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RESEARCH ARTICLE



Healthy landscapes, healthy people: living landscapes as sites for the integration of heritage and modern health knowledges

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ABSTRACT

This paper explores social-ecological relational dynamics in health knowledge and practices in health education relating to the social practices of government and communities, and how the microbial world could be relationally normalized for better health and well-being of individuals and communities. A case study methodology is operationalized, focusing on cholera in Zimbabwe in response to how human health practices in the ever-changing environment in Southern Africa are largely determined by an expert-driven and top-down scientific knowledge landscape grounded in colonial approaches. Communities view themselves as unable to contribute to addressing health challenges exacerbated by ecological, social, and infrastructural conditions. The findings highlight a dissonant relationship in which modern health approaches often marginalize heritage knowledge and practices regarding the relationships between human and environmental health in managing socio-ecological relationships. This paper shows how knowledge landscapes have real-world, ontological impacts on educational efforts to address the health challenges posed by cholera bacteria. A critical perspective is provided regarding the integration of heritage approaches to modern challenges in health education, offering knowledge for living with and within the environment. This study contributes to normalizing socio-ecological relationships in water bodies and human bodies and building social resilience to emerging human and environmental health challenges.

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Introduction

Human health in Southern Africa has been largely determined by restorative and responsive scientific practices mediated by experts in research institutions and governments (Burger & Christian, 2020; Mhazo & Maponga, 2022; Mupara et al., 2023; Hamann et al., 2020). While these modern medical ways of knowing health relies on clinical specialists, heritage health knowledges relies on its own experts, including traditional healers and elders (Maluleka & Ngoepe, 2019). Furthermore, heritage health approaches, which emphasize living within the land, are closely tied to socio-ecological and cultural heritage practices (Marques et al., 2021). While both ways of knowing health are expert-guided, the modern biomedical ways of knowing often marginalize heritage health knowledges, with intergenerational learning, which is central to heritage practices, being undermined by urban migration and the disappearance of key medicinal plants (Conte, 2022; Xiao et al., 2022). Changes in land-use patterns resulting from this urban migration and loss of medicinal plants disrupt the knowledge of seasonal disease patterns and cultural practices, impacting sustainable health systems (Finn & Cobbinah, 2023; Chatwood et al., 2017). As such, the paper presents a critical analysis of the hierarchical relationship and valuing of these approaches to health knowledge (Marques et al., 2021).

Land health reflects the health of the surrounding ecosystems, including water, fauna, flora, and microbes (Greenwood & Lindsay, 2019; Malapane et al., 2022). Prior to colonization, Southern African communities enjoyed relatively healthy water sources. Colonial policies relegated indigenous populations to resource-scarce areas, and urbanization worsened water quality and sanitation (Haywood et al., 2021; Mbiyozo & Institute for Security Studies, 2022; Potts, 2016; Delius et al., 2012; Austin, 2010). Pollution facilitates conditions favorable for pathogens, such as cholera bacteria, exacerbating community health risks (Dalu et al., 2011; Davis, 2016; Stec et al. 2022). Environmental changes due to anthropogenic activities and pollution further threaten water and food security, increasing vulnerability to infections (Jutla et al., 2015; Charnley et al., 2024). Heritage practices historically mitigated such risks with Nguni handwashing traditions of washing before meals, upon returning home, or during ceremonies, reflecting preventative health measures embedded in cultural practices (Moyo, 2023). Such practices enable

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communities to coexist with naturally occurring cholera in the coastal regions of Southern Africa, where the cholera bacterium is endemic in the brackish waters due to the environmental determinants (Gwenzi & Sanganyado, 2019; Rebaudet et al., 2013).

The concept of 'living landscapes' emphasizes the interplay between physical and knowledge landscapes, both integral to human health and wellbeing. These landscapes evolve through human-environment interactions, shaping ecosystem services and health knowledge over generations (Biggs et al., 2022; Cilliers et al., 2018; Daniels & Cowell, 2011). This analogy highlights uncertainty in environmental conditions, emphasizing the importance of context-sensitive, adaptable knowledge (Rounsevell et al., 2021). The exclusion of heritage knowledge from formal systems creates dissonance between lived experiences and expert-driven approaches (Svalastog et al., 2015). Addressing this gap requires integrating pluralistic, inclusive health systems that acknowledge diverse ecological and cultural contexts as part of multidimensional knowledge landscapes incorporating traditional and modern health knowledge (de Sousa Santos, 2007; Sturmberg, 2018; van Druten et al., 2022). The paper understands health as emerging in social-ecological dynamic interactions between the human and microbial world, with the human world encompassing social structures of governance and cultural norms, practices of hygiene and water management and our human bodies entailing microbiomes and immunities. Meanwhile, the microbial world is understood as including microbiota, i.e. ecosystems of microbes, their ecological niches, as the environmental conditions microbiota exist in as well as potentially pathogenic microbes such as *Vibrio cholerae*. These two worlds are conceptualised as interacting through physical exchanges, such as humans using unsafe and contaminated water sources, landscape mediation such as droughts or floods transforming the ecological niches of microbiota, and knowledge practices such as infection preventive heritage practices or medical treatment of cholera. The results of these interactions are key to living landscapes, centered on our coexistence as humans with the microbial world (Schlüter et al., 2015; Steiner, 2012). Top-down sanitation policies as examples of colonial disruptions to these interactions can be understood as examples of creating pathogenic (disease-generating) relationships.

We conceptualise health education as the transferal of health knowledges in dynamic and contextually based processes with intergenerational learning constituting key ways to establish and sustain health practices (Morton Ninomiya et al., 2022). Health education is thus understood as lived and participatory processes in which health practices become embedded in everyday social interactions as well as seasonal ecological activities (Rizvi, 2022). More than top-down instruction, health education becomes development of culturally resonant and scientifically informed practices.

The history of cholera illustrates the co-evolution of humans and microbes with early responses in East Africa, attributed cholera to 'bad air,' contrasting Western medicine's categorization as a waterborne disease (Echenberg, 2011; WHO, 2024). Practices like 'phuza moya' (breathing in fresh upland air) and communal handwashing reflected indigenous preventative measures rooted in socio-ecological relationships.

Modern health systems, although advanced, often fail to resonate with local contexts. They rely on clinical research, new technologies, and expert knowledge, which can alienate communities (Kannampallil et al., 2011). Achieving sustainable health, as outlined in Sustainable Development Goals (SDG) 3, requires bridging this divide by embedding health knowledge in daily life (UN, 2015). Heritage approaches, which integrate intergenerational practices with modern insights, offer a pathway to sustainable health education and community resilience. Recognizing knowledge as both situated and contextual, integrative health practices that address local challenges can be fostered (Koon et al., 2020). This involves leveraging heritage knowledge as a resource for sustainable coexistence with microbial ecosystems, minimizing health risks, while promoting ecological balance (Carrie et al., 2015; Maluleka & Ngoepe, 2019). Heritage practices can thus inform ethics-led education and enhance community engagement and sustainability in health systems (Corso et al., 2022; Ooms et al., 2018).

Aim and research questions

This study aims to explore the social-ecological relational dynamics in health knowledge and practices as part of health education. Using cholera as a case study, this study highlights the potential of integrating heritage and intergenerational knowledge into education and health systems to expand 'living knowledge spaces' and promote *resilience* (the capacity to manage and mitigate health challenges such as cholera outbreaks), *adaptability* (the ability to adapt practices to changing conditions such as climate-induced droughts), and *sustainability* (the long-term balance of socio-ecological relationships) in health practices. In the case study of cholera in Zimbabwe, we utilise these three concepts in the analysis. Exploring resilience in how heritage practices and modern health interventions together contribute to the mitigation of cholera outbreaks (Mashe et al., 2020), adaptability in how the integration of knowledges enables community responses to environmental change (Jutla et al., 2015), and sustainability in the how intergenerational learning can sustain equitable health practices that balances cultural norms and the prevention of pathogens (Dzinamarira & Musuka, 2021). Social practices of the Zimbabwean government and communities are studied to determine how the microbial world can be relationally normalized for better health and well-being of individuals and communities. Two research questions were formulated.

