilience building. The project equipped young people with the knowledge, confidence, and resources to actively engage in their communities, make informed health decisions, and combat misinformation, particularly among at-risk groups, including students with disabilities, young people living with HIV, and those in rural areas. By engaging adolescents and young people as peer influencers, the initiative aimed to drive behaviour change and curb the spread of COVID-19. With the introduction of the COVID-19 vaccine, Youth Advocates launched a new WhatsApp training module on vaccines, empowering young people to use digital media to spark conversations, build awareness, and address concerns about vaccination. This approach encouraged youth to mobilize and educate their peers, parents, and community elders, fostering greater vaccine acceptance through the power of digital engagement.

Youth Advocates implemented this innovative program to connect participants of the Youth Advocates Leadership Programme (YALEP) as volunteers, enabling them to spread positivity amid the pandemic and prepare young people for potential vaccination. Through traditional media and community outreach, the initiative highlighted key issues that matter to young people, encouraged solution-driven discussions, and nurtured critical thinking, creativity, and a passion for making a difference. Over six months, the project supported adolescents and young people, both in and out of school, to collaborate with the Government, communities and health workers in leading, planning, preventing, and responding to the pandemic. It focused on building adolescents' and young people's capacity to combat misinformation by countering fake news and disseminating accurate information to save lives. Additionally, the initiative strengthened a network to gather insights on how communities were responding to and coping with both COVID-19 and HIV. Young people were also empowered to participate in meetings, advocating for inclusive policies and programs that address their emerging needs. Given these efforts, an endline study was essential to evaluate the effectiveness of the interventions, specifically assessing knowledge and awareness, and practices related to COVID-19.

This study conducted an endline evaluation of COVID-19 among youth aged 10 to 24 years to assess the impact of the Youth Advocates program in project areas across Harare, Gweru, Bulawayo, and Masvingo. The study's main objective was to evaluate the knowledge and practices related to COVID-19 among adolescents and young people, including vaccination uptake.

Methodology

A before-and-after survey design was employed to assess the effectiveness of the Youth Advocates COVID-19 Programme on Adolescents and Young People in Harare, Gweru, Bulawayo and Masvingo Districts. This approach aimed to measure changes in COVID-19-related outcomes or behaviours. A survey, using a questionnaire, was undertaken with 342 and 419 school children aged 10-24 years at baseline (in 2021) and endline (in 2022), respectively. The participants were from 40 project schools in Bulawayo, Gweru, Masvingo, and Harare. The survey quantified the magnitude of the knowledge and practices related to COVID-19 among adolescents and young people, including vaccination uptake in Zimbabwe. In addition, the survey was used to collect the quantitative data on knowledge and practices. The questionnaire was adapted from existing literature on similar studies conducted at global, regional and national levels. In addition, the questionnaire was developed from tools used in other reproductive health studies, including but not limited to the Demographic and Health Surveys and the Multiple Indicator Cluster Surveys. To assess respondents' knowledge, attitudes, and practices related to COVID-19, the questionnaire comprised 30 questions: 5 on knowledge, 9 on practices, 7 on risk perceptions, 2 on stigma, 7 on vaccines, and 3 on access to information. The survey questions were adapted and modified from previously published literature on knowledge, attitudes, and practices regarding COVID-19.

Data analysis was performed using SPSS version 25.0. Quantitative survey data was collected through electronic devices running CSEntry 7.6.0. During fieldwork, data was electronically transmitted to team leaders at the end of each day for review. Team leaders provided summary feedback on any emerging issues, ensuring data quality before it was securely stored in an SPSS database. Data cleaning was performed using frequency analysis to identify and correct inconsistencies. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed. Additionally, first-order analyses, such as chi-square tests, were conducted, and a z-test was used to compare proportions between baseline and endline data (p-values) to assess statistical significance.

The study adhered to Institutional Research Ethics and the Declaration of Helsinki. Verbal consent and parental or guardian consent were sought before the interviews. The consent information documented the study's aims, nature, and procedure. Anonymity and confidentiality were strictly maintained.

Results

SOCIO-DEMOGRAPHIC CHARACTERISTICS

Table 1 presents the background characteristics of the respondents. Most of the adolescents in the assessment were females at both the baseline and endline (57.1% and 62.2%, respectively). Over 98% (98.5%) of the adolescents were never married at baseline, and 98.8% at endline. The proportion of adolescents who had some secondary education was 52% at baseline and 67.5% at the endline. The average age for the adolescents was 15 years at baseline and 14 at endline.

