Chapter 5
Global COVID-19 Pandemic: A Strategic Opportunity for Operationalizing One Health Approach in Zimbabwe

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Abstract One Health (OH) is an integrated and holistic approach for prevention and control of infectious diseases at the human-animal-ecosystem interface. The OH approach recognizes the interconnectedness and interdependency of humans, animals, and environmental health. The on-going COVID-19 pandemic has served as a reminder on the importance of OH, thereby providing an opportunity to operationalize the OH approach in response to the current and future pandemics. The purpose of this chapter is to assess the prospects and constraints of operationalizing OH approach in Zimbabwe. The chapter is based on desktop research, focusing on peer-reviewed journal articles and official government documents such as policy documents, budget statements, and progress reports. The results show that Zimbabwe is not currently prioritizing the operationalization of the OH approach. The opportunities of implementing the OH approach include an existing supporting legal and institutional framework and open-source database management systems and geospatial technology. The constraints include resource-limited public and animal health systems, water and sanitation challenges, and increased human-domestic animal-wildlife interactions.

Keywords One Health · Human-animal-ecosystem interface · Infectious diseases · Operationalize

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5.1 Introduction

The on-going COVID-19 pandemic has reinforced the importance of One Health (OH) approach as a response strategy for reducing health risks at human-animal-ecosystem interface (Ruckert et al., 2020). Globally, there is an increase of emerging and re-emerging zoonoses, accounting for 70% of emerging infectious diseases (World Bank, 2012). On average, there is a new infectious disease emerging in humans every 4 months (UNEP, 2016). Zoonoses are infectious diseases caused by pathogens such as bacteria, viruses, fungi, and macro-parasites which are naturally transmissible between humans and animals (Deem & Brenn-White, 2020). Spillover events are happening at an escalating rate (Deem & Brenn-White, 2020), and most of the infectious diseases originate in wildlife, with domestic animals often serving as an epidemiological bridge between wildlife and human infections (UNEP, 2016).

There are several emerging zoonotic diseases that have made world headlines over the last few years which include Middle East respiratory syndrome (MERS), Rift Valley fever, severe acute respiratory syndrome (SARS), Ebola, West Nile virus, bird flu, and Zika virus disease (UNEP, 2016). There are also neglected zoonoses which are less headline-grabbing, such as anthrax, bovine tuberculosis, rabies, and several parasitic diseases (UNEP, 2016; World Bank, 2012). These zoonoses outbreaks have shown the interdependence of human health, animal health, and ecosystem health (Destoumieux-Garzón et al., 2018).

There are several factors responsible for the emergence and re-emergence of infectious diseases, and most of these factors are closely interlinked with ecosystem's health (UNEP, 2016). The main risk factors of infectious diseases are associated with ecological disturbances or environmental changes such as climate change, habitat destruction and fragmentation, environmental pollution, illegal trade in wildlife, and growing antimicrobial resistance (Calistri et al., 2013; de Macedo Couto & Brandespim, 2020; UNEP, 2016; World Bank, 2012). The West African Ebola outbreak was triggered by deforestation that resulted in an overlap of human and wildlife habitats (Jorwal et al., 2020). Although not yet conclusive, circumstantial evidence available links the origin of COVID-19 virus to Wuhan wet markets which are hotspots for spillover events (Bonilla-Aldana et al., 2020; Fasina et al., 2021).

Zoonotic diseases pose a threat to animal and human well-being, economic development, and ecosystem integrity (UNEP, 2016). Without effective response, zoonoses outbreaks can result in pandemics with potentially devastating impacts at global scale (World Bank, 2012). Pandemics greatly affect health systems, economies, and global health security (Buregyeya et al., 2020; Ruckert et al., 2020), and infectious diseases are also a threat to wildlife conservation (Cunningham et al., 2017a). The magnitude and impact of the on-going COVID-19 pandemic is unprecedented in modern times (Häsler et al., 2020).

Effective response to zoonosis health threat needs a forward-looking and coordinated approach in the detection, prevention, and control of emerging and re-emerging infectious diseases at the human-animal-ecosystem interface (Gruetzmacher et al.,

2021). Prevention and control of zoonosis pandemics requires a holistic approach to health risks at the human-animal-ecosystem interface, such as the integrated OH approach (Buregyeya et al., 2020; Schmiege et al., 2020; World Bank, 2012). The OH approach recognizes the interconnectedness and interdependency of the humans, animals, and environmental health, and in turn it offers a more integrated, holistic, and proactive response to zoonoses (Buregyeya et al., 2020; Kelly et al., 2020).