- What socio-ecological relational dynamics are created through current health knowledge and practices for governments and communities to mitigate the risks associated with changing health conditions?
- How can the relationality of health knowledge practices of experts and communities facilitate the normalization of socio-ecological relationships with the microbial world in ever-changing health conditions?

Materials and methods

Using a case study methodology (Priya, 2021; Yin, 2009) to study documentary materials such as published research papers, literature and official reports, we argue for recurring cholera outbreaks as the development of pathogenic relationships with *Vibrio cholerae* and the possibility of normalizing social-ecological relationships with the microbial world by tapping into cultural heritage knowledge and ensuing social practices.

The study focuses on cholera outbreaks in Zimbabwe, analyzing socio-ecological dynamics related to health knowledge and practices. It explores how communities and government agencies address cholera through both modern scientific approaches and heritage knowledge systems, drawing insights from historical and contemporary cholera outbreaks, including the 2008–2009 and 2023–2024 outbreaks.

As data sources, the paper draws on documentary materials, including published research papers, government reports, policy documents, historical records, and grey literature related to cholera outbreaks in Zimbabwe. The selection of these sources was guided by relevance to the socio-ecological dimensions of cholera, health education, and the integration of heritage knowledge in public health responses. These diverse data sources enable a multi-perspective analysis, ensuring that both contemporary scientific insights and traditional knowledge systems are represented. The integration of historical and contemporary data allows for a cross-case comparison, highlighting the evolution of cholera management strategies and their socio-ecological implications. The case study (Bowen, 2009; Flyvbjerg, 2006; Owen, 2014) is guided by the living landscapes of the health conceptual framework, which draws on interrelated concepts of heritage health approaches, knowledge landscapes, and living landscapes. Together, these concepts constitute the framework of the case study analysis in the findings section. The case study method was chosen due to its ability to generate context-relevant knowledge, particularly for studying complex, intertwined phenomena such as health education, where the boundaries between practice and context are often difficult to delineate (Yin, 2009). This methodological approach enables a nuanced understanding of why certain processes develop, highlighting elements that may be essential for future research (Bowen, 2009; Flyvbjerg, 2006; Thomas & Magilvy, 2011). Furthermore, a cross-case study analysis (Yin, 2009) was utilized to compare cholera outbreaks across different periods and settings. This approach allows for the identification of both expected and unforeseen factors influencing the relationship between health education, government interventions, and community practices. By contrasting cases, it becomes possible to pinpoint key themes and divergences, ultimately strengthening theoretical insights into the normalization of socio-ecological relationships with microbial ecosystems. The analytical process involved an iterative engagement with the data to provide analytical depth and strengthen the rigour, including repeated readings of documents, identifying key aspects, and comparison of different case materials to discern patterns in governmental and community responses. The first step involved reading and re-reading the documentation, guided by the conceptual framework, to identify health educational engagements in each case. The second step entailed examining the empirical materials both separately and collectively to establish how different aspects of health education related to one another within the material. In the third step, similarities and differences were systematically analyzed, allowing for the identification of key divergences in approaches to health education. This iterative and comparative process enabled a more comprehensive understanding of how cholera-related health knowledge is constructed, disseminated, and applied within different contexts. This structured approach, as noted by Simons (2015), provides an essential foundation for theory development by identifying both recurring and contrasting themes in the data. The case study of cholera in Zimbabwe examines government hygiene and sanitation practices policies, community handwashing rituals, and nutritional practices (human-world), microbiota (including *Vibrio cholerae*) responses to environmental changes (microbial-world), and how cholera outbreaks are driven by the breakdown in the interactive relationships between these two worlds, as exemplified in water, sanitation and waste failures and the loss of heritage knowledge. In analysing the documentary materials of the cases, a document analysis method (Bowen, 2009) was used. The analysis focused on the breakdown of relationships between human communities and the microbial world, emphasizing the need for relational normalization. With regards to food-related practices the paper drew on ethnographic accounts of heritage rituals and practices (Kamwendo & Manyeruke, 2017; Mwandayi, 2011); peer-reviewed studies on thermal inactivation of *V. cholerae* (Ghosh & Ramamurthy, 2011), as well as policy documents and guidelines (WHO, 2021).

By integrating these methods, the paper offers conceptually grounded and deep insights into the social-ecological relational dynamics of cholera outbreaks. It contrasts expert-driven health policies with traditional communal health practices, highlighting how integrating diverse knowledge systems can enhance community resilience and improve health outcomes. The case study method not only facilitates a deeper understanding of the conditions that enable or constrain public health responses and health education, but it also provides pathways for future research to bridge the gap between modern and heritage-based health approaches in addressing cholera in Zimbabwe and beyond. Throughout the research process has been guided by the ethical principles of Good research practice by the Swedish Research Council (2017), supporting the scientific rigour of the research. This study did not require ethics approval as it does not involve human participants, animals, or sensitive personal data, only using documentary materials previously published for the case study analysis.

Results

The case of cholera in Zimbabwe allows us to look at how we normalize the relationship with the microbial world in general, and the *Vibrio cholerae* in particular, in changing physical contexts. Cholera emerges as a result of relational breakdown, not as

something to be destroyed or killed. This relational breakdown is the result of historical and current anthropogenic activities, resulting in changes in both the communities and their environments. Satellite data have highlighted how changes in hydro-climatic conditions correlate with cholera outbreaks, showing how environmental conditions are key predictors of cholera cases (Jutla et al., 2015; Rebaudet et al., 2013). With the failure of rains and rising temperatures resulting in droughts, changes occur in the health of water environments, which places communities in precarious situations of heightened vulnerability to the resurgence of *Vibrio cholerae* in their immediate environment (Jutla et al., 2015). The current 2024 cholera outbreak in Zimbabwe (WHO, 2024) is the latest recurring cholera outbreak linked to changing environmental health conditions, including extreme weather conditions such as torrential rainfall, severe flooding, heatwaves, and droughts (Jutla et al., 2015; Ray et al., 2022). 2008–2009 saw a cholera outbreak occurring throughout the country during challenging social, political and economic conditions that heightened existing vulnerabilities in communities and the public health system (Chimusoro et al., 2016). The outbreak that affected 60 of Zimbabwe's 62 districts happened as Zimbabwe was faced with dramatic economic loss, severe unemployment and hyperinflation that was coupled with political and social instability. These conditions significantly impacted the maintenance of water, sanitation and sewage services and infrastructure putting many communities in a situation of having to rely on contaminated sources of water (Chimusoro et al., 2016). Conditions were thus created for the spread of Cholera and with healthcare services also suffering due to the economic and political situation, prevention and treatment was often slow and insufficient. For the affected population of Harare, more severe impacts of resurgence involving a *Vibrio cholerae* highly resistant to most antimicrobials were alleviated through the comprehensive administration of later-line antimicrobials (Ghosh & Ramamurthy, 2011; Mashe et al., 2020). This course of events could be understood as an example of the acquired reliance on reactive public health responses centered around the distribution of pharmaceuticals in society, with therapeutic approaches to health often leading to the de-emphasis of preventive health knowledge and practices (Denyer Willis & Chandler, 2019; Dixon et al., 2021; Yim et al., 2006). By becoming a pharmaceutical replacement for adequate healthcare and societal health-promoting services, antimicrobials are quick fixes that exacerbate entrenched health-related inequalities in society (Mashe et al., 2023; Tompson et al., 2021; McCartney et al., 2019; Mickelsson et al., 2023). While this softens the blows of tragic disease outbreaks, its effects and the responses that rely on pharmaceuticals are not equally distributed with the health impacts of mortality and morbidity borne more heavily by the poorer and disadvantaged in society. How the recurring cholera outbreaks are 'resolved' along with their long-term causes and impacts has been the topic of recent research (Chandler et al., 2016; Dixon et al., 2021). Health policy and practice have recurrently emphasized educational (education and learning) processes as crucial in addressing sustainability challenges that exceed strict health considerations (WHO, 2015). While this approach is appreciable, it is coming into society as if it is new and arriving as a responsive mechanism, not as a repertoire of daily living.