Table 1: Socio-demographic Characteristics

Background Variable	Adolescents	
	Baseline	Endline
Sex		
Male	42.9	37.8
Female	57.1	62.2
Marital status		
Married	1.2	0.2
Widowed	0.0	0.0
Separated	0.0	0.0
Divorced	0.0	0.0
Never Married	98.5	99.8
Highest level of education		
No Education	0.3	.2
Some Primary	2.2	26.3
Completed Primary	7.4	2.2
Some Secondary	52.2	67.5
Completed Secondary	17.3	3.8
Tertiary		0.0
Other specify	0.6	0.0
Overall	**324**	**419**
Mean age	15	14

KNOWLEDGE ABOUT COVID-19

Table 2 presents the proportion of respondents who had heard about COVID-19 by background variables. Overall, the proportion of participants who have heard about COVID-19 increased significantly from 95.6% at baseline to 98.7% at endline (p=0.0032). Those aged 15-19 years gained knowledge about COVID-19 the most compared to other age groups, increasing from 95.4% to 99.3% (p=0.0001). The proportion of males who knew about COVID-19 increased from 94.1% at baseline to 98.5% at endline, compared to females who increased from 97.2% to 98.8%. The proportion of those who had heard about COVID-19 increased from 95.8% to 98.6% among the unmarried (p=0.0056), increased amongst all the religions, from 94.6% to 98.8% among those with primary (p=0.001), and in both urban and rural areas, and in Harare and Gweru (p=0.005 and p<0.0001, respectively). However, the proportion who have heard about COVID-19 declined among those with higher education from 100% to 97.8% (p=0.0005).

Table 2: Ever Heard about the New Coronavirus Disease (COVID-19)

Background characteristics	Ever heard about the new coronavirus disease (COVID-19)		
	Baseline	Endline	P Value
Sex			
Male	94.1	98.5	**0.0002**
Female	97.2	98.8	0.0638
Age			
10–14	96.4	97.6	0.2528
15–19	95.4	99.3	**0.0001**
20–24	100.0	98.1	**0.0014**
Marital status			
Never married	95.8	98.6	**0.0056**
Married	100.0	100	
Religion			
Pentecostal	94.1	98.5	**0.0001**
Protestant	100.0	97.1	**0.0001**
Catholic	96.9	100	**< 0.0001**
Apostolic sect	95.7	100	**<0.0001**
Muslim	100.0	100	
Other	98.3	100	**0.0024**
Education			
Primary	97.4	98.6	**0.1581**
Secondary	94.6	98.8	**0.0001**
Higher	100.0	97.8	**0.0005**
Residence			
Urban	94.9	98.5	**0.0009**
Rural	96.0	100	**<0.0001**

Background characteristics	Ever heard about the new coronavirus disease (COVID-19)		
	Baseline	Endline	P Value
Province/District			
Bulawayo	97.1	96.6	0.6349
Harare	96.2	99.3	**0.0005**
Gweru	92.6	99.2	**<0.0001**
Masvingo	97.9	99.2	**0.0708**
Overall	**95.8**	**98.7**	**0.0032**

The proportion of participants who correctly identified COVID-19 as a virus that causes disease increased from 90.7% at baseline to 98.6% at endline. The percentage of respondents who mistakenly perceived it as a government programme declined from 1.2% to 0.6%. The proportion of those who reported not knowing COVID-19 dropped from 4.3% to 0.8%. Bulawayo had the highest proportion of respondents with no knowledge at both baseline (10.3%) and endline (2.7%). See Table 3.

Table 3: Knowledge about the new coronavirus disease

Background Characteristics	What do you know about the new coronavirus disease?									
	Baseline					Endline				
	Don't know anything	It's a virus that can cause a disease	It's a government programme	It's a TV/radio campaign	Other	Don't know anything	It's a virus that can cause a disease	It's a government programme	It's a TV/radio campaign	Other
Residence										
Urban	3.7	91.2	1.4	1.9	1.9	0.8	98.5	0.6	0.0	0.0
Rural	8.1	87.8	0.0	1.4	2.7	0.0	100	0.0	0.0	0.0
Province/District										
Bulawayo	10.3	82.4	2.9	2.9	1.5	2.7	96.4	0.9	0.0	0.0
Harare	0.7	96.7	0	1.4	0.7	0.0	99.3	0.7	0.0	0.0
Gweru	4.8	90.5	1.6	1.6	1.6	0.0	100	0.0	0.0	0.0
Masvingo	1.1	93.5	0.0	0.0	5.4	0.8	98.4	0.8	0.0	0.0
Overall	**4.3**	**90.7**	**1.2**	**1.8**	**2.0**	**0.8**	**98.6**	**0.6**	**0.0**	**0.0**

In 2022, the majority of participants (99%) identified fever and headache as symptoms of COVID-19, whereas in 2021, coughing was the most commonly reported symptom. The proportion of respondents who mentioned coughing as a symptom increased from 83.7% in 2021 to 97.7% in 2022. The least mentioned symptom in 2021 was loss of smell (21%), which significantly rose to 98.3% in 2022. In rural areas, all participants identified all symptoms except for fever and loss of smell, both of which were reported by 97.7% of respondents. See Table 4.