Despite strong advocacy for OH approach, its practical implementation remains limited across the globe (Kelly et al., 2020; Ruckert et al., 2020), and its influence on most operational health policies has been insignificant (Jorwal et al., 2020). The on-going COVID-19 pandemic is expected to significantly influence the broader implementation of OH programmes (Fasina et al., 2021). Scientists had predicted the pandemic; however, little was done in response, and consequently, the world has witnessed the exorbitant cost of inaction (Gruetzmacher et al., 2021). The impacts of the pandemic could have been greatly reduced by adopting a precautionary OH approach to hazards and coordinating in advance a global preparedness plan that bridged all the normal sectoral and disciplinary silos (Gruetzmacher et al., 2021). The current COVID-19 pandemic has brought enormous multifaceted impacts, but it also provides an opportunity to operationalize the OH approach in response to the current and future pandemic (Deem & Brenn-White, 2020). It is under this background that this study seeks to assess the prospects and constraints of operationalizing the OH approach in Zimbabwe.

5.2 One Health Concept

The OH concept originates from the "One Medicine" concept, which recognized the intersection of human and veterinary medicine in response to zoonoses (Destoumieux-Garzón et al., 2018; Jorwal et al., 2020). After the outbreak of SARS in 2003, the "One Medicine" concept evolved into an improved all-inclusive "One World – One Health" concept or simply "One Health" (Jorwal et al., 2020). The novelty was the incorporation of the ecosystem health (Destoumieux-Garzón et al., 2018). Therefore, the OH concept is based on the knowledge that human and animal health are interdependent and connected to the ecosystem's health (OIE, 2021).

There is no single, internationally agreed definition of OH, although several have been suggested (Mackenzie et al., 2014). The most commonly used definition is by the American Veterinary Medical Association (AVMA) which defines OH as "collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and our environment" (King et al., 2008, p. 260).

Although there are several definitions of OH, some common salient features can be drawn from these definitions:

- Holistic and integrated approach that recognizes the inextricable interconnectedness and interdependency of human, animal, and environmental (natural and

Fig. 5.1 OH Conceptual Framework. (Source: Centers for Disease Control and Prevention [CDC] (2022))

built) health (Buregyeya et al., 2020; de Macedo Couto & Brandespim, 2020; Mackenzie et al., 2014).
- Proactive and forward-looking approach for detection, prevention, monitoring, control, and mitigation of emerging/re-emerging diseases at the human-animal-ecosystem interface (Gruetzmacher et al., 2021; World Bank, 2012).
- Coordinated and collaborative approach: multi- and cross-sectoral and multi- and interdisciplinary approach (Fasina et al., 2021; Kelly et al., 2020; Mackenzie et al., 2014).
- Multi-scale approach: action at global, regional, national, and subnational/local levels (King et al., 2008).

These key features of OH concept are reflected in the Berlin Principles formulated in 2019 which were adopted at the "One Planet, One Health, One Future" conference. The Berlin Principles updated the Manhattan Principle through the reintegration of ecosystem health and integrity while also addressing the current pressing issues of climate change and antimicrobial resistance (Gruetzmacher et al., 2021). An illustrative conceptual framework of OH (Fig. 5.1) also captures the salient components of the concept.

5.2.1 Benefits of One Health Approach

OH approach has several benefits highlighted in literature which include the following:

- Investment in OH schemes for zoonoses response has significant benefits, and the required OH investments are modest when compared to the costs of zoonoses outbreaks under the business-as-usual approach (World Bank, 2012).

- Increasing coordination and collaboration reduces the gaps and removes unnecessary duplication of responsibility among the human, animal, and environmental health systems (Kelly et al., 2020; World Bank, 2012). The approach helps in breaking sectoral and disciplinary silos which affects the timely and effective disease outbreak response (Häsler et al., 2020).
- OH approach addresses multifaceted health issues and risk factors at the human-animal-ecosystem interface, thereby enhancing resilience of systems (Agrimi et al., 2021).
- The OH approach improves human, animal, and ecosystems health at different scales (global, national, and local) through collaboration among all the health sciences (King et al., 2008).