In both Nguni and Shona traditions, hand washing was key. A visitor arriving at a homestead was provided with water and soap for handwashing before receiving a mug of fresh drinking water as part of the welcoming process. After this, the visitor is formally greeted. The hosts ensured that the visitor was provided with hot food, which they ate while hot. There is no plausible explanation for this tradition. This tradition has largely been lost over the years, as people no longer wash their hands before greeting them. This could be attributed to the presumed improvement in healthcare and hygiene. Washing recognized that disease-causing organisms could potentially be transferred by hand-to-hand contact. The hands had to be washed before the formal greetings to wash away any potential germs on the hands of meeting people. The assumption was that the visitor would be thirsty after travelling long distances without drinking from the water sources that they crossed, as they did not know which had fresh or uncontaminated water. Handwashing was thus a cultural heritage practices based on empirical observation of disease interruption later validated by science (Greenwood & Lindsay, 2019). This included enacted understandings of how timing handwashing before greetings (*kubata maoko*) and meals physically disrupted spread of disease (Dzinamarira & Musuka, 2021), how certain situations such as funerals and arriving from travel necessitated rituals that limited exposure (Saidi, 2017), as well as the recognition of water as an interface between the human body and the world outside (Mandikonza et al., 2011). Traditional food preparation practices in Shona and Nguni cultures emphasize serving hot meals to visitors, with oral histories suggesting this was understood to reduce illness risk (Mwandayi, 2011; Saidi, 2017). In contrast with modern public health practices that separates sterilization from pathogen reduction, these heritage practices can be reasonably assumed to have, when combined with other measures like handwashing, provided a degree of protection from infection.

In modern Zimbabwe, at funerals, the Shona people express their condolences by shaking their hands with bereaved members and other mourners. The heritage tradition is called '*kubata maoko*' which translates to '*touching hands*' (Saidi, 2017). Expressing condolences is a part of mourning. After family procedures for preparing the deceased for burial, including ceremonial 'bathing' of the corpse, the mourners accompany the corpse to the internment (Mwandayi, 2011). They all contributed to the burial by taking turns covering the coffin in the grave with soil. After burial, all mourners were invited back home to a meal together. As they re-entered the homestead, all the people who would have gone to the graveyard were expected to wash their hands. In the past, they would wash in the same dish, and with modern scientific knowledge, someone would pour water for each wash (Kamwendo & Manyeruke, 2017). This observation points to people recognizing over generations that people can share pathogens through their hands during mourning and through tools during the burial process (Dzinamarira & Musuka, 2021). Mourning the dead in solidarity with their bereaved family through the rituals of *kubata maoko* (hand-touching) and meal sharing after the funeral is an African expression of *unhu/ubuntu*, that is what makes them *vanhu* (people/human beings) and part of *unhu* (humanity) (Mwandayi, 2011; Taringa & Chirongoma, 2023). While these

practices are not exclusive to African cultures, they are in this case part of an interconnective ontology of being human. Therefore, when there is bereavement, the community supports the living and respects the dead and conveys their condolences and sympathy through handshaking and in the community (Taringa & Chirongoma, 2023). This highlights that transferable pathogens are recognized in non-scientific cultural settings.

It is thus necessary to empower communities to take power over their health so that as they mourn and sympathize, they also ensure that they curtail the spread of pathogens driven by changing environmental health conditions, including droughts and heatwaves, by building capabilities for good health and well-being among them. In response to the 2023 cholera pandemic, the Zimbabwean government pronounced a blanket ban on serving food at funerals (Olatunji et al., 2024). While sharing of food could be one of the causes of the spread of the pathogen, the absence of food when Africans meet undermines their relationships. According to the Shona people '*Ukama igasva, hunozadzisa nekudya*,' 'A relationship is incomplete without sharing of food,' meaning that sharing of food during mourning is a heritage practice that helps with social cohesion, relevant to SDG11, sustainable cities, and communities (UN, 2015).

It is also important to examine the socioecological impacts of urbanization and how they impact the relationship between humans and microbes. Higher population density and impacts on waste management and pollution need to be considered when understanding how *Vibrio cholerae*, changes into pathogens and diseases, highlighting social and ecological factors. Forecasting pathogenicity and prevention include empowering people to take control of their health and well-being by addressing the socioecological factors driving pathogenicity and disease (Mandikonza et al., 2011). Preventing morbidity includes knowledge and practice of water and its well-being, basic hygiene and sanitation, as well as pathogenicity and disease. Mandikonza et al. (2011) observed that sewage-contaminated water flowed on the surface when underground sewage pipes broke. This 'dirty' water had the potential to invite vectors such as flies and had the potential to be in contact with people as it flowed on the surface. While municipalities are responsible for maintaining sanitation, residents need to develop capabilities to deal with burst pipes by reducing contact with sewage effluents and addressing transmission pathways. Droughts mean that water bodies receive less fresh water, making them brackish, thus changing environmental health conditions and driving the proliferation of *Vibrio cholerae*. Knowing how to relate to this water could save lives by drawing on cultural heritage knowledge to distinguish clean water from contaminated water. These are areas of food and hygiene practices that could be explored as part of building the resilience of the community to pathogenicity and disease by normalizing the relationship between humans and bacteria.

Many ongoing social practices in health care and Zimbabwean society have contributed to the reappearance of cholera since the 2008–2009 outbreak. The healthcare system faces a shortage of skilled and motivated health and weakening health infrastructure, including shortages of medicines undermining health information and health surveillance systems. When combined with dilapidated water and sanitation infrastructure, environmental conditions are created for poor health service delivery and stewardship (Chimusoro et al., 2016; UN, 2010). Drawing on Denyer Willis and Chandler (2019) and Dixon et al. (2021), cholera outbreaks can be interpreted as the result of social practices of the Zimbabwean government and communities enacted in the structures of health care, sanitation, and water. Reactive public health efforts focus on offsetting structural health challenges; that is, the results of social practices impacting the ecological and built environments of water bodies, groundwater, and water and sanitation systems. Such a reading of cholera outbreaks highlights the perpetuation of an (over) reliance on therapeutic and reactive health knowledge and practices as quick fixes to underperforming systems of health care and health governance, poor sanitation and water quality in Zimbabwe, and enduring vulnerabilities in the population to cholera infection, mortality, and morbidity.