Table 4: Knowledge about signs and symptoms of COVID-19

Background Characteristics	What do you think are the signs and symptoms of COVID-19?								
	Cough	Fever	Running nose/ sneezing	Difficult breathing	Sore throat	Loss of smell	Aches and pains	Headache	Feeling weak and tired
Residence									
Urban	97.5	99.2	96.8	98.1	98.7	98.3	98.1	98.9	94.5
Rural	100	97.7	100	100	100	97.7	100	100	100
Province/District									
Bulawayo	96.6	96.6	98.2	100	99.1	100	100	100	100
Harare	99.3	99.3	100	98.0	98.6	100	100	100	91.2
Gweru	90.1	96.9	90	96.2	100	99.2	98.4	98.4	99.2
Masvingo	99.2	98.4	100	99.2	97.7	93.8	94.6	97.7	90.8
Overall	**97.7**	**99.0**	**97.1**	**98.3**	98.8	98.3	98.3	99.0	95.0

At baseline in 2021, wearing a mask was the most frequently mentioned COVID-19 prevention method, cited by 88.9% of respondents. By endline in 2022, awareness of all prevention methods had increased, with avoiding crowded places and frequent hand sanitization being mentioned by all participants. These two methods were also the most commonly cited in both rural and urban areas. Additionally, wearing a mask remained the most mentioned prevention method across all provinces, with Harare having the highest proportion (94.7%) while Masvingo had the least proportion (75.9%). See Table 5.

Table 5: Knowledge about the methods of preventing the spread of COVID-19

	What do you think are the methods of preventing the spread of COVID-19?											
	Baseline						**Endline**					
	Wear a mask (whether sick or not)	Avoid crowded places /physical distance	Wash with soap and clean water/ sanitize hands frequently	Disinfect surfaces regularly	Cover nose and mouth when coughing	Other	Wear a mask (whether sick or not)	Avoid crowded places/ physical distance	Wash with soap and clean water/ sanitize hands frequently	Disinfect surfaces regularly	Cover nose and mouth when coughing	Other
Residence												
Urban	92.1	87.6	88.3	52.4	59.6	1.5	100	100	100	96.4	96.0	0.8
Rural	85.7	60.3	73.0	30.2	36.5	6.3	97.7	100	100	88.6	90.9	0
Province/District												
Bulawayo	92.6	87.4	90.4	45.2	46.7	3.0	100	100	100	100	99.1	0
Harare	94.7	93.4	93.4	64.5	74.3	0.0	100	100	100	98.6	95.9	0
Gweru	92.0	78.4	84.0	53.6	66.4	1.6	100	100	100	86.2	94.6	0.8
Masvingo	75.9	61.1	61.1	7.4	7.4	7.4	99.2	100	100	98.6	92.9	0.8
Overall	**88.9**	**74.0**	**80.7**	**41.3**	**48.1**	**3.9**	**99.8**	**100**	**100**	**95.7**	**95.6**	**0.4**

Respondents were asked about the key times to wash their hands. The most frequently mentioned time was 'after coming from outside/touching things from outside,' cited by 97.5% of respondents, an increase from 53.2% at baseline. This was followed by 'after touching common surfaces and objects' (96.3%) and 'before eating' (96.1%), both of which increased from 51.3% and 56.8%, respectively, at baseline. The proportion of participants who reported washing hands after using the toilet rose from 58.8% at baseline to 95.9% at endline. In rural areas, this figure increased from 60.3% to 84.1%, while in urban areas, those who mentioned washing hands after coming from outside/touching things from outside rose from 71.5% to 98.3%. The least mentioned key time was 'washing hands every 5–30 minutes every hour,' with only 42.5% of respondents in Bulawayo reporting this practice. See Table 6.

Table 1: Key times to wash hands as a COVID 19 preventive measure

Background Characteristics	**What do you think are the key times to wash your hands?**							
	After coming from outside/ touching things from outside	**Before eating**	**After touching common surfaces and objects**	**Every 5-30 mins / every hour**	**After using the toilet**	**After eating**	**When I touch my mask**	**Other**
Residence								
Urban	98.3	97.3	97.3	53.3	97.0	91.5	90.3	100
Rural	88.6	84.1	86.4	63.6	84.1	84.1	81.8	100
Province/District								
Bulawayo	97.3	96.5	98.2	42.5	98.2	96.5	92.9	100
Harare	98.6	97.3	96.6	74.1	95.2	94.6	87.1	100
Gweru	96.9	95.4	96.2	43.8	95.4	79.2	85.4	100
Masvingo	96.9	95.3	94.5	52.0	95.3	93.7	93.7	100
Overall	**97.5**	**96.1**	**96.3**	**54.2**	**95.9**	**90.9**	**89.6**	**100**

Participants reported an overall increase in access to various types of COVID-19 information. The most frequently mentioned type was "How to protect yourself from the disease" (99.2%), rising from 84.6% at baseline. The largest increase was seen in information on "Risks and complications of COVID-19", which rose from 39.0% at baseline to 85.5% at endline. This highlights the success of awareness efforts in improving public knowledge about COVID-19 prevention and its potential health impacts. Radio was the most mentioned source of COVID-19 information at baseline, whereas at endline, Youth Advocates became the primary source, cited by nearly all participants (97.5%). Other widely mentioned sources at endline included radio (92.2%) and TV (95.2%), indicating the continued importance of electronic media in disseminating COVID-19 information. The radio remained the most trusted source of COVID-19 information, with trust levels increasing from 45.2% at baseline to 82.4% at endline. In contrast, WhatsApp saw a slight decline in trust, dropping from 2.1% to 1.7%. This suggests a growing reliance on traditional media for accurate COVID-19 information.