5.3 One Health in Practice

In recent years, OH has gained considerable recognition which has led to the adoption of several OH initiatives across the globe (Fasina et al., 2021; Kelly et al., 2020). The key features of these OH initiatives include coordination, capacity building, information sharing, tool development and collaborative research (Fasina et al., 2021), resources (e.g. laboratory) sharing, and the application of an evaluation framework (Mackenzie et al., 2014). There are multiple best case practices of OH at global and regional level.

5.3.1 Global Level

At global scale, the operationalization of OH concept is being led by the UN agencies, namely, the World Health Organization (WHO), World Organisation for Animal Health (OIE), and Food and Agriculture Organization (FAO). These UN agencies came up with a tripartite agreement on allocation of tasks and coordination of international activities aimed at solving health risks at the animal-human-ecosystem interfaces (World Bank, 2012). However, the effectiveness of this collaboration among the three UN agencies (WHO, OIE, and FAO) is being affected by some differences in scope, priorities, and resources (Mackenzie et al., 2014).

There are several countries across the globe that have established national OH units within or supported by government and varying in scope and resources (Mackenzie et al., 2014). Canada is one of the few countries that have implemented the OH approach with much success, by integrating the human and veterinary diagnostic services at different levels that include the administration, laboratory research, and emergency response (World Bank, 2012). Another good example of OH working in practice is found in Mongolia, where coordination platforms which were set up between human and animal health sectors are proving effective in managing food safety and emergency disease issues (Mackenzie et al., 2014).

The US Agency for International Development (USAID) is engaged in a key global OH initiative focused on establishing an international early warning system for pathogens with spillover potential (World Bank, 2012). In 2009, PREDICT, a project of USAID's Emerging Pandemic Threats (EPT) programme, was launched to enhance global capacity for surveillance of zoonotic viruses with pandemic potential (USAID, 2014). PREDICT has been implemented in 31 countries and has significantly strengthened the capacity for early detection and discovery of new and known viruses (USAID, 2014). These achievements are being attained through working in collaboration with relevant stakeholders that include government departments, non-government organizations (NGOs), and research institutions and local organizations (Kelly et al., 2020; USAID, 2014).

There are also cases where OH approach is being used in response to the ongoing COVID-19 pandemic. For example, in New South Wales, state authorities worked in collaboration with animal health veterinarians and epidemiologists with the aim of leveraging disease outbreak knowledge and offering technical support structures for application to the COVID-19 emergency (Häsler et al., 2020).

5.3.2 Regional Level

There has been extensive adoption of OH in sub-Saharan Africa, evidenced by 291 OH initiatives across the region (Fasina et al., 2021). Some countries in the region, such as Uganda, are considered as hotspots for infectious disease epidemics due to several outbreaks of diseases which include Ebola, Marburg, plague, Rift Valley fever, yellow fever, and Crimean-Congo haemorrhagic fever (Buregyeya et al., 2020). In response to these public health threats, Uganda embraced the OH approach to improve its capacity to respond effectively to possible outbreaks through prevention and control of infectious diseases. The achievements include formation of a multi-sectoral National One Health platform, the National OH Strategic Plan, and OH communication strategy aimed at strengthening engagement across sectors and stakeholders (Buregyeya et al., 2020).

In Kenya, FAO through the Global Health Security Agenda's Zoonotic Diseases and Animal Health in Africa (GHSA-ZDAH) funded by the USAID has promoted several OH initiatives through policy formulation, staff training, capacity building in national veterinary laboratories, and disease surveillance (Fasina et al., 2021). There are also innovative OH partnerships that have been established in the region with the support of different institutions from developed nations. These partnerships include the South African Centre for Infectious Disease Surveillance (SACIDS) focused at improving the region's capacity in zoonotic disease surveillance and early detection, diagnosis, and control and the One Health Central and East Africa (OHCEA 2013), a partnership of 14 institutions of public and veterinary health in Ethiopia, Democratic Republic of the Congo, Kenya, Tanzania, and Uganda (Mackenzie et al., 2014).

Rwanda successfully integrated OH into its response systems to infectious diseases and to COVID-19 pandemic (Igihozo et al., 2022; Karim et al., 2021). Some of the major achievements include the formulation of OH strategic plans and policies, incorporation of OH into higher and tertiary education curriculum, development of multi-disciplinary rapid response teams, and decentralization of animal and human health laboratories to strengthen surveillance (Igihozo et al., 2022). To address COVID-19, Rwanda crafted in advance a National Preparedness and Response Plan and set up a multi-sectoral COVID-19 Joint Task Force to coordinate the response to the pandemic (Igihozo et al., 2022; Karim et al., 2021). Rwanda managed to expeditiously implement OH-informed response to COVID-19 through the use of existing OH structures (Igihozo et al., 2022).