The focus on public health responses to emerging outbreak risks undermines the use of mitigation strategies that could have addressed the more structural challenges in the Zimbabwean healthcare and water and sanitation systems generating repeated outbreaks (Chigudu, 2021; UN, 2010; WHO, 2021). As an anthropogenic problem (Lee & Motzkau, 2013), the health challenges of cholera have become integrated with challenges in the rest of society, including governance and equity. Neither the microbial world nor its consequences on human health are easily separated from the social conditions under which such health challenges emerge (UN, 2010; WHO, 2021). Public health responses and reactive treatment have partly replaced preventive health efforts, health care, policy decisions, responsiveness, technical sanitation, and water infrastructure, all of which are social practices that create microbial conditions for cholera outbreaks. The current outbreak can thus be seen as part of an ongoing cholera epidemic event, together with the outbreaks in 2008–2009 and 2018–2019, rather than discreet occurrences. While the social practices of government public health responses and therapeutic approaches during cholera outbreaks may seem singularly beneficial, the reading based on Yim et al. (2006)

Dixon et al. (2021) also highlighted another possibility. (Over)reliance on the public health system has shaped community practices around cholera outbreaks and the balance between preventive and therapeutic approaches. In addition, Chimusoro et al. (2016) and Chigudu (2021), every outbreak post-2012, and thus, in the waters of the efforts made to build the resilience of the Zimbabwean healthcare system, have been controlled. Consequently, while the fatal impacts of cholera outbreaks have improved over the 15 years from 2008 to 2009 to 2024, outbreaks continue to recur regularly, highlighting that the ecological conditions of droughts and heatwaves affecting environmental health and driving outbreaks are still in place, as well as the social practices that recreate the social-ecological relationships that precipitate these conditions. Thus, more efficient public health responses might cover and perpetuate inequalities in terms of access to sanitation, clean water, and preventive health measures, as well as de-emphasizing communities' role in normalizing the relationship with the *Vibrio cholerae* and the

microbial world in an ever-changing socio-ecological system. The impact of current social practices is further complicated when considering how the mortality and morbidity burden of cholera outbreaks largely follow socioeconomic lines, with south-eastern areas of Harare repeatedly showing the highest number of cases throughout the 15 years of outbreaks since 2008 (Chigudu, 2021; Chimusoro et al., 2016; Mashe et al., 2020).

These socioeconomic lines represent inequalities of Harare with the south-eastern areas characterised as low-income and have seen a persistent lack of investment by the government in water and sanitation infrastructure coupled with poor municipal service delivery leading to inadequate waste management. The consequence is that in contrast to more well-off northern areas, the south-east relies to a greater extent on unsafe water from wells and boreholes, driven by long periods of municipal water cuts. These challenges are also exacerbated by the prevalence of informal settlements. To this end, disparities in investment, as well as economic and social disadvantage, have resulted in communities in these areas of Harare being more vulnerable to recurrent outbreaks of waterborne pathogens like *Vibrio cholerae*, which drives an ongoing cycle of public health inequity linked to social structural and infrastructural challenges.

Discussion

The specific social practices of the empirical data this paper explores include the heritage approaches of communities preventing water bodies conducive to cholera bacteria through social norms and values, and preventing the spread of cholera through the social practice of hand washing. These practices were contrasted with the social practices of colonial approaches, in which the government treats contaminated water and cholera infections as contaminated digestive systems. As these social practices are grounded in different knowledge practices, they create different social-ecological relationships with the microbial world. The resulting dissonance between colonial health systems and heritage practices (Svalastog et al., 2015) can be addressed through the integration of heritage practices as part of government health education programs. This includes strengthening resilience with handwashing rituals and disease surveillance jointly managing and mitigating cholera outbreaks, enhancing adaptivity combining traditional water stewardship with water quality tests as part of responses to environmental change, and securing sustainability by having funeral practices balancing cultural norms and preventive health efforts (Ayling et al., 2023; Dzinamarira & Musuka, 2021; Jutla et al., 2015; Mashe et al., 2020). As highlighted in the case, the dissonance centers on the exclusion of heritage health knowledge and experts from preventive practices as traditional well-protection rituals were dismissed during the Zimbabwe 2008–2009 cholera outbreak while being shown to reduce contamination (Dalu et al., 2011; Mandikonza et al., 2011).

We differentiate short-term from long-term interactions between the human and microbial world, with short-term including emergency water treatment, that while addressing the immediate health challenge risks perpetuating dependency cycles (Denyer Willis & Chandler, 2019). Meanwhile, long-term interactions, such as intergenerational knowledge transfer, contributes to more sustainable socio-ecological balance (Zinsstag et al., 2024). This differentiation is reflected in how school programs, as examples of government health education, focused on handwashing techniques while not linking these to social and cultural practices, such as *kubata maoko* greetings, resulting in more limited adoption (Kamwendo & Manyeruke, 2017). A further example is how medical training promoted therapeutic responses over preventative efforts of addressing the environments that spread cholera, thus reflecting colonial knowledge hierarchies (Chigudu, 2021). Different knowledge practices (ways of knowing cholera) thus have ontologically real-world impacts on our relationship dynamics with the *Vibrio cholerae*. At the center of these dynamics is the development of pathogenic relationships with the *Vibrio cholerae*, for which we developed a layered model (Figure 1), arguing that cholera is the result of the breakdown of the relationship between humans and the microbial world through social practices, resulting in bacterial spread, exposure, infection, and ultimately the development of symptoms.

As seen in Figure 1, we can use the same layered model to show how social practices could normalise the social-ecological relationships both in water bodies and human bodies. Pathogenic relationships emerge across levels when interaction dynamics, i.e. relationships, break down. On the landscape level, this includes how water policies and practices grounded in the human world result in degrading ecological niches of microbiota, representing the microbial world with the subsequent spread of *Vibrio cholerae*. On the community level, disruptions of heritage preventive practices, such as handwashing, result in heightened exposure to contaminated waters as physical exchanges between the human and microbial worlds. Finally, on the bodily level, human practices resulting in malnutrition exacerbate susceptibility to cholera infections through bodily interactions with the microbial world. The idea of a living landscape involves a landscape with certain features. The aim of normalising the socio-ecological relationship is not to kill or eliminate *Vibrio cholerae* but to develop health educational efforts that can re-establish socio-ecological feedback between the human world and microbial world. This includes interactions that protect and restore water sources to sustain the microbiota there within, intergenerational knowledge transfer that adapts practices to shifts in climate and environment, as well as community and culture-centred hygiene and sanitation efforts. Thus, a landscape can be created in which both humans and the bacteria can exist without developing the pathological relationship outlined in the layered model. Such relationships as part of living landscapes represent sustainable health practices as they value microbial coexistence with cultural identity (Zinsstag et al., 2024). Oral rehydration therapy is just the last line of social practice to normalise the social-ecological relationship with the microbial world. There is much to do in terms of social practices to normalise the social-ecological relationships enacted in water bodies (rivers, groundwater, water

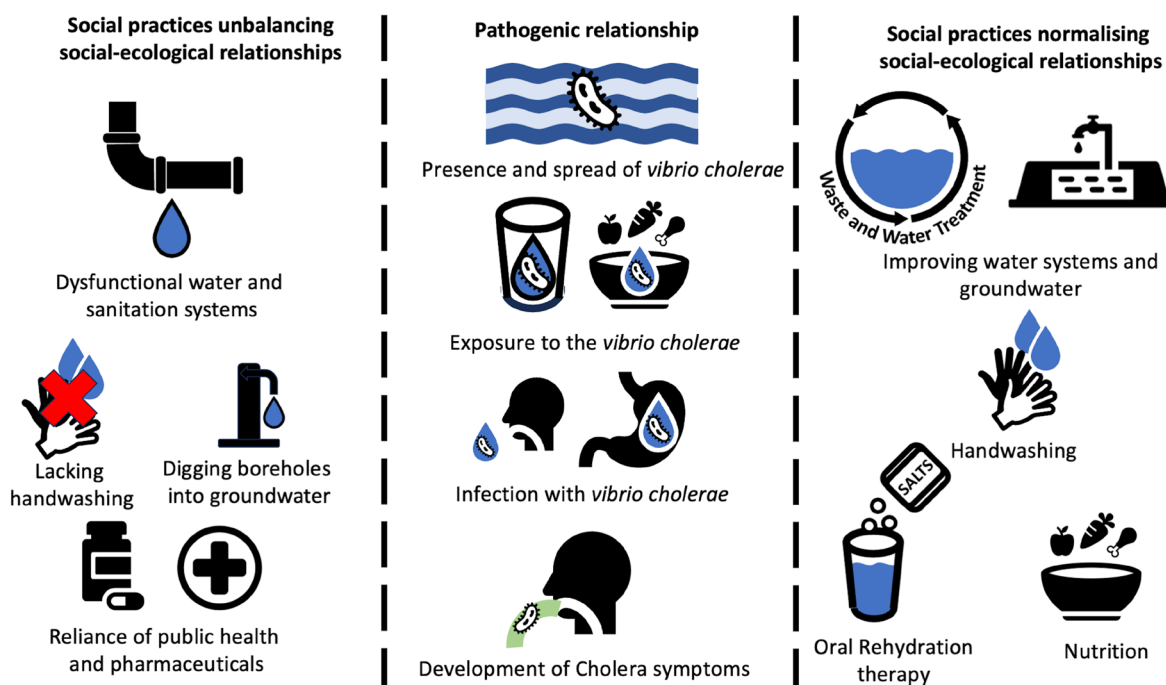


Figure 1. Cholera as the product of a breakdown of the relationship between humans and the microbial world.

distribution systems). There are also social practices to strengthen the bodily environment of the microbiome to become more resilient to develop a pathological relationship with *Vibrio cholerae*. A central concern is that overreliance on government leads to people and communities not engaging in preventive social practices of nutrition and hand washing. We have the layered model as a backdrop and then map the different social practices of communities and government onto it. Show how practices can normalise social-ecological relationships as well as skew the same relationships. It's all centred on addressing the development of a pathological relationship with the *Vibrio cholerae* leading to the symptoms of the cholera disease.

To further explore government and community practices, we detail public health responses and practices around drilling boreholes, as well as village practices of pour hand washing when coming into the homestead or village. To prevent the development of pathogenic relationships, we were able to identify several social practices normalizing the social-ecological relationship with *Vibrio cholerae*. First, a social practice by the government to prevent the existence of *Vibrio cholerae* leading to its proliferation is to normalize the environments of contaminated water bodies, including groundwater, by limiting the contamination of rivers and groundwater. Second, the government can also normalize the relationship by preventing the proliferation of *Vibrio cholerae*, leading to the spread and exposure to *Vibrio cholerae* by addressing the function of the water delivery system and waste treatment and management systems. Third, communities can use the social practice of hand washing and food preparation to prevent exposure to infection with *Vibrio cholerae*. From the results, we find how temperature affects *Vibrio cholerae*, with meals being effective if heated high and long enough (Ghosh & Ramamurthy, 2011), and how timing in terms of immediate eating of the food limits bacterial regrowth, while cultural and ritual norms strengthen adherence to these preventive food practices (Mandikonza et al., 2011). While important, these food practices are not sufficient without access to safe water, which was acknowledged in heritage knowledge systems, particularly related to droughts (Mandikonza et al., 2011).

Fourth, communities can prevent infections through diet, nutrition, and hydration, including food traditions such as fermented foods supporting gut microbiome, practice norms for food preparation and the use of sustained heat as well as hydration practices encompassing avoiding stagnant water. Crucially, how these practices contribute to prevention depends on how they are conducted, highlighting the need to sustain their social and cultural rationale through health education in addition to the actual practice.

Finally, to prevent cholera disease leading to morbidity and mortality, communities and governments can utilize the social practice of oral rehydration therapy as a way to normalize the microbiome environments of the infected human bodies and digestive systems.

As illustrated in this discussion, tensions between short- and long-term practices is linked a mismatch in knowledge systems where modern health education assumes linear knowledge transfer where formal education leads to behavior change, while we argue for more hybrid educational models, combining pairing school handwashing programs with intergenerational learning (Marques et al., 2021; Sturmberg, 2018).

While this paper contributes to knowledge on the integration of heritage and modern health knowledges in addressing cholera in Zimbabwe, there are limitations to the study's approach. Firstly, the reliance on documentary materials makes it more difficult to account for communities' experiences and health practices in response to climate change that is not published.

This includes the risk of underrepresenting the oral knowledges of heritage health knowledge experts. The results could have provided further depth by including data on community members' or healthcare practitioners' perspectives especially on the effectiveness of heritage practices. Secondly, the case study method provides contextual depth to Zimbabwean conditions with the socio-ecological dynamics of cholera being partially specific for the context. Meanwhile, this means that the paper's ability to reflect the diversity of health challenges and practices is more limited with implications for generalisability to other places and health challenges. This includes capturing the diversity of Indigenous health knowledges across the Southern African region. Thirdly, the paper raises the challenge of structural barriers that could affect the practical implementation of integrated health approaches. Together, these limitations illustrate the necessity for future research to provide additional depth by utilising participatory methods and breadth by utilising comparative research methods across places and cultural contexts.

Conclusion

This study aimed to explore social-ecological relational dynamics in health knowledge and practices in health education relating to the social practices of government and communities, and how the microbial world could be relationally normalized for better health and well-being of individuals and communities. To achieve SDG 3 Good health, there is a need to openly examine the relationship between health knowledge landscapes in the context of their application as a process that is integral to contextual knowledge and experience landscape. While modern health knowledge approaches have shown good response abilities, heritage-based health approaches can enhance the resilience of communities to pathogenicity and disease if they are brought into the mainstream health knowledge practice space. The paper illustrates how dissonance between health knowledges are due structural hierarchies, with heritage practices such as well-protection rituals being possible to combine with water quality testing as well as cultural practices such as sustained heating of food embody scientific approaches (Dalu et al., 2011; Ghosh & Ramamurthy, 2011). Such integration of heritage practices should acknowledge rationales regarding how heat and water play a key role in human-microbial world interactions. Furthermore, contextual limits need to be considered, such as water, sanitation and waste services, and be combined with biomedical understanding of cholera building on partnerships between health knowledge experts (Jutla et al., 2015; Maluleka & Ngoepe, 2019). There is thus a need to rebalance the modern approaches to health and well-being that accompany the changing conditions for environmental health in the southern African sub-region. This integrative approach has the potential to reposition health and human well-being from being responsive and expert-driven to preventative and community-led.

Crucially, calls for rebalancing modern approaches should not be taken to eliminate public health efforts and the need for therapeutic approaches in severe cholera cases. Rather, it entails understanding government-based public health responses as a tool for the promotion of health and well-being. The integration between the health knowledges is thus framed as a process of overcoming epistemological and policy hierarchies (Chigudu, 2021; Denyer Willis & Chandler, 2019). Social practices to address cholera are thus broadened to include communities engaging in preventive practices by themselves and in collaboration with the government to normalize social-ecological relationships with the microbial world, avoiding the development of pathogenic relationships with *Vibrio cholerae*. A curriculum process emphasizing ethics-led action learning focused on care would shift the focus towards living with the landscape, including the microbial world.

Authors' contributions

Conceptualization (Martin Mickelsson (MM), Caleb Mandikonza (CM), Rob O'Donoghue (RO)); Data curation (MM, CM, RO); Formal analysis (MM, CM, RO); Funding acquisition (MM); Investigation (MM, CM, RO); Methodology (MM, CM, RO); Project administration (MM) Resources (N/A) Software (MM); Supervision (N/A) Validation (MM, CM, RO) Visualization (MM) Writing (MM, CM, RO)—original draft Writing (MM, CM, RO)—review & editing (MM, CM, RO). All author contributions meet the Taylor and Francis authorship criteria. All authors approved the final version of the manuscript.

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Data availability statement

The data that support the findings of this study are available from the corresponding author [MM] upon reasonable request.

References

- Asadgol, Z., Badirzadeh, A., Niazi, S., Mokhayeri, Y., Kermani, M., Mohammadi, H., & Gholami, M. (2020). How climate change can affect cholera incidence and prevalence? A systematic review. *Environmental Science and Pollution Research International*, 27(28), 34906–34926. <https://doi.org/10.1007/s11356-020-09998-1>
- Austin, G. (2010). African economic development and colonial legacies. *Revue Internationale De Politique De Développement*, 1(1), 11–32. <https://doi.org/10.4000/poldev.78>
- Ayling, S., Milusheva, S., Maidei Kashangura, F., Hoo, Y. R., Sturrock, H., & Joseph, G. (2023). A stitch in time: The importance of water and sanitation services (WSS) infrastructure maintenance for cholera risk. A geospatial analysis in Harare, Zimbabwe. *PLoS Neglected Tropical Diseases*, 17(6), e0011353. <https://doi.org/10.1371/journal.pntd.0011353>
- Biggs, R., Clements, H. S., Cumming, G. S., Cundill, G., de Vos, A., Hamann, M., Luvuno, L., Roux, D. J., Selomane, O., Blanchard, R., Cockburn, J., Dziba, L., Esler, K. J., Fabricius, C., Henriksson, R., Kotschy, K., Lindborg, R., Masterson, V. A., Nel, J. L., ... Reyers, B. (2022). Social-ecological change: Insights from the Southern African program on ecosystem change and society. *Ecosystems and People*, 18(1), 447–468. <https://doi.org/10.1080/26395916.2022.2107476>
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>
- Bray, D. (2007). Knowledge ecosystems: A theoretical lens for organizations confronting hyperturbulent environments. In *Organizational dynamics of technology-based innovation: Diversifying the research agenda* (pp. 457–462). Springer US. https://doi.org/10.1007/978-0-387-72804-9_31
- Burger, R., & Christian, C. (2020). Access to health care in post-apartheid South Africa: Availability, affordability, acceptability. *Health Economics, Policy, and Law*, 15(1), 43–55. <https://doi.org/10.1017/S1744133119000048>
- Carrie, H., Mackey, T. K., & Laird, S. N. (2015). Integrating traditional indigenous medicine and western biomedicine into health systems: A review of Nicaraguan health policies and Miskitu health services. *International Journal for Equity in Health*, 14(1), 129. <https://doi.org/10.1186/s12939-015-0260-1>
- Chandler, C. I. R., Hutchinson, E., Hutchinson, C. (2016). Addressing antimicrobial resistance through social theory: An anthropologically oriented report. London School of Hygiene & Tropical Medicine. <http://www.lshtm.ac.uk/php/ghd/research/app/anthropologyofantimicrobial>
- Charnley, G. E., & Kelman, I. (2024). Perspectives on climate change and infectious disease outbreaks: is the evidence there?. *npj Climate Action*, 3(1), 61.
- Chatwood, S., Paulette, F., Baker, G. R., Eriksen, A. M. A., Hansen, K. L., Eriksen, H., Hiratsuka, V., Lavoie, J., Lou, W., Mauro, I., Orbinski, J., Pambrun, N., Retallack, H., & Brown, A. (2017). Indigenous values and health systems stewardship in circumpolar countries. *International Journal of Environmental Research and Public Health*, 14(12), 1462. <https://doi.org/10.3390/ijerph14121462>
- Chigudu, S. (2021). *The political life of an epidemic: Cholera, crisis, and citizenship in Zimbabwe*. Cambridge University Press. <https://doi.org/10.1002/wmh3.410>
- Chimusoro, A., Maphosa, S., Manangazira, P., Phiri, I., Midzi, S. M., Danda, S., Tapfumane, O., & Nabyonga-Orem, J. (2016). Responding to cholera outbreaks in Zimbabwe: Building resilience over time. *Current Issues in Global Health*, 1, 21.
- Cilliers, S. S., Siebert, S. J., Du Toit, M. J., Barthel, S., Mishra, S., Cornelius, S. F., & Davoren, E. (2018). Garden ecosystem services of Sub-Saharan Africa and the role of health clinic gardens as social-ecological systems. *Landscape and Urban Planning*, 180, 294–307. <https://doi.org/10.1016/j.landurbplan.2018.09.006>
- Conte, B. (2022). *Climate change and migration. The Case of Africa*.
- Corso, M., DeSouza, A., Brunton, G., Yu, H., Cancelliere, C., Mior, S., Taylor-Vaisey, A., MacLeod-Beaver, K., & Côté, P. (2022). Integrating indigenous healing practices within collaborative care models in primary healthcare in Canada: A rapid scoping review. *BMJ Open*, 12(6), e059323. <https://doi.org/10.1136/bmjopen-2021-059323>
- Dalu, T., Barson, M., & Nthiatiwa, T. (2011). Impact of intestinal microorganisms and protozoan parasites on drinking water quality in Harare. *Journal of Water, Sanitation and Hygiene for Development*, 1(3), 153–163. <https://doi.org/10.2166/washdev.2011.027>
- Daniels, S., & Cowell, B. (2011). Living landscapes. In *The public value of the humanities* (pp. 105–117). Bloomsbury.
- Davis, D. K. (2016). *The arid lands: History, power, knowledge*. MIT Press.
- de Sousa Santos, B. (2007). Beyond abyssal thinking: From global lines to ecologies of knowledges. *Review (Fernand Braudel Center)*, 30(1), 45–89.
- Delius, P., Maggs, T., & Schoeman, M. (2012). Bokoni: Old structures, new paradigms? rethinking pre-colonial society from the perspective of the stone-walled sites in Mpumalanga. *Journal of Southern African Studies*, 38(2), 399–414. <https://doi.org/10.1080/03057070.2012.682842>
- Denyer Willis, L., & Chandler, C. (2019). Quick fix for care, productivity, hygiene and inequality: Reframing the entrenched problem of antibiotic over-use. *BMJ Global Health*, 4(4), e001590. <https://doi.org/10.1136/bmjgh-2019-001590>
- Department of Water and Sanitation (South Africa). (2023). Blue Drop Watch Report 2023. <https://ws.dws.gov.za/IRIS/releases/BDWR.pdf>
- Dixon, J., Manyau, S., Kandiye, F., Kranzer, K., & Chandler, C. I. R. (2021). Antibiotics, rational drug use and the architecture of global health in Zimbabwe. *Social Science & Medicine* (1982), 272, 113594. <https://doi.org/10.1016/j.socscimed.2021.113594>
- Dzinamarira, T., & Musuka, G. (2021). When culture, traditions and public health clash: A paradigm shift urgently needed to stem the spread of COVID-19 in Zimbabwe. *South African Medical Journal*, 111(4), 279. <https://doi.org/10.7196/SAMJ.2021.v111i4.15484>
- Echenberg, M. J. (2011). *Africa in the time of cholera: A history of pandemics from 1817 to the present*. Cambridge University Press.
- Finn, B. M., & Cobbinah, P. B. (2023). African urbanisation at the confluence of informality and climate change. *Urban Studies*, 60(3), 405–424. <https://doi.org/10.1177/00420980221132115>
- Flyvbjerg, B. (2006). Five Misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219–245. <https://doi.org/10.1177/1077800405284363>
- Ghosh, A., & Ramamurthy, T. (2011). Antimicrobials & cholera: Are we stranded? *The Indian Journal of Medical Research*, 133(2), 225–231.
- Greenwood, M., & Lindsay, N. M. (2019). A commentary on land, health, and Indigenous knowledge(s). *Global Health Promotion*, 26(3_suppl), 82–86. <https://doi.org/10.1177/1757975919831262>
- Gwenzi, W., & Sanganyado, E. (2019). Recurrent cholera outbreaks in Sub-Saharan Africa: Moving beyond epidemiology to understand the environmental reservoirs and drivers. *Challenges*, 10(1), 1. <https://doi.org/10.3390/challe10010001>