COVID-19 PREVENTIVE PRACTICES

The majority of participants (58.6%) reported that at least half of the people around them were willing to maintain physical distance, increasing from 18.2% at baseline. The proportion of participants who reported that less than half were willing to keep a distance increased from 34.1% at baseline to 37.8% at endline.

In the urban areas, it increased from 33.3% to 37.3% compared to the rural areas, which increased notably from 33.3% at baseline to 43.2% at endline. See Table 7.

Table 2: Willingness to keep social distance from others

Background Characteristics	In the past 7 days, when you were outside your house, were people around you willing to keep a distance from you and others?									
	Baseline					Endline				
	Less than half the people	Half the people	More than half the people	All the people	None	Less than half the people	Half the people	More than half the people	All the people	None
Residence										
Urban	34.2	18.7	17.6	13.8	15.8	37.3	59.4	2.7	0.4	0.2
Rural	33.3	15.4	7.7	24.4	19.2	43.2	50.0	6.8	0	0
Province/District										
Bulawayo	32.1	16.4	26.4	13.6	11.4	24.8	70.1	5.1	0	0
Harare	35.4	19.0	11.4	18.4	15.8	33.8	62.8	2.0	0.7	0.7
Gweru	28.7	15.4	15.4	22.1	18.4	55.0	41.2	3.1	0.8	0
Masvingo	42.6	23.4	9.6	3.2	21.3	36.7	60.9	2.3	0	0
Overall	**34.1**	**18.2**	**16.1**	**15.3**	**16.3**	**37.8**	**58.6**	**3.1**	**0.4**	**0.2**

The proportion of participants who cited that "they don't think it is important to maintain social distance and were tired of it" as the main reason why people do not maintain physical distance when outside was 33.4%, an increase from 27.8%. In the urban areas, those who mentioned that they 'did not think that it is important to maintain physical distance and are tired as the main reason why people do not maintain physical distance when they are outside was 33.8%, decreasing from 34.2% at baseline, whereas in the rural areas the proportion was 29.5%, increasing from 27.8% at baseline. Masvingo had the highest proportion of respondents (41.5%) who think that people do not maintain physical distance because they don't think it is important and they were tired of it in 2021, increased to 43.8% in 2022. See Table 8.

Table 3: Main reason why people do not maintain physical distance when outside (Endline)

Background Characteristics	What is the number one reason why people do not maintain physical distance when you were outside?					
	Don't think it is important and are tired of it	Not paying attention / aware of distance from others	They are with people they know well (friends /family)	Not enough space	Don't know that it is important to maintain physical distance	Other
Residence						
Urban	33.8	25.8	21.0	0.4	19.0	0.0
Rural	29.5	20.5	34.1	4.5	11.4	0.0
Province/District						
Bulawayo	25.6	34.2	25.6	1.7	12.8	0.0
Harare	38.5	29.1	12.8	0.0	19.6	0.0
Gweru	0.0	0.0	0.0	0.0	0.0	0.0
Masvingo	43.8	26.6	17.2	1.6	10.9	0.0
Overall	**33.4**	**25.4**	**22.1**	**0.8**	**18.3**	**0**

Table 9 presents the proportion of respondents who reported wearing masks by people around them. The participants who reported that half the people were willing to wear masks increased from 19.1% in 2021 to 66.2% in 2022. In the urban areas, the participants who reported that less than half the people around them were willing to wear a mask decreased from 29.6% in 2021 to 28.1% in 2022. In the rural areas, the proportion increased from 28.2% in 2021 to 29.5% in 2022. Masvingo had the highest proportion in 2021 (41.5%), which reported that less than half the people were willing to wear masks, it then decreased to 28.9% in 2022.

Table 9: Wearing face masks 7 days preceding the survey as a COVID 19 preventive measure

Background Characteristics	In the past 7 days, when you were outside your house, were people around you wearing masks?									
	Baseline					Endline				
	Less than half the people	Half the people	More than half the people	All the people	None	Less than half the people	Half the people	More than half the people	All the people	None
Residence										
Urban	29.6	19.8	26.9	17.8	6.0	28.1	66.3	5.0	0.6	0.0

Background Characteristics	In the past 7 days, when you were outside your house, were people around you wearing masks?									
	Baseline					Endline				
	Less than half the people	Half the people	More than half the people	All the people	None	Less than half the people	Half the people	More than half the people	All the people	None
Rural	28.2	15.4	23.1	17.9	15.4	29.5	65.9	2.3	2.3	0.0
Province/District										
Bulawayo	27.9	22.9	30.0	13.6	5.7	16.2	73.5	8.5	1.7	0.0
Harare	28.5	21.5	25.9	20.3	3.8	26.4	68.2	4.1	0.0	0.0
Gweru	23.5	11.0	30.1	26.5	8.8	40.5	55.0	4.6	0.0	0.0
Masvingo	41.5	21.3	16.0	7.4	13.8	28.9	68.8	2.3	0.0	0.0
Overall	**29.4**	**19.1**	**26.3**	**17.8**	**7.4**	**28.2**	**66.2**	**4.8**	**0.8**	**28.2**

Participants who mentioned that people who wear masks sometimes remove or pull them down increased from 84.7% at baseline to 98.1% at endline. In the rural areas, the proportion increased from 84.6% at baseline to 90.9% at endline, compared to the urban areas, which increased more from 84.7% at baseline to 98.8% at endline. Respondents in all provinces who reported people sometimes removing or pulling down masks increased, although participants in Gweru increased the most, from 72.8% at endline to 98.5% at endline.

Table 10: Face mask wearing practices among respondents

Background Characteristics	When you observe the people who wear masks, do you notice that they keep them on at all times/ remove them down sometimes?			
	Baseline		Endline	
	Remove or pull them down	Always keep them on	Remove or pull them down	Always keep them on
Residence				
Urban	84.7	15.3	98.8	1.3
Rural	84.6	15.4	90.9	9.1
Province/District				
Bulawayo	87.1	12.9	99.1	0.9
Harare	86.7	13.3	98.0	2.0
Gweru	72.8	27.2	98.5	1.5
Masvingo	94.7	5.3	96.9	3.1
Overall	**84.7**	**15.3**	**98.1**	**1.9**

The proportion of participants who reported that people pull down their masks increased from 48.9% at baseline to 85.5% at endline. In urban areas, most respondents indicated that people remove their masks when they become uncomfortable, whereas in rural areas, the primary reason cited was when it becomes hot. Access to soap or hand sanitizer increased significantly from 94.7% at baseline to 99.0% at endline ($p<0.0001$). In the rural areas, access to hand sanitizer or soap increased significantly from 94.9% to 100% ($p<0.0001$) compared to the urban areas, which increased from 94.7% to 99.0% ($p=0.0001$). Overall, the proportion of participants who reported that the female head was responsible for ensuring the availability of handwashing supplies increased from 44.7% at baseline to 65.3% at endline. In both urban and rural areas, this figure rose from 45% and 41%, respectively, to 65.2% and 65.9%. The major reasons that would make people in their community practise COVID-19 prevention behaviours were "to avoid getting sick" (84.9%), "the need to continue with their normal life such as, work and school" (81.9%) and fear of death (79.4%). The proportion of participants who cited fear of death as a motivation for practicing COVID-19 prevention behaviours increased from 57.9% to 79.4%, while those who aimed to avoid getting sick rose from 49.7% at baseline to 84.9% at endline. However, the most significant increase was seen in those motivated by the need to continue their normal activities, such as work and school, which jumped from 33.4% to 81.9%.

At baseline, the most cited reason people do not practise the "new normal" behaviours was 'lack of knowledge about COVID-19 infection' (60%), which increased to 86.9% at endline. Lack of knowledge was also the most frequently mentioned among both males and females, increasing from 56.2% and 63.7% to 84.3% and 88.1%, respectively. Bulawayo recorded the highest proportion of respondents who cited lack of knowledge as the reason people do not practise "new normal" behaviours, such as handwashing, mask-wearing, and physical distancing, at both baseline and endline.

COVID-19 VACCINES

The main reason participants had not been vaccinated was that the vaccine was inconvenient to get (80%), an increase from 24.1% at baseline. Twenty percent mentioned that the vaccine was against their religious beliefs, increasing from 6.3% at baseline. At baseline, the primary reason cited by respondents who were unwilling or unsure about getting vaccinated was concerns about the vaccine's safety (52.6%). By endline, this proportion had dropped to zero percent. The proportion of participants who would take the vaccine when offered

increased from 62% at baseline to 90% at endline. Most respondents at baseline reported that the benefits of the vaccine were the most important information for someone to decide whether or not to get a COVID-19 vaccine (34.8%), which increased to 47.2% at endline. The least cited reason was endorsement from the Ministry of Health and Child Care (MOHCC) (2.2%).

Discussion

KNOWLEDGE AND AWARENESS

Overall, knowledge about COVID-19 increased between the baseline and endline of the project. The proportion of participants who had heard about COVID-19 increased from 95.6% at baseline to 98.7% at endline, likely due to ongoing awareness campaigns by YAZ and the government. A notable increase was observed among those aged 15–19, while a decline occurred among youth aged 20–24. Additionally, knowledge about COVID-19 increased more among males than females, bringing awareness levels between the two groups to be on the same level. The proportion of participants who correctly identified COVID-19 as a virus that causes disease also increased from 90.7% at baseline to 98.6% at endline, likely reflecting improved awareness efforts. Awareness of COVID-19 symptoms also improved over the period. While coughing was the most commonly cited symptom at baseline, fever and headache became the most frequently mentioned symptoms at endline. By endline, all respondents recognized all COVID-19 symptoms except for fever and loss of smell, unlike at baseline.