The One Health Research, Education and Outreach Centre in Africa (OHRECA) is another OH initiative being implemented in response to COVID-19 pandemic. OHRECA was established in 2020 to promote networking, knowledge sharing, critical OH thinking, and applied research in the region (Fasina et al., 2021). There is also the African OH University Network that brings together members from health and research institutions from eight nations with the aim of providing a virtual platform for knowledge exchange on COVID-19 response (Häsler et al., 2020).

5.3.3 One Health Implementation Challenges and Gaps

Despite this broad support, implementing OH approaches in practice still proves challenging (Kelly et al., 2020; Fasina et al., 2021). Fasina et al. (2021) provide a comprehensive review of the challenges and gaps affecting OH initiative in sub-Saharan Africa. Some of the challenges highlighted by Fasina et al. (2021) include poor communication and information sharing among OH stakeholders; limited capacities (financial, technical expertise, technology infrastructure, and laboratory services); overreliance on external funding; economic and socio-political instabilities/insecurities; and limited OH operational research.

Numerous studies (e.g. Destoumieux-Garzón et al., 2018; Fasina et al., 2021; Mackenzie et al., 2014; Schmiege et al., 2020) have highlighted that several OH initiatives have failed to adequately include the environmental (natural and built) issues by focusing narrowly on human-animal health issues. Most policy and strategic framework documents and publications on OH approach are largely focused on the response to emerging zoonoses originating in domestic and wildlife animals and/or their interactions, without really considering the role of inclusive and health ecosystems (Destoumieux-Garzón et al., 2018). However, COVID-19 outbreak is demonstrating the importance of the natural and built environments in the response to health threat at human-animal-ecosystem interface (Schmiege et al., 2020).

5.4 Methods

The chapter was based on desktop research with the general focus on Zimbabwe and the on-going One Health initiatives. The review was carried out from peer-reviewed journal articles and official government documents such as policy documents, statutory instruments and acts, and reports. The general search engines such as Google Scholar and Semantic Scholar were used to come up with the relevant literature to guide the study, and a number of keywords were used. Keywords and combinations were used, and these were in the "abstract, title, keywords and topic" following the approach used by Chivhenge et al. (2022) such that there was easy identification of the literature on Zimbabwe. The most common words used in the study were "Zimbabwe", "One Health", "zoonoses", "human-animal-ecosystem interface", and "COVID-19 pandemic". The aspect of COVID-19 was very recent which started in 2019, and hence, the filters were used from 2019 to present, and for some other elements such as One Health, the 10-year rule of thumb was used meaning that literature was filtered from 2012 to 2022. Grey literature was only used if it was part of seminal concepts such as OH which emanated around 2003.

5.5 Results

This section is going to present results on the OH initiatives being implemented in Zimbabwe and the opportunities and constraints of operationalizing a holistic and integrated OH approach in the country.

5.5.1 One Health Initiatives in Zimbabwe

Zimbabwe has mainly ad hoc OH initiatives which include its participation in international OH programmes: OH Antimicrobial Resistance National Action Plan, SAFE (Transforming Zimbabwe's Animal Health and Food Safety Systems) project, PACMAN (Diagnostic Platform for the Control of Animal Diseases) project, and Cross-Sectoral Zoonotic Committees.

5.5.1.1 Participation in International One Health Programmes

Zimbabwe is a member of the Global Health Security Agenda (GHSA) – a network having 70 nations and international and non-government organizations and companies in the private sector, coming together to provide health security worldwide. The year 2014 saw the launching of GHSA, bringing together nations towards the promotion of OH methodologies and enhancing capabilities of preventing, detecting, and responding to health risks. In the 70 member countries across the globe, the

GHSA is a launchpad which is used to coordinate and serve for the initiation and development of OH national policies and strategic plans (Kelly et al., 2020). Some of GHSA's main ideas such as the Joint External Evaluation (JEE) tool have been adopted by WHO, with the aim of promoting compliance with the International Health Regulation (IHR) of 2005. Zimbabwe participated in the Joint External Evaluation of IHR core capacities in 2018 (WHO, 2018).