- Hamann, M., Biggs, R., Pereira, L., Preiser, R., Hichert, T., Blanchard, R., Warrington-Coetzee, H., King, N., Merrie, A., Nilsson, W., Odendaal, P., Poskitt, S., Sanchez Betancourt, D., & Zervogel, G. (2020). Scenarios of good anthropocenes in southern Africa. *Futures*, 118, 102526. <https://doi.org/10.1016/j.futures.2020.102526>
- Harb, Y., Al-Sulaiti, K. J., & Al-Karaghoul, W. (2021). Managing knowledge workers in healthcare context: Role of individual and knowledge characteristics in physicians' knowledge sharing. *Industrial management & data systems* 121(2), 381–408. <https://doi.org/10.1108/IMDS-05-2020-0271>
- Haywood, L. K., Kapwata, T., Oelofse, S., Breetzke, G., & Wright, C. Y. (2021). Waste disposal practices in low-income settlements of South Africa. *International Journal of Environmental Research and Public Health*, 18(15), 8176. <https://doi.org/10.3390/ijerph18158176>
- Jutla, A., Whitcombe, E., Hasan, N., Haley, B., Akanda, A., Huq, A., Alam, M., Sack, R. B., & Colwell, R. R. (2015). Satellite based assessment of hydroclimatic conditions related to cholera in Zimbabwe. *PloS One*, 10(9), e0137828. <https://doi.org/10.1371/journal.pone.0137828>
- Kamwendo, L. M., & Manyeruke, C. (2017). Power politics during and after funerals amidst the Shona of Zimbabwe. *Africology: The Journal of Pan African Studies*, 10(2), 151–164.
- Kannampallil, T. G., Schauer, G. F., Cohen, T., & Patel, V. L. (2011). Considering complexity in healthcare systems. *Journal of Biomedical Informatics*, 44(6), 943–947. <https://doi.org/10.1016/j.jbi.2011.06.006>
- Koon, A. D., Windmeyer, L., Bigdeli, M., Charles, J., El Jardali, F., Uneke, J., & Bennett, S. (2020). A scoping review of the uses and institutionalisation of knowledge for health policy in low- and middle-income countries. *Health Research Policy and Systems*, 18(1), 7. <https://doi.org/10.1186/s12961-020-0523-1>
- Lee, N., & Motzkau, J. (2013). Varieties of biosocial imagination: Reframing responses to climate change and antibiotic resistance. *Science, Technology, & Human Values*, 38(4), 447–469. <https://doi.org/10.1177/0162243912473162>
- Malapane, O. L., Musakwa, W., Chanza, N., & Radinger-Peer, V. (2022). Bibliometric analysis and systematic review of indigenous knowledge from a comparative African perspective: 1990–2020. *Land*, 11(8), 1167. <https://doi.org/10.3390/land11081167>
- Maluleka, J. R., & Ngoepe, M. (2019). Integrating traditional medical knowledge into mainstream healthcare in Limpopo Province. *Information Development*, 35(5), 714–723. <https://doi.org/10.1177/0266666918800110>
- Mandikonza, C., Musindo, B., & Taylor, J. (2011). Cholera in Zimbabwe: Developing an educational response to a health crisis. *Journal of Education for Sustainable Development*, 5(1), 17–25. <https://doi.org/10.1177/097340821000500106>
- Marques, B., Freeman, C., & Carter, L. (2021). Adapting traditional healing values and beliefs into therapeutic cultural environments for health and well-being. *International Journal of Environmental Research and Public Health*, 19(1), 426. <https://doi.org/10.3390/ijerph19010426>
- Mashe, T., Chaibva, B. V., Nair, P., Sani, K. A., Jallow, M., Tarupiwa, A., Goredema, A., Munyanyi, M., Chimusoro, A., Mpala, N., Masunda, K. P. E., Duri, C., Chonzi, P., & Phiri, I. (2023). Descriptive epidemiology of the cholera outbreak in Zimbabwe 2018–2019: Role of multi-sectorial approach in cholera epidemic control. *BMJ Open*, 13(1), e059134. <https://doi.org/10.1136/bmjopen-2021-059134>
- Mashe, T., Domman, D., Tarupiwa, A., Manangazira, P., Phiri, I., Masunda, K., Chonzi, P., Njamkepo, E., Ramudzulu, M., Mtapuri-Zinyowera, S., Smith, A. M., & Weill, F.-X. (2020). highly resistant cholera outbreak strain in Zimbabwe. *The New England Journal of Medicine*, 383(7), 687–689. <https://doi.org/10.1056/NEJMc1914703>
- Mbiyozo, A.-N, Institute for Security Studies. (2022). The role of colonialism in creating and perpetuating statelessness in Southern Africa. *African Human Mobility Review*, 8(3), 75–93. <https://doi.org/10.14426/ahmr.v8i3.1129>
- McCartney, G., Popham, F., McMaster, R., & Cumbers, A. (2019). Defining health and health inequalities. *Public Health*, 172, 22–30. <https://doi.org/10.1016/j.puhe.2019.03.023>
- Mhazo, A. T., & Maponga, C. C. (2022). The political economy of health financing reforms in Zimbabwe: A scoping review. *International Journal for Equity in Health*, 21(1), 42. <https://doi.org/10.1186/s12939-022-01644-1>
- Mickelsson, M., Usai, T., Chinofunga, D., & Oljans, E. (2023). Health communication for AMR behaviour change: Zimbabwean students' relationships with the microbial world. *JAC-Antimicrobial Resistance*, 5(6), dlad133.
- Morton Ninomiya, M. E., Maddox, R., Brascoupé, S., Robinson, N., Atkinson, D., Firestone, M., Ziegler, C., & Smylie, J. (2022). Knowledge translation approaches and practices in Indigenous health research: A systematic review. *Social Science & Medicine* (1982), 301, 114898–114898. <https://doi.org/10.1016/j.socscimed.2022.114898>
- Moyo, H. (2023). The Nguni traditional 'religious' thoughts. In *Diversifying philosophy of religion: Critiques, methods and case studies* (p. 218). Bloomsbury Publishing.
- Mupara, L. M., Mogaka, J. J. O., Brieger, W. R., & Tsoka-Gwegweni, J. M. (2023). Community health worker programmes' integration into national health systems: Scoping review. *African Journal of Primary Health Care & Family Medicine*, 15(1), e1–e16. <https://doi.org/10.4102/phcfm.v15i1.3828>
- Mwandayi, C. (2011). *Death and after-life rituals in the eyes of the Shona: Dialogue with Shona Customs in the quest for authentic inculturation*. University of Bamberg Press.
- Olatunji, G., Kokori, E., Moradeyo, A., Olatunji, D., Ajibola, F., Otolorin, O., & Aderinto, N. (2024). A perspective on the 2023 cholera outbreaks in Zimbabwe: Implications, response strategies, and policy recommendations. *Journal of Epidemiology and Global Health*, 14(1), 243–248. <https://doi.org/10.1007/s44197-023-00165-6>
- Ooms, G., Brolan, C., Eggermont, N., Eide, A., Flores, W., Forman, L., Friedman, E. A., Gebauer, T., Gostin, L. O., Hill, P. S., Hussain, S., McKee, M., Ottersen, T., Røttingen, J.-A., & Waris, A. (2018). Addressing the fragmentation of global health: The lancet commission on synergies between universal health coverage, health security, and health promotion. *Lancet (London, England)*, 392(10153), 1098–1099. [https://doi.org/10.1016/S0140-6736\(18\)32072-5](https://doi.org/10.1016/S0140-6736(18)32072-5)
- Owen, G. T. (2014). Qualitative methods in higher education policy analysis: Using interviews and document analysis. *The Qualitative Report*, 19(26), 1–19. <https://doi.org/10.46743/2160-3715/2014.1011>
- Potts, D. (2016). Debates about African urbanisation, migration and economic growth: What can we learn from Zimbabwe and Zambia? *The Geographical Journal*, 182(3), 251–264. <https://doi.org/10.1111/geoj.12153>
- Priya, A. (2021). Case study methodology of qualitative research: Key attributes and navigating the conundrums in its application. *Sociological Bulletin*, 70(1), 94–110. <https://doi.org/10.1177/0038022920970318>
- Ray, S., Goronga, T., Chigiya, P. T., & Madzimbamuto, F. D. (2022). Climate change, disaster management and primary health care in Zimbabwe. *African Journal of Primary Health Care & Family Medicine*, 14(1), e1–e3. <https://doi.org/10.4102/phcfm.v14i1.3640>
- Rebaudet, S., Sudre, B., Faucher, B., & Piarroux, R. (2013). Environmental determinants of cholera outbreaks in Inland Africa: A systematic review of main transmission foci and propagation routes. *The Journal of Infectious Diseases*, 208 (suppl_1), S46–S54. <https://doi.org/10.1093/infdis/jit195>

- Rizvi, D. S. (2022). Health education and global health: Practices, applications, and future research. *Journal of Education and Health Promotion*, 11(1), 262. https://doi.org/10.4103/jehp.jehp_218_22
- Rounsevell, M. D. A., Arneth, A., Brown, C., Cheung, W. W. L., Gimenez, O., Holman, I., Leadley, P., Luján, C., Mahevas, S., Maréchaux, I., Péliissier, R., Verburg, P. H., Vieilledent, G., Wintle, B. A., & Shin, Y.-J. (2021). Identifying uncertainties in scenarios and models of socio-ecological systems in support of decision-making. *One Earth*, 4(7), 967–985. <https://doi.org/10.1016/j.oneear.2021.06.003>
- Saidi, U. (2017). Agonya neiko mfanha uyu? Of death and funerals: A semiotic exploration of the Shona funeral ritual in Zimbabwe. *African Identities*, 15(4), 353–366. <https://doi.org/10.1080/14725843.2017.1319753>
- Schlüter, M., Biggs, R., Clements, H., de Vos, A., & Maciejewski, K. (2015). Reflections on building resilience—interactions among principles and implications for governance. In *Principles for building resilience* (pp. 251–282). Cambridge University Press.
- Simons, H. (2015). Interpret in context: Generalizing from the single case in evaluation. *Evaluation*, 21(2), 173–188. <https://doi.org/10.1177/1356389015577512>
- Stec, J., Kosikowska, U., Mendrycka, M., Stępień-Pyśniak, D., Niedźwiedzka-Rystwej, P., Bębnowska, D., Hryniewicz, R., Ziętara-Wysocka, J., & Grywalska, E. (2022). Opportunistic pathogens of recreational waters with emphasis on antimicrobial resistance: A possible subject of human health concern. *International Journal of Environmental Research and Public Health*, 19(12), 7308. <https://doi.org/10.3390/ijerph19127308>
- Steiner, F. R. (2012). *The living landscape: An ecological approach to landscape planning*. Island Press.
- Sturmberg, J. P. (2018). Knowledge translation in healthcare - towards understanding its true complexities comment on 'using complexity and network concepts to inform healthcare knowledge translation'. *International Journal of Health Policy and Management*, 7(5), 455–458. <https://doi.org/10.15171/ijhpm.2017.138>
- Svalastog, A. L., Allgaier, J., & Gajović, S. (2015). Navigating knowledge landscapes: On health, science, communication, media, and society. *Croatian Medical Journal*, 56(4), 321–323. <https://doi.org/10.3325/cmj.2015.56.321>
- Swedish Research Council. (2017). Good Research Practice.
- Taringa, B., & Chirongoma, S. (2023). Unpacking and repackaging the shona funeral and post-burial rites in the context of the novel coronavirus (COVID-19) in Zimbabwe. In *Religion and COVID-19 vaccination in Zimbabwe* (pp. 43–69). Routledge.
- Thomas, E., & Magilvy, J. K. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing*, 16(2).
- Tompson, A. C., Manderson, L., & Chandler, C. I. R. (2021). Understanding antibiotic use: Practices, structures and networks. *JAC-Antimicrobial Resistance*, 3(4), dlab150. <https://doi.org/10.1093/jacamr/dlab150>
- United Nations (UN). (2010). OCHA annual report 2009. *UN Office for the Coordination of Humanitarian Affairs*, <https://doi.org/10.1093/iclqaj/24.3.577>
- United Nations (UN). (2015). Transforming our world: The 2030 agenda for sustainable development. UN General Assembly Resolution, A/RES/70/(1) <https://www.refworld.org/docid/57b6e3e44.html>
- van Druten, V. P., Bartels, E. A., van de Mheen, D., de Vries, E., Kerckhoffs, A. P. M., & Nahar-van Venrooij, L. M. W. (2022). Concepts of health in different contexts: A scoping review. *BMC Health Services Research*, 22(1), 389. <https://doi.org/10.1186/s12913-022-07702-2>
- World Health Organization (WHO). (2015). *Connecting global priorities: Biodiversity and human health*. WHO Press. <https://doi.org/10.13140/RG.2.1.3679.6565>
- World Health Organization (WHO). (2021). Zimbabwe Multi-Sectoral Cholera Elimination Plan 2018–2028.
- World Health Organization (WHO). (2024). Multi-Country Outbreak of Cholera: External Situation Report No. 15 (19 June 2024). <https://www.who.int/publications/m/item/multi-country-outbreak-of-cholera-external-situation-report-15-19-june-2024>
- Xiao, T., Oppenheimer, M., He, X., & Mastroiillo, M. (2022). Complex climate and network effects on internal migration in South Africa revealed by a network model. *Population and Environment*, 43(3), 289–318. <https://doi.org/10.1007/s11111-021-00390-w>
- Yim, G., Wang, H. H., & Davies, J. (2006). The truth about antibiotics. *International Journal of Medical Microbiology: IJMM*, 296(2–3), 163–170. <https://doi.org/10.1016/j.ijmm.2006.01.039>
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). SAGE.
- Zinsstag, J., Meyer, J. M., Bonfoh, B., Fink, G., & Dimov, A. (2024). One health in human-environment systems: Linking health and the sustainable use of natural resources. *CABI One Health*. <https://doi.org/10.1079/cabionehealth.2024.0012>