There was an overall increase in awareness of COVID-19 prevention methods at endline compared to baseline. By endline, all respondents, regardless of location or province, identified "avoiding crowded places/physical distancing" and "washing hands with soap and clean water or sanitizing frequently" as key prevention methods. Wearing a mask was also universally mentioned, except in rural areas and Masvingo province. Similar findings were reported in Jordan, where students mentioned use of masks to prevent viral infections[5]. These findings indicate that participants had a strong awareness of essential COVID-19 preventive measures. The most frequently mentioned key time for handwashing was "after coming from outside or touching things from outside", increasing significantly from 53.2% at baseline to 97.5% at endline. Similarly, the proportion of participants who identified "after using the toilet" as a key time to wash hands rose from 58.8% to 95.9%. These increases represent a significant achievement in COVID-19 prevention efforts. However, the least mentioned key time was "after every 5–30 minutes or every hour," which is unsurprising given the country's water shortages, making such frequent handwashing impractical. The levels of COVID-19 knowledge in this study were higher compared to other similar studies. However, a similar study in Ethiopia reported an overall knowledge level of 40.1%, showing low knowledge levels[19]. This should be noted that the participants were not beneficiaries of the youth-led initiative. However, other studies demonstrated good knowledge of COVID-19 but also noted some misinformation due to multiple social media sources of COVID-19 information[20]. It is imperative to note that, the Government finally had a COVID-19 command centre to update the nation about COVID-19 information, including the statistics and prevention measures.

Overall, there was an increase in the variety of COVID-19 information mentioned at endline, with "how to protect yourself from the disease" being the most frequently cited. The greatest increase was observed in information regarding the "risks and complications of COVID-19". At endline, the most frequently mentioned source of COVID-19 information was the Youth Advocate, marking a shift from radio, which was the primary source at baseline. Other widely cited sources included TV and radio, with radio being reported as the most trusted. The Youth Advocates' emergence as the leading source of information reflects the impact of their interventions in the four provinces. The study showed improved access to COVID-19 information, the online education program by Youth Advocates Zimbabwe was cited as the most common source among multiple sources, such as television (TV) and radio. In other COVID-19 studies, multiple sources of COVID-19 information were reported[21]. Relying on social media alone, at times can lead to distorted information, hence the need for a dedicated program to correct the misinformation.[3]

PRACTICES

COVID-19 preventive behaviours increased over the period. The proportion of participants who reported that at least half of the people around them maintained physical distance rose from 18.2% at baseline to 58.6% at endline. This is similar to the study in Kenya where the majority of youth adopted positive behaviours to avoid infection, after receiving messages about COVID-19. Similar findings were also reported in Jordan with students displaying favourable practices toward COVID-19 prevention, such as handwashing, refraining from shaking hands, and following proper etiquette for coughing and sneezing[5]. However, a similar study in Northwest Ethiopia reported low adherence to COVID-19 preventive measures among high school students[22]. The current study reported that the main reason cited for not maintaining distance, “they don’t think it is important and are tired of it", also increased from baseline. Similarly, the proportion of participants who observed that at least half the people around them were willing to wear masks increased significantly from 19.1% at baseline to 66.2% at endline. In Kenya, higher percentages reported using masks (97.7%). This could be a result of self-reporting on the use of masks. However, proper mask-wearing remained a challenge, as the proportion of participants who reported that people sometimes removed or pulled down their masks increased from 84.7% to 98.1%. At endline, the most common reason for pulling down masks was discomfort, whereas at baseline, the primary reason was eating or drinking. This shift suggests that as COVID-19 cases declined, people became less strict about preventive measures, which remains a concern due to the risk of infection. Access to soap or hand sanitizer in households increased significantly from 94.7% at baseline to nearly universal coverage (99.0%) at endline, with rural areas reaching full access (100%). This concurs with a study in Kenya which reported that households were already engaging in risk-reduction behaviours, including increased handwashing with soap when available, and use of hand

sanitizer. Additionally, the responsibility for ensuring the availability of handwashing supplies was primarily attributed to the female head of household, increasing from 44.7% at baseline to 65.3% at endline.

The major reasons cited for practising COVID-19 prevention behaviours were "to avoid getting sick", "the need to continue with their normal life", and "fear of death", all of which recorded increases. The most significant rise was in the motivation to resume normal activities. The occurrence of COVID-19-related deaths in the country may have heightened awareness and influenced behaviour. However, a finding of concern is that the most frequently mentioned reason for not adhering to preventive measures was a "lack of knowledge about COVID-19 infection", which increased from 60% at baseline to 86.9% at endline. This highlights the need for continued public health education and awareness campaigns. A similar study in Northwest Ethiopia reported low adherence to COVID-19 preventive measures among high school students[23]. This underscores the need for ongoing engagement with adolescents through innovative programs to enhance their knowledge and adherence to available prevention options.

COVID-19 VACCINES

The primary reason cited by participants for not being vaccinated was that the vaccine was "inconvenient to get", followed by the belief that vaccination was "against their religious beliefs." The proportion of respondents citing these reasons increased, eliminating all other reasons mentioned at baseline. To address this, it is crucial to improve vaccine accessibility for adolescents and youth while also engaging with religious communities, particularly those with beliefs opposing vaccination, to promote informed decision-making. The proportion of participants who had not been vaccinated but were willing to take the vaccine when offered increased significantly from 62% at baseline to 90% at endline. This indicates a strong willingness among youth to get vaccinated. With vaccinations now being extended to adolescents and children, ensuring accessibility is crucial. The study reported significant improvement in the acceptability of COVID-19 vaccines among adolescents. This was due to the correct information about the vaccines disseminated during program implementation to counter the myths and misconceptions surrounding the then newly introduced vaccines. Zimbabwe, like many African countries, reported higher COVID-19 vaccine hesitancy[24] due to myths and misconceptions about both COVID-19 itself and the vaccines. Authorities should capitalize on this opportunity by making vaccines more readily available to adolescents and youth. Similarly, an evaluation of the youth-led vaccination campaign in KwaZulu-Natal, South Africa, reported significant increases in vaccine intent and uptake and recommended scaling up such youth-led initiatives in enhancing vaccine uptake and combating misinformation. Additionally, since most respondents indicated that information about the benefits of the vaccine was the most important factor in their decision-making, it is essential to emphasize these benefits in COVID-19 awareness campaigns and informational materials.

Conclusion

Knowledge about COVID-19 has increased between the baseline and endline of the project. All respondents were aware of key prevention methods, including avoiding crowded places/physical distancing and washing hands with soap and clean water or sanitizing frequently. Awareness of mask-wearing also improved, though to a lesser extent. This rise in awareness has likely contributed to the reduction in COVID-19 cases, as reflected in daily reports. The increase in knowledge is largely attributed to the Youth Advocates' rollout of their program, which emerged as the most frequently cited source of COVID-19 information, while TV and radio also remained important sources, with radio being the most trusted. To maximize impact, interventions should continue leveraging these platforms to enhance COVID-19 awareness and prevention efforts. The practice of COVID-19 preventive behaviours increased during the review period, particularly in maintaining physical distancing, avoiding crowded places, wearing masks, and washing hands with soap and water or using sanitizers. The primary motivations for adhering to these measures were fear of death and fear of illness. However, some community members were not consistently following preventive behaviours due to various reasons, including a lack of seriousness about the disease or fatigue from continuously practicing these measures. This highlights the need for ongoing awareness efforts to reinforce the importance of sustained prevention. While many respondents had not been vaccinated, primarily due to inconvenience in accessing the vaccine, the proportion of those willing to take it when offered increased. In conclusion, access to COVID-19 information, primarily through Youth Advocates and electronic media, has played a significant role in the success of the project, contributing to increased awareness, preventive behaviours, and vaccine acceptance. Lessons learnt for future pandemics by this youth-led initiative were proposed. One of the lessons learnt is that technologically innovative approaches to health are effective for both urban and rural adolescents and youth. This is supported by the improvement in COVID-19 knowledge levels and positive change in practices in both rural and urban districts. Continuous education and awareness campaigns are crucial for reinforcing the significance of COVID-19 preventive measures among adolescents and young people. The YAZ peer educator program has shown significant value and should be expanded to engage youth in all provinces in preparation for future disasters. Most adolescents and young people demonstrate a high willingness to receive vaccines when the opportunity arises, indicating strong acceptance. It is crucial to actively promote vaccine uptake among youth, particularly given the availability of vaccines at nearby health facilities like clinics, to underscore the significance of preventive health measures. Ongoing education is critical - continuous awareness campaigns are essential to reinforce the importance of COVID-19 preventive measures among adolescents and young people.

Funding Statement

The study was funded by the United Nations Children's Fund (UNICEF) Zimbabwe Office.

Acknowledgments

We would like to express our deepest gratitude to several key partners who made this study possible. Specifically, we thank UNICEF for their generous funding and technical assistance, as well as Youth Advocates Zimbabwe (YAZ) for their expert technical support. We also appreciate the Ministry of Health and Child Care for facilitating access to health facilities. Additionally, we extend our sincere appreciation to the communities in the selected districts for their active participation and to the young people who shared their valuable insights, without whom this study would not have been possible.

References

[1] Riley, T., Sully, E., Ahmed, Z., & Biddlecom, A. (2020). Estimates of the potential impact of the COVID-19 pandemic on sexual and reproductive health in low-and middle-income countries. International perspectives on sexual and reproductive health, 46, 73-76.

[2] Stover, C. S., Beebe, R., Clough, M., DiVietro, S., Madigan, L., & Grasso, D. J. (2020). Evaluation of a statewide implementation of fathers for change: A fathering intervention for families impacted by partner violence. Journal of Family Violence, 1-11.

[3] Stover, J., Glaubius, R., Kassanjee, R., & Dugdale, C. M. (2021). Updates to the Spectrum/AIM model for the UNAIDS 2020 HIV estimates. Journal of the International AIDS Society, 24, e25778.

[4] UN Women 2020, Annual report, https://www.unwomen.org/en/digital-library/publications/2020/06/annual-report-2019-2020

[5] World Health Organization. (2020). COVID-19 and the youth of today, leaders of tomorrow. World Health Organization. https://www.who.int/publications/m/item/covid-19-and-the-youth-of-today-leaders-of-tomorrow

[6] UNAIDS (2020). Global AIDS Update https://www.unaids.org/en/resources/documents/2020/global-aids-report

[7] Govender, Keenan. "Africa's Young People Innovate in the Face of COVID-19." ACCORD, 22 Sept. 2021, https://www.accord.org.za/analysis/africas-young-people-innovate-in-the-face-of-covid-19/.