5.5.1.2 OH Antimicrobial Resistance National Action Plan

One of the tangible OH initiatives in Zimbabwe is a national action plan (NAP) on antimicrobial resistance (AMR) – Zimbabwe One Health Antimicrobial Resistance National Action Plan (2017–2021). The NAP was developed according to the OH approach, after conducting a robust situation analysis on AMR (WHO, 2018). The strategic objectives of the NAP covered education, training, and awareness, surveillance to improve detection of the AMR, infection prevention and control, rational use of antimicrobials, and investment into research and development (Government of Zimbabwe, 2017). A multi-stakeholder and cross-sectoral team was involved in the preparation, implementation, and evaluation of the plan. Some of the key stakeholders included the Ministry of Health and Child Care (MHCC); Ministry of Environment, Climate, Tourism and Hospitality Industry (MECTHI); Ministry of Lands, Agriculture, Fisheries, Water, and Rural Resettlement (MLAFWRR); WHO; FAO; and OIE.

Funding constraints are affecting the execution of the OH AMR national action plan, as the existing sentinel surveillance sites only have the capacity of monitoring two of the eight WHO priority pathogens (WHO, 2018). However, currently there are no documented evaluation reports on the implementation of the NAP. A review study by Harant (2022) on the implementation of NAP in African countries showed that consistent reporting of progress and allocation of funds were non-existent in most of the countries.

5.5.1.3 SAFE Project

Another OH initiative in Zimbabwe is the SAFE (Transforming Zimbabwe's Animal Health and Food Safety Systems) project whose thrust is capacity building for the purpose of controlling animal disease, sanitary and phytosanitary, and promoting food safety (Zimbabwe Agricultural Growth Programme [ZAGP], 2019). SAFE is a European Union (EU)-funded project led by FAO working in collaboration with the Department of Veterinary Services (DVS) under the MLAFWRR and the Department of Environmental Health (DEH) under the MHCC. The main aim of the SAFE project is transformation of local animal health and food safety systems to boost productivity in livestock and safety of food for consumers allowing access to local, regional, and global markets (ZAGP, 2019). The project is being implemented at national, provincial, district, and ward levels, covering 30 rural districts and 18 border areas in Zimbabwe.

Some of the achievements of the SAFE project include the development of a new Environmental Health Technician (EHT) Curriculum (FAO, 2022). The revised curriculum managed to align training of EHTs with international best practices on food safety and new approaches in environmental health. The SAFE project also managed to renovate tick-borne disease (TBD) vaccine production unit and supported the preparation of a national tick-borne disease control strategy (ZAGP, 2022). The disease control strategy was aimed at the sustainable control of TBDs for ruminant animals as part of a main intervention strategy to deal with livestock health issues targeting a reduction in their morbidity and mortality.

5.5.1.4 PACMAN Project

PACMAN (Diagnostic Platform for the Control of Animal Diseases) is another OH initiative in Zimbabwe that is narrowly focused on animal health. The PACMAN project is focused on developing the capacity of Zimbabwe's agricultural sector in the early detection, monitoring, as well as mitigation of animal and zoonotic diseases (French National Research Institute for Sustainable Development [IRD], 2020). The 3-year project (November 2020 to November 2023) is being implemented by the French Development Agency (AFD) and the French Agricultural Research Centre for International Development (CIRAD), working in partnership with the IRD, Faculty of Veterinary Sciences of the University of Zimbabwe, and DVS under MLAFWRR.

The PACMAN project complements the activities initiated through the CAZCOM project (Strengthening Zimbabwe's Capacity for Animal and Zoonotic Disease Control). CAZCOM was a 2-year project (2019–2021) coordinated by CIRAD. The achievements of the project include human capital development focusing on zoonoses response, as well as establishing a molecular biology laboratory guided by global standards (CIRAD, 2021).

5.5.1.5 Cross-Sectoral Zoonotic Committees

Zimbabwe has established Zoonotic Committees – a OH platform for coordinated zoonoses response which brings together ministries (MHCC, MLAFWRR, and MECTHI) responsible for management of zoonotic diseases (WHO, 2018). The Zoonotic Committees at national (inter-ministerial committee) and subnational (provincial and district committees) levels hold meetings on a monthly basis for the purposes of sharing information and coordinating the delivery of health interventions. These interventions include surveillance, prevention, monitoring, and control of zoonoses with particular priority on rabies, anthrax, trypanosomiasis, salmonellosis, avian influenza, and brucellosis (WHO, 2018). However, some of these committees are not functional or fully functional, mainly due to limited resources (Gombe et al., 2010; Makurumidze et al., 2021).

5.5.2 *Opportunities for a Holistic One Health Approach in Zimbabwe*

The OH approach builds on available capacities but is unique in terms of creating a platform for coordination and collaboration among disciplines and sectors with more extensive health benefits (Kelly et al., 2020). The factors that can promote the successful implementation of the OH approach in Zimbabwe include a relevant legal and institutional framework, opportunities for open-source database management systems and geospatial technology, and existing cross-border OH initiatives.

5.5.2.1 Relevant Legal and Institutional Framework

Zimbabwe has the relevant legal and institutional framework to support the implementation of OH approach. The existing legislation covers all the key issues necessary for human, animal, and ecosystem health. The key legislation includes Public Health Act (Chapter 15:17) of 2018, Animal Health Act (Chapter 19:01) of 2001, and Environmental Management Act (Chapter 20:27) of 2005 (Table 5.1). The Public Health Act (Chapter 15:17) has provisions for communication and coordination between the DVS and MHCC when responding to notifiable disease outbreaks.

In addition to Acts of Parliament, the legal framework that supports the OH approach includes several statutory instruments such as by-laws for urban and rural local authorities. There are also international and regional regulations, for example, the IHR of 2005 that supports the integrated disease surveillance across international borders. Although the existing legislation provides a solid foundation for the holistic adoption of OH approach, there is a need to review or update some of the legislation so as to incorporate specific OH provisions.

Zimbabwe also has the relevant institutional framework to facilitate the successful implementation of the OH approach. The institutions include government ministries, departments, and parastatals that cover all the key sectors for OH (Table 5.2). All these institutions are operational at national, provincial, and district level. The

Table 5.1 Existing legal framework

Sector	Legislation and policy
Public Health	Public Health Act [Chapter 15:17] Food and Food Standards Act [Chapter 15:04] Medicines and Allied Substances Control Act [Chapter 15:03].
Animal Health	Animal Health Act [Chapter 19:01] Veterinary Surgeons Act [Chapter 27:15]
Environmental Health	Environmental Management Act [Chapter 20:27] Parks and Wild Life Act [Chapter 20:14] Forest Act [Chapter 19:05] Communal Land Forest, Produce Act [Chapter 19:04] Water Act [Chapter 20:24]

Table 5.2 Existing institutional framework

Sector	Government ministry	Government department or parastatal
Human health	Ministry of Health and Child care	Department of Environmental Health, Department of Epidemiology and Disease Control
Animal health	Ministry of Lands, Agriculture, Fisheries, Water, and Rural Resettlement	Department of Livestock and Veterinary Services
Environmental health	Ministry of Environment, Climate, Tourism and Hospitality Industry	Environmental Management Agency; Zimbabwe Parks and Wildlife Management Authority; Forestry Commission

urban and rural local authorities also play a significant role in the adoption and implementation of OH approach at local level. In addition, there are several higher and tertiary education institutions which can play an important role in OH training and research.

Some levels of coordination and collaboration (a key feature of OH approach) already exist through information sharing across various sectors and levels, using multi-sectoral channels and platforms (e.g. multi-stakeholder committees and task forces). The multi-sectoral platforms include the Inter-Agency Coordination Committee on Health (IACCH), National Task Force on Cholera Elimination (NTFCE), Inter-Ministerial COVID-19 Task Force, and Zoonotic Committees at national, provincial, and district level. IACCH is a multi-sectoral and multi-disciplinary committee responsible for facilitating resource mobilization as well as managing response to public health emergencies, which is normally activated during major health emergencies such as the 2018 cholera outbreak (WHO, 2018). International development partners such as WHO, OIE, FAO, and UNICEF are also actively involved in some of these platforms. However, there are still a lot of improvements required to achieve effective coordination and collaboration necessary for successful implementation of OH approach.

5.5.2.2 Open-Source Database Management Systems and Geospatial Technology

Advances in technology for data collection, manipulation, and interpretation are expected to transform the methods for monitoring changes in the earth's natural systems and the detection of disease pathogens, with subsequent improvements in decision-making (Osterhaus et al., 2020). There are free and open database management systems (DBMS) such as WHONET, District Health Information Software version 2 (DHIS2), and the Rabies Epidemiological Bulletin (REB) which are valuable to developing countries like Zimbabwe. WHONET is a free access application for the management and analysis of microbiology laboratory data with a primary focus on antimicrobial resistance surveillance, and DHIS2 is a free, open-source software platform for collecting, analysing, visualizing, and sharing data. Some

laboratories in Zimbabwe are already using these DBMS, and the country's health system has come up with an indicator-based human disease surveillance system through the use of DHIS2 (WHO, 2018).

Zimbabwe can also fully utilize the easily accessible geospatial technology (such as QGIS and open satellite imagery data) in the surveillance, monitoring, and control of infectious diseases. Geospatial technology is valuable in analysing spatio-temporal trends, patterns, and relationships at the human-animal-ecosystem interface. Currently, the DVS is applying GIS in mapping risks related to foot and mouth disease (FMD), anthrax, and rabies (WHO, 2018). The Zimbabwe National Geospatial and Space Agency (ZINGSA) that was established in 2018 also enhances the prospects of implementation of OH approach. ZINGSA is set to launch its first satellite ZIMSAT-1 in 2022 which is going to improve access to geospatial data that can be used in the surveillance and monitoring of infectious diseases.

5.5.2.3 Existing Cross-Border Initiatives

Sub-Saharan African countries can take advantage of several existing cross-border OH initiatives, to implement national- and subnational-level OH initiatives (Fasina et al., 2021). Zimbabwe can benefit from the SADC Protocol on Health, the Isdell: Flowers Cross Border Malaria Initiative (IFCBMI), and the Trans-Limpopo Malaria Initiative (TLMI). The SADC Protocol on Health exists to coordinate the regional efforts on epidemic preparedness, mapping prevention as well as control. IFCBMI is committed to the elimination of malaria through community mobilization within the shared borders of Angola, Namibia, Zambia, and Zimbabwe and is implemented by a number of partners, among them, health ministries and religious ministries from these four countries (Gordon et al., 2019). The TLMI seeks a reduction in malaria transmission in Matabeleland South Province (Beitbridge municipality) of Zimbabwe and the Limpopo Province (Musina municipality). Its major focus is hinged on ensuring the harmonization of policy and management of malaria interventions such as managing cases, vector control, surveillance, and health promotion across the bordering districts of Zimbabwe and South Africa (Moonasar et al., 2012).

5.5.3 Constraints for a Holistic One Health Approach in Zimbabwe

There are several constraints in operationalizing the OH approach in Zimbabwe which include limited resources in the health system, water and sanitation challenges, and increased human-domestic animal-wildlife interactions.

5.5.3.1 Resource-Limited Public Health System

Zimbabwe's healthcare system has limited financial, physical capital, and human resources which is significantly limiting capacities for public healthcare. The absolute expenditure of government on health and as a share of gross domestic product (GDP) demonstrates the government's commitment to health (Piatti-Fünfkirchen et al., 2018). Zimbabwe's actual domestic health spending and national budget allocation are below the recommended African Union's targets for sustainable domestic health financing. The government's expenditure on health as a percentage of total government expenditure averaging 8.3% for the period of 2017–2022 falls short of the Abuja Declaration target of 15%. The average domestic health expenditure as a percentage of GDP was 1.3% for the same period and is also below the Africa Scorecard target (>5%). The failure to meet these funding thresholds indicates insufficient health sector funding by the government (Table 5.3).

The actual domestic health spending for the period 2017 to September 2021 was less than external funding from development partners (Fig. 5.2). On average, the Zimbabwean government contributed only 43% of the total actual health spending, compared to 57% from external sources. This financing trend indicates high dependence on external funding, which is unsustainable considering the unpredictability issues associated with external financing (UNICEF, 2021b).

Physical capital investments are being compromised by low budgetary allocation and weak execution rate, with recurrent costs accounting for the greater proportion of the national health budget (UNICEF, 2021b). As a proportion of total national health budget, capital budget was cut from 31% in 2020 to only 17% and 15% in 2021 and 2022, respectively (MoFED, 2021; UNICEF, 2021b). Weak execution of the capital budget is evidenced by underperformance averaging 71% over the period 2018–2020 (UNICEF, 2021b). In 2020, capital expenditure only accounted for 4.2% of total actual expenditure against a budget target of 31%, and for January–September 2021, it was 4% against a target of 17% (MoFED, 2021; UNICEF, 2021b). This low budgetary allocation and weak execution of capital budget for health, and non-prioritization of capital expenditures by development partners, has greatly compromised physical capital investments. For example, the Ministry of

Table 5.3 Zimbabwe government's healthcare financing (2017–2022)

	Actual health spending					Budget allocations	
Health expenditure indicators	2017	2018	2019	2020	Jan–Sept 2021	2021	2022
Domestic expenditure (US$ millions)	$341	$635	$134	$206	$288	$672	$1342
Domestic health expenditure as % of total government expenditure	5.9%	7.1%	7%	10%	7%	13%	12.7%
Domestic health expenditure as % of GDP (%)	1%	1.1%	0.8%	1.7%	0.8	2.3%	2.3%

Source: Ministry of Finance and Economic Development [MoFED] (2020, 2021), UNICEF (2020, 2021a, b)

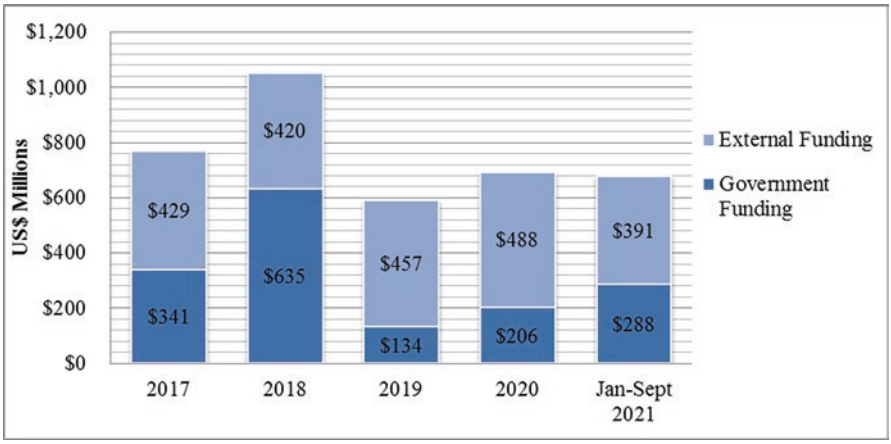

Fig. 5.2 Zimbabwe's sources of health financing (2017–2021). (Source: Authors, data from MoFED (2021), UNICEF (2020, 2021a, b))

Health and Child Care (2017) notes that inadequate budgetary allocation for laboratory services is affecting the attainment of standardized laboratory equipment and reagents and maintenance of existing equipment leading to frequent breakdowns.

The public health sector in Zimbabwe is also greatly affected by inadequate human resources, and there is persistent staff turnover in the government's health sector (Dzinamarira & Musuka, 2021). In 2018, Zimbabwe had 0.14 physicians and 1.85 midwives/nurses per 1000 population which is below the Sustainable Development Goals (SDGs) index threshold of 4.45 midwives, nurses, and doctors per 1000 population (WHO, 2021). The Health Service Board's staff returns of December 2021 had a 16% vacancy rate of the total positions in the public health sector. The vacancy rates' breakdown for selected key positions is as follows: medical doctors, 26%; nursing staff, 18%; laboratory/pathology staff, 26%; surveillance and health information systems staff, 15%; and infrastructure, engineering, and equipment maintenance staff, 34% (Health Service Board, 2021). The problem of inadequate health personnel has been exacerbated by deterioration in working conditions in Zimbabwe as health professionals leave for other countries where conditions of service are attractive (Dzinamarira & Musuka, 2021; Kanyumba & Msosa, 2020). These factors have led to brain drain as critical and experienced health professionals are leaving the country in search for better opportunities. According to the Health Service Board, 2246 nurses and doctors resigned in 2021 to take job opportunities in the region and beyond.

The inadequacy of critical resources is negatively affecting implementation of important public health programmes which include the malaria control, biosafety, and biosecurity programmes. Financial constraints are affecting malaria control initiatives such as the annual indoor and outdoor residual spraying and free distribution of insecticidal nets, leading to recurrence of malaria outbreaks (Mbunge et al., 2021). In addition, there is inadequate funding to support the oversight and

enforcement of biosafety and biosecurity (WHO, 2018). Insufficient resources have also affected COVID-19 response as frontline workers (doctors, nurses, and supporting staff) have been working without adequate personal protