

ONE HEALTH CASES

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Co-design of Locally Adapted Communication Materials to Boost Engagement around Water Sanitation and Hygiene (WASH) in a Community in Ibadan, Nigeria

In limited-resource settings, hygiene and water management are difficult. This exposes communities to health risks. This study used a participatory approach to engage a community in understanding WASH-related health risks. Leverage points for intervention, highlighting the communities' social behaviours and territorial awareness, were co-designed and evaluated by the community.

[AU 1]

Authors: Olivier Kambere Kavulikirwa^{1,2,3}, Irabor Thomas-Julian¹, Emmanuelle Achiaka Irabor⁴, Olonade Oluwafunmilayo⁴, Meaza Kidanemariam Berhaneselassie¹, Mireille Nokam Ndeffo Marguerite¹, and Nicolas Antoine-Moussiaux¹

Affiliations:

¹University of Liège, Liège, Belgium

²Catholic University of Graben, Butembo, RDCongo

³Université de Montréal, Montreal, Canada

⁴University College Hospital, Ibadan, Nigeria

[AU 2]

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Table of Contents

[AU 3]	Abstract	3
	What is the Incremental Value that Makes this a One Health Case?.....	4
	Learning Outcomes.....	4
	Background and Context	4
	The Challenges of Access to Water, Sanitation, and Hygiene in the Developing World	4
	Community Engagement for an Inclusive Action	5
	Study Area	5
	Methodological Approach.....	6
	Sample Procedure.....	6
	Data Collection	6
	Focus Group Discussion and Participatory Mapping	6
	Data Analysis.....	7
	Poster Creation for Visual Communication Materials.....	8
	Project Impact.....	8
	Sanitation and Waste Management in the Compound.....	8
	Images Speak Louder than Words	9

Project Outlook.....	10
Limitations	12
Conclusion and Recommendation	12
Recommendation.....	13
Group Discussion Questions	13
Acknowledgements.....	13
Further Readings.....	13
References	14

Abstract

In limited-resource settings with rapidly increasing populations, inadequate access to water, sanitation, and hygiene (WASH) remains one of the greatest challenges. This exposes communities in these settings to water-borne health risks including zoonotic helminths and water-borne bacteria, among antimicrobial-resistant germs. Many diseases have the potential to first spread from the environment or an animal to a person and then from one person to another through contaminated hands. The so-called “diseases of dirty hands” have several ways of spreading as contamination may occur through human-to-human contact, human-to-animal contact, or even contact with contaminated surfaces and tools.

[AU 4]

To be more conscious about the challenges of water, sanitation, and hygiene (WASH), members of the community need to arrive at a shared understanding of how their individual actions have an impact on the health of their immediate environment and others around them. However, this is often difficult due to diverging interests, a lack of proper representation of affected stakeholders, and a lack of proper communication channels.

This study focuses on the use of a participatory approach called territory mapping to mobilize the implicit and explicit knowledge of different actors to build a shared representation of their reality. It is a transdisciplinary process that facilitates knowledge sharing and the generation of new knowledge to support learning, negotiation, and planning. Based on the knowledge obtained, communication materials were co-designed with the stakeholders to act as reminders of particular social behaviours that increased WASH-related risks.



Figure 1. Focus group discussion guided by the territory mapping participatory approach.

[AU 5]

What is the Incremental Value that Makes this a One Health Case?

This study focuses on the use of a participatory approach called territory mapping to mobilize the implicit and explicit knowledge of different actors to build a shared representation of their reality. It is a transdisciplinary process that facilitates knowledge sharing and the generation of new knowledge to support learning, negotiation, and planning (Binot *et al.*, 2015). Based on the knowledge obtained, communication materials were co-designed with the stakeholders to act as reminders of particular social behaviours that increased WASH-related risks. This task helped to visualize in a systemic way how the members of the community and their actions were interconnected. It also helped them to understand how their animal husbandry techniques, the topography, as well as the infrastructural arrangements or lack thereof, had an impact on their health as they share the same environment. In addition, the community in question is organized around a healthcare facility. This is of extreme importance because the use and management of antibiotics and medical waste have a strong and direct link with antimicrobial resistance (AMR). Also, improving water, sanitation, and hygiene (WASH) and wastewater management are critical elements of preventing infections and reducing the spread of antimicrobial resistance (AMR) as identified in the Global Action Plan to combat AMR (WHO). This created an opportunity to discuss this important One-Health topic with the community as well.

Learning Outcomes

- Sanitation issues related to daily movement, especially for those living with physical disabilities, such as the lack of hand washing after using a wheelchair can increase the risk of contamination.
- The open drainage system and the proximity of the kitchen to the drainage may contribute to the proliferation of flies and the risk of contamination.
- The school in the compound may be at risk for environmental and infrastructural contamination due to a lack of adequate sanitary facilities, the presence of vegetation used for waste disposal and defecation, and the topography of the land.
- The mixing of infectious and non-infectious waste, the improper disposal of leftover and expired medication, and the presence of animals in the compound may all contribute to the risk of disease transmission and AMR.
- A territory mapping process provides a platform for gathering disciplines and community members together to foster collective intelligence

Background and Context

The Challenges of Access to Water, Sanitation, and Hygiene in the Developing World

In limited-resource settings with rapidly increasing populations, inadequate access to water, sanitation, and hygiene (WASH) remains one of the greatest challenges (Ginja *et al.*, 2021). In Africa, between 2000 and 2020, the population dramatically increased from 800 million to 1.3 billion. Unfortunately, according to the WHO/UNICEF's Joint Monitoring Programme (JMP), the availability and access to potable water as well as sanitation and hygiene services is not following this continuously growing demography. With that population shift, only 500 million Africans have access to basic water and 290 million others have basic sanitation services. Proper sanitation is essential for public health and can prevent the transmission of diarrhoeal diseases. Despite its importance, access to adequate sanitation remains a global challenge and has been recognized as a human right by the United Nations General Assembly. Unfortunately, at the current rate of progress, it is projected that the African continent will struggle to provide universal access to water, sanitation, and hygiene-related services by 2030, with marginalized communities bearing the heaviest burden of water-borne diseases. It is crucial that action is taken now to address this pressing issue (Unicef Nigeria, 2022).

In recent times, Nigeria has been experiencing recurrent outbreaks of cholera due to increased flooding and subsequent sanitation challenges including infrastructure. According to the NCDCs October-November 2022 monthly Cholera situation report, the country recorded 23,550 suspected cases and 533 deaths due to cholera, calling for improvements in sanitation (NCDC, n.d.). In 2015, Omole *et al.* found that out of the

seven most frequently observed diseases in Ogun state in Nigeria, five were water-borne, underscoring the magnitude of WASH-related health risks in the country (Omole *et al.*, 2015). In another study, conducted in a low-income urban area of Agbowo Community, Ibadan, Nigeria, most women and children suffer from the effects of water-borne health risks as they are the most vulnerable (Gbadegesin and Olayide, 2019).

Prior studies have demonstrated the effectiveness of WASH initiatives (Bartram and Cairncross, 2010). However, these interventions have yielded little success in improving and maintaining positive behaviours in targeted populations (Waddington and Snilstveit, 2009; Garn *et al.*, 2017). In a community, there are always various leverage points where these interventions can be targeted for more sustainable change. The levels of action can range from investment in infrastructure, all the way, to the individual level where a member of the community's personal actions poses a risk to their health as well (Ginja *et al.*, 2021). Therefore, to improve the appropriation of WASH interventions, the community, on all levels, needs to be empowered. Increasing the level of involvement of a community in a learning process of transformative change requires a means by which the community becomes aware of how interdependent their social behaviours are and how these interrelationships with the environment have an impact on their health and welfare.

Community Engagement for an Inclusive Action

Community engagement is a process that fosters the active participation of community members in research or decision-making processes that affect them. This means that the guided process should consider contextual elements including the culture, values, and needs of the community, as well as the specific research question or issue being addressed (Hall *et al.*, 2021). Ensuring that community engagement is contextually driven, is important for making sure that it is relevant and responsive to the needs and priorities of the community (McCloskey *et al.*, n.d.). Accompanying the community in the identification of their needs requires a participatory approach. This helps to integrate the community members in all aspects of the research process. It is based on the belief that communities have valuable knowledge and experiences that can inform research and contribute to more sustainable problem-solving (Chevalier and Buckles, 2019).

In the context of community engagement, participatory research has been recognized as a tool that empowers community members to have a say in the research questions being asked, the methods being used, and the interpretation and dissemination of the results. This can help to ensure that the research is relevant and responsive to the needs and priorities of the community. There are various participatory research methods that can be used, including focus groups, action research, and participatory workshops (Vaughn and Jacquez, 2020).