[8] UNICEF. (2020). COVID-19 response in North Kivu: Information dissemination through youth engagement. UNICEF DRC. https://www.unicef.org/drcongo/media/4531/file

[9] ACCORD. (2020). Africa's young people innovate in the face of COVID-19. ACCORD. https://www.accord.org.za/analysis/africas-young-people-innovate-in-the-face-of-covid-19/

[10] Slum and Rural Health Initiative. (2020). Stop COVID-19 multilingual infographics campaign. Slum and Rural Health Initiative Network. https://www.srhin.org

[11] Karijo, E., Wamugi, S., Lemanyishoe, S., Njuki, J., Boit, F., Kibui, V., Karanja, S., & Abuya, T. (2021). Knowledge, attitudes, practices, and the effects of COVID-19 among the youth in Kenya. BMC Public Health, 21(1), 1028. https://doi.org/10.1186/s12889-021-11067-2

[12] Austrian K, et al., COVID-19 related knowledge, attitudes, practices and needs of households in informal settlements in Nairobi, Kenya. [Submitted]. Bull World Health Organ. E-pub: 6 April 2020. doi: https://doi.org/10.2471/ BLT.20.260281. 2020.

[13] Habtamu Tadesse Gudeta, Yordanos Jemberu, et al., Adherence to COVID-19 preventive measures and associated factors among high school students in Northwest Ethiopia: a cross-sectional study. https://doi.org/10.1136/bmjresp-2023-001960

[14] Marinda E, Mathentamo Q, Coulson N, Parker S, Dmc Katoto P, Houston G, Magampa M, Pillay N, Ngungu M, Wiysonge CS, van Rooyen H. Impact evaluation of a youth-led intervention to increase COVID-19 vaccine uptake in Kwazulu-Natal, South Africa. Vaccine. 2024 Mar 19;42(8):2089-2098. doi: 10.1016/j.vaccine.2024.02.052. Epub 2024 Feb 29. PMID: 38423816.

[15] Taghrir MH, Borazjani R, Shiraly R. COVID-19 and Iranian medical students; a survey on their related-knowledge, preventive behaviors and risk perception. Arch Iran Med. 2020;23(4):249–254. doi:10.34172/aim.2020.06

[16] Alzoubi H, Alnawaiseh N, Lubad MA, Aqel A, Al-Shagahin H. COVID-19 - knowledge, attitude and practice among medical and non-medical university students in Jordan. J Pure Appl Microbiol. 2020;14(1):17–24. doi:10.22207/JPAM.14.1.04

[17] Karijo, E., Wamugi, S., Lemanyishoe, S., Njuki, J., Boit, F., Kibui, V., ... & Abuya, T. (2021). Knowledge, attitudes, practices, and the effects of COVID-19 among the youth in Kenya. BMC Public Health, 21, 1-13.

[18] Alzoubi H, Alnawaiseh N, Lubad MA, Aqel A, Al-Shagahin H. COVID-19 - knowledge, attitude and practice among medical and non-medical university students in Jordan. J Pure Appl Microbiol. 2020;14(1):17–24. doi:10.22207/JPAM.14.1.04

[19] Gadzayi, M. R., Mukuzunga, M., Chadambuka, A., Chiwanda, S., Govha, E., Gombe, N. T., ... & Tshimanga, M. (2020). An Evaluation of the Adverse Events Following Immunization Surveillance System: A Case of the Oral Cholera Vaccine Mass Campaign, Chimanimani and Chipinge Districts, Zimbabwe, 2019.

[20] Midzi, N., Mutsaka-Makuvaza, M. J., Charimari, L. S., Mangwiro, P., Manengureni, T., & Mugadza, G. (2024). Understanding facilitators and barriers to COVID-19 vaccination in the Zimbabwean population: a qualitative analysis. BMC Public Health, 24(1), 1174.

[21] Wang PW, Lu WH, Ko NY, Chen YL, Li DJ, Chang YP, Yen CF. COVID-19-Related Information Sources and the Relationship With Confidence in People Coping with COVID-19: Facebook Survey Study in Taiwan. J Med Internet Res. 2020 Jun 5;22(6):e20021. doi: 10.2196/20021. PMID: 32490839; PMCID: PMC7279044.

[22] Habtamu Tadesse Gudeta, Yordanos Jemberu, et al., Adherence to COVID-19 preventive measures and associated factors among high school students in Northwest Ethiopia: a cross-sectional study. https://doi.org/10.1136/bmjresp-2023-001960

[23] Habtamu Tadesse Gudeta, Yordanos Jemberu, et all, Adherence to COVID-19 preventive measures and associated factors among high school students in Northwest Ethiopia: a cross-sectional study. https://doi.org/10.1136/bmjresp-2023-001960

[24] Ssentongo, S., Muhereza, A., Mustapha, M. et al. COVID-19 vaccine uptake in Zimbabwe and Sierra Leone: an application of Health Belief Model constructs. BMC Public Health 25, 451 (2025). https://doi.org/10.1186/s12889-025-21610-0