In Nigeria, field interventions have used community engagement strategies to increase the demand for health services. For instance, a study on the relationship between educational leadership behaviour and community engagement conducted in Kwara State, Nigeria, highlighted a positive correlation among efficient communication, interpersonal relationship, participatory decision-making, and effective community engagement (Kadir, 2020). To identify the developmental needs of a community, participatory mapping has been playing a pivotal role in guiding social change. This is because it has a unique potential to visually represent what a community perceives and points out features of significance within it – both physically and socio-culturally (Cochrane and Corbett, 2018). Furthermore, the process of participatory mapping recognizes the intrinsic value of crafting an inclusive environment where all voices have the space to be expressed (Rambaldi *et al.*, 2006). This inclusiveness creates a sense of responsibility and ownership by the stakeholders involved and can play a role in more sustainable decision-making through achieving a shared understanding of the environment and its challenges.

Study Area

This study was carried out at the Agbeke Mercy Medical Centre and the Cheshire Home, Ibadan, Nigeria, from April to June 2021. Cheshire Home for the Disabled (CH), Polytechnic Road, Ibadan North LGA, Nigeria, was founded in 1959, by Lord Leonard Cheshire and it is one of the five Cheshire services in Nigeria. It aims to provide opportunities for people living with disabilities through the home and residential care, education, vocational training, and rehabilitation support. It operates independently as a non-profit community-based organization. The Agbeke Mercy Medical Clinic (AMMC) is a primary care facility in the Cheshire homes that operates as a day care outpatient outpost of the Department of Family Medicine, University College Hospital (UCH), Ibadan. The services offered at AMMC cut across different age groups and disease conditions. All primary care services are provided at the clinic except for ante-natal and obstetric care. As part of the compulsory rural and remote postings stipulated in the West African College of Physicians (WACP) curriculum, resident doctors from the Department of Family Medicine of the University College Hospital are sent to the clinic on rotation.



Figure 2. Google Maps ® aerial snapshot of Cheshire homes, Ibadan, Nigeria.

[AU 6] **Methodological Approach**

Sampling Procedure

A stakeholder analysis was conducted with the partners in Ibadan, and priority was given to consenting residents that represented each stakeholder in this closed community. Using purposive sampling, 12 participants were selected to be part of the participatory mapping and focus group discussion. The study received an ethical approval from the Ethics Board of the University of Ibadan (granted by the University College Hospital Ibadan Ethical Review Board with approval number UI/EC/21/018). As per the principle of voluntary participation in research, only individuals who accepted being part of the study by means of an informed consent were included. The participants were composed of Cheshire homes partners, a teacher from the school for the disabled, health professionals from the medical centre (a senior nursing officer, two chief nursing officers, and two medical doctors), a caregiver taking care of the residents living with disabilities, a cleaner, and three of the residents living with disabilities.

Data Collection

Focus Group Discussion and Participatory Mapping

Due to the COVID-19 pandemic, interactions between the authors and the participants were conducted remotely by videoconference with the help of partners in Ibadan, Nigeria. Insights from consenting participants were collected through a video recording of the focus group discussion. A semi-structured interview guide was created and translated into the Yoruba language for non-English-speaking participants. During the focus group discussion, a participatory mapping approach called territory mapping was introduced to visually explore the potential risk factors emerging from the relationships between stakeholders' immediate environment and their social behaviours. This mapping technique was mobilized because of its cost-effectiveness and



Figure 3. Participants interacting collectively to map the Cheshire compound through instructions given by the authors at distance over a videoconferencing software.

its use in participatory research, planning, and management initiatives for development projects at small scales (Denwood *et al.*, 2022; Lynam *et al.*, 2007). This was done to promote interaction, mutual learning, collective engagement, group cohesion, and shared representation of the risk factors linked to social behaviours. The process included describing the purpose of the drawing, handing over a piece of paper to the participants with a pencil and eraser, and asking them to draw the geographic boundaries of the Cheshire Home compound relating it to WASH in their environment (location of water sources, toilets, drainage areas, areas of waste disposal). At the end of the mapping, the drawing was displayed to probe the risk pathways.

Data Analysis

Recordings were transcribed and coding was done for categorization using Microsoft Excel 2020. Data analysis was achieved using inductive thematic analysis to present main themes from categories that emerged from the coding process following Braun and Clarke's framework for thematic analysis (Braun and Clarke, 2013).

[AU 7]

Poster Creation for Visual Communication Materials

Information from the focus group was used to create posters that were based on what the community had identified through the participatory mapping session as challenges in ensuring hygienic practices. The challenges were focusing on modifiable human behaviour such as hand washing, defecation sites, and waste management (hospital, hostels, and animal waste).

After the posters were designed, they were shared again with the community members in the original study through a survey using Google form® to ascertain the following:

1. Was the message in the poster clear and understandable to them?
2. Did the poster carry the message that the community had in mind?
3. Did the community judge that the posters required modifications and what were these?
4. Where would be the best place to situate the posters within the community?

This was done using a five-point Likert scale with one as “poor” and five as “great”. When participants were awarded a score of 3 or less, they were invited to indicate what modification(s) would be required to improve the impact of the poster. Feedback was captured from each representative of the community through the form. Those who did not have access to a smartphone had another member of the community share the information through their personal phone to ensure that everyone’s opinion was captured.

Once it was captured, all the responses were weighed in terms of commonly occurring opinions so that the posters were modified. Some solo contributions were evaluated based on the researcher’s knowledge of WASH and modifications to the posters were made accordingly.

Project Impact

Two main themes emerged from the discussion including sanitation and waste management. The discussions with the participants highlighted the interconnections between the social behaviours of the different community members and the state of the infrastructural configuration of their immediate environment. Also, the appraisal of the posters co-created by the community is presented below.

Sanitation and Waste Management in the Compound

Efforts to maintain a safe and hygienic environment were raised. From the perspective of the residents living with disabilities, some sanitation issues concerning their daily movement were pointed out. One of the residents raised an interesting point about their constant contact with the wheelchair tire to move around. These members of the community increase their risk of contamination through direct contact with the ground if their hands are not washed after. One participant stated how “little attention is taken to washing hands since they often get dirty because of having to move around with the wheelchair.”

The sewage system in the compound was also addressed by the cleaners. The open drainage system that is currently being used was identified as a possible infrastructural risk as the drainage was close to the kitchen quarters, causing a proliferation of flies.

It was also pointed out that in the same compound, there is a school that provides education for students both living in the Cheshire homes and the surrounding communities. This school is surrounded by a lot of vegetation, which was mentioned by the participants as being regularly used for waste disposal and defecation. The participants pointed out the lack of adequate sanitary facilities such as toilets for the number of students present, which pushes them to defecate in the bushes. However, the topography of the land where the school was built and its proximity to one of the wells in the compound presented an environmental and infrastructural risk. The participants mentioned that the school and surrounding vegetation were built on higher ground and the presence of a slope between the school environment and the well might be a strong indicator of runoff of faecal and waste materials from the school’s vegetation into the well by force of gravity. According to the participants, a foul odour and change in colour of the well water from clear to brown were observed during the rainy seasons leading to the abandonment of the well.

From the perspective of the medical staff, mixed waste containing infectious waste materials from the clinic is often burned in the clinic’s backyard which is close to the hostel and the water supply of male residents. Likewise, it was found that some waste materials were placed near the water points as other members of

the community were unsure of the location of waste disposal sites and the waste sorting policy applied in the compound. In addition, leftover and expired medication was sometimes released into the environment as a way of discarding them. This was corroborated by a non-medical staff who mentioned that *if an antibiotic accidentally falls to the ground, the patient will not pick it up to properly discard it.*

Finally, the community practices livestock farming to support the upkeep of the residents at the Cheshire home. The presence of poultry behind the clinic as well as the presence of dogs were mentioned. During the discussion, a participant stated how *chickens come from the neighbouring community and enter our compound. They even enter the clinic; they are almost like patients.* This may present a risk factor for disease transmission due to the high probability of these animals having access to waste disposal sites and possible access to human faecal material in the environment. These animals can also play a specific role in the transmission of resistant germs to humans through direct contact and interaction. This observation helped to highlight the connection between humans, animals, and the environment.

All the information above was collectively represented by the participants through a participatory map (Figure 2) visualizing the perceived interconnection of their environment to their hygienic behaviours and waste management practices.

The Figure 5 visualizes the different actor's involvement and their respective roles in the transdisciplinary process of knowledge integration, collective intelligence, and action research that emerges from inclusive active participation. [AU 8]

Images Speak Louder than Words

Based on the creation of the map, participants highlighted the importance of being reminded of their actions and how it linked to WASH-related health risks. The community members decided on the use

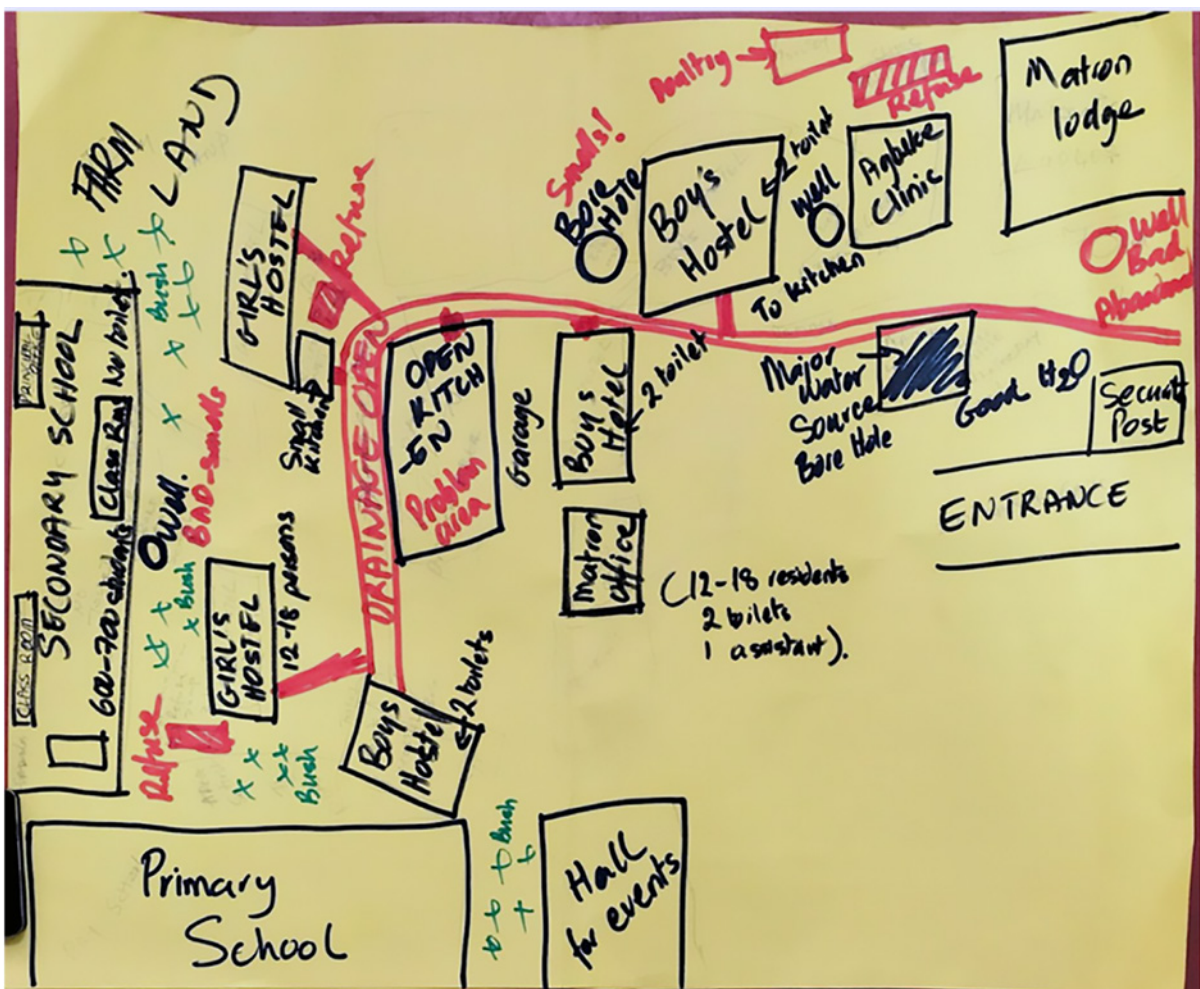


Figure 4. Territory map co-designed by members of the community showing their collective perception of their infrastructure, social behaviours, and environmental topography that have an impact on water, sanitation, and hygiene.

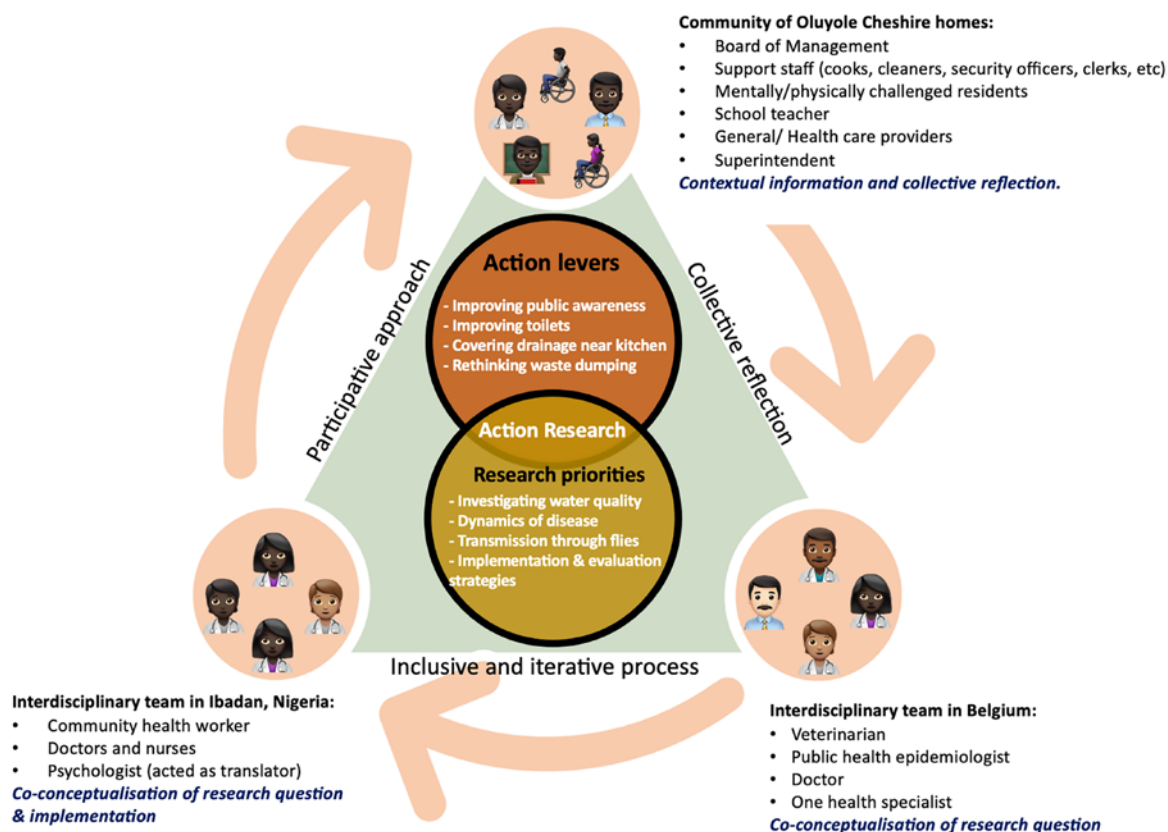


Figure 5. Flowchart of the transdisciplinary process: An interdisciplinary team of doctors, veterinarians, and public health professionals proposed a research question about WASH to a group of community health workers involved in the management of Cheshire homes and the clinic situated within it. Priority was given to residents of the community to gather their insights on the physical and social aspects of their living conditions and its connections to WASH. Both groups then took part in a participative and iterative decision-making process to arrive at a shared understanding of their situation and identify action levers and research priorities related to WASH.

of visual communication materials in form of posters to serve as reminders of WASH guidelines for the members of the community and the eventual visitors. The stakeholders suggested that the poster should be made in a way that is inclusive of all members of the community to hold more attention. A participant spoke actively about the advantages of visual elements that were catchy with less words so that it can be understood by everyone in the community. Regarding the content, most of the insights suggested practical guidelines on handwashing, latrine use, waste sorting, and antibiotics disposal as well as basic illustrated messages about the link between WASH and AMR. The participants also suggested favourable locations in their compound where these posters will have the most impact.

A total of three posters were made. Regarding community feedback, 14 responses were recorded from the Google form including inputs from five health workers, one cleaner, one volunteer, one tutor, one caregiver, three handicapped persons, and two unspecified.







The scores given to the poster ranged from one to five with an estimated score of 3 across all posters which indicated that the posters were scored as “good”. However, any participants that scored the posters below 3 were highly considered in the modification of the posters to ensure that everyone’s opinion was taken into consideration.

[AU 9]

Project Outlook

Even though potable water access is low in West Africa, communities need to be sensitized to the dangers of poor management linked to existing social behaviours. Improving the communities’ shared understanding of their interdependencies also helps them highlight areas where the stakeholders at different levels can act in a sustainable manner. Based on the collective mapping process and the discussions carried out by the community, the authors created a decision-making and planning map (Figure 4) highlighting a

Table 1. Appraisal of posters created from the feedback of community members at Cheshire Homes, Ibadan, Nigeria. Each poster was presented to the participants for their evaluation using a Likert scale and eventual suggestions for improvement.

No.	Poster image	Poster concept	Rating score (N=12)	Critique	Modification made	Final poster
1		Diagram showing how hospital and human waste contaminate the water well during the rain, reflecting the topography of the territory.	Range: 2 (fair) – 5 (great) Mean: 3.9 (very good) No of scores < 3 = 2/12	1. "A negative mark should be included to show it is wrong behaviour" 2. "Let the main message be at the forefront"	A red bar was added to the human and hospital waste dumping and the message emboldened.	
2		Poster showing how hands get contaminated for wheelchair users and the need to wash hands.	Range: 2 (fair) – 5 (great) Mean: 3.7 (very good) No of scores < 3 = 1/12	1. Be specific about what should be washed! Do you mean Wash the wheels of the wheelchair or wash your hands OFTEN! 2. Show the man in a wheelchair washing his hands.	Hand Washing icon was depicted in yellow to be much clearer and focus was made in the form of a red circle on the hands alone. Addition of "your hands" in the sentence to specify what to wash.	
3		6-Step poster showing how bugs develop antimicrobial resistance when dosage is not completed to form superbugs.	Range: 1 (poor) – 5 (great) Mean: 3.5 (between good and very good) No of scores < 3 = 3/12	1. "I wish I could get the message first and clearly" 2. "It is too crowded" 3. "It's too crowded, no message"	The poster was decongested slightly (difficult as it was a poster showing stages of a process for AMR through non-adherence to prescribed medication). The printing of the poster was to be at a minimum of A2 size to aid the visualization of its content.	

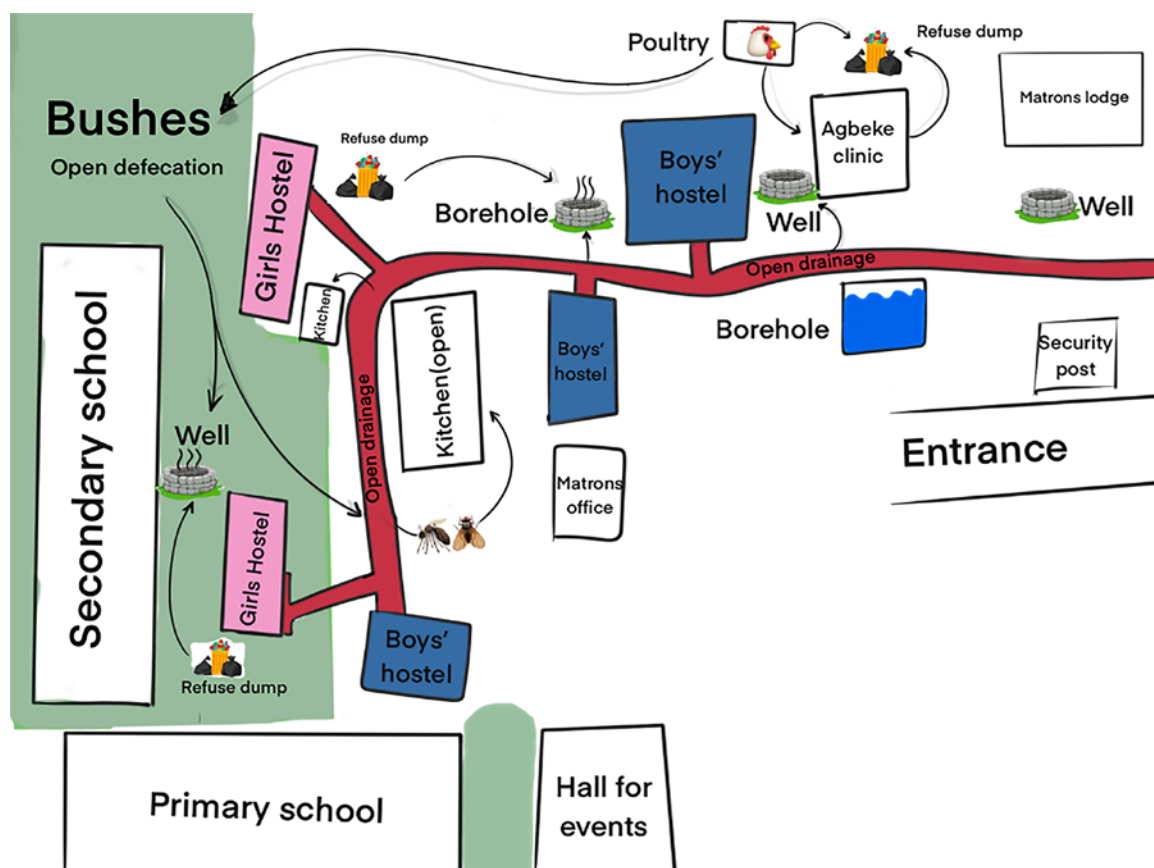


Figure 6. Risk pathways of WASH challenges and their interconnections with social behaviours. The visual was inspired by the co-designed map and information obtained from the focus group discussion of the residents of the Cheshire homes community. The image shows the feedback loops between members' behaviours concerning hygiene and animal husbandry in connection to the general landscape of the Cheshire home compound.

risk pathway showing leverage points for the improvement of environmental and personal hygiene in the Cheshire homes. This tool will be used to advocate for further interventions involving internal/external partners and the Board of Management of Cheshire homes. In this way, the stakeholders can systemically consider the behaviours that need to be targeted and what activities are needed to change them.

In terms of maintaining a sustainable change in the community, the map provides a reference point and a means of constant visual evolution for all concerned members. For example, considering the fact that the medical staff are sent to the Agbeke Medical Clinic on rotation, the map ensures that future medical staff arrive at an initial understanding of the context and can then contribute more effectively to the continuity of activities or interventions already in process.

Limitations

One of the challenges faced by the authors was movement restrictions due to COVID-19. To overcome this challenge, the authors strengthened their partnership with the team in Ibadan and used technology for video conferencing. Another challenge was the nature and characteristics of the participants, who were from a handicapped community. To address this challenge, the authors used strategic planning in their interactions with the participants, including providing a translator and carefully examining the questions being asked to ensure that they were ethically sound. These strategies helped the authors to effectively engage with the community and gather valuable insights despite the challenges they faced.

Conclusion and Recommendation

Participatory approaches have the potential to drive problem structuring and knowledge co-creation around health risk management. With territorial mapping, the community was able to arrive at a shared

understanding of how microbial hazards are likely to move between humans and animals through their shared environment from different sources and various pathways. Furthermore, this participatory approach, through its simple design that requires no prior competencies or skills, brought together all relevant stakeholders in the community, and gave them an opportunity to speak and share their different perspectives around a common, complex health problem. This can increase the feeling of ownership and equity promotion. There is a high likelihood for the better appropriation of collectively discussed WASH-related risk reduction strategies and co-designed communication visuals. Also, the application of the community members in a creative process of risk communication design and evaluation can help in the appropriation of these tools for further planning and action in their community. This shows the crucial importance of a transdisciplinary and bottom-up approach to health promotion initiatives.

Recommendations

There are two main areas of focus for improving WASH in the Cheshire homes: education and infrastructure. [AU 10] The goal of educating people about proper hygiene and sanitation practices is to reduce the prevalence of open defecation near schools and the contamination of well water. The goal of improving toilets and covering drainage near the kitchen is to reduce the risk of contamination and the spread of illness. Rethinking waste dumping is aimed at finding more sustainable and sanitary ways to dispose of waste. It is also mentioned that the management of Cheshire homes is already in talks about improving toilets. Overall, these recommendations aim to address various aspects of WASH in the community in order to improve public health and living conditions.

In addition, some potential areas for further research related to WASH include investigating water quality in the wells surrounding the Cheshire homes, studying the transmission of disease through flies, and developing and evaluating implementation strategies. This research could involve analysing the physical, chemical, and biological characteristics of water, understanding the behaviour of flies and the diseases they can transmit, and testing and evaluating interventions.

Group Discussion Questions

- Talk to us about the common water sources in the centre/compound.
- Which water treatment methods are used in the centre/compound?
- What are some of the biggest challenges you face concerning hygiene and sanitation in the centre/compound?
- Kindly tell us about waste sorting in the centre/compound
- Imagine you are to improve the water supply in the centre/compound. What actions will you undertake first?

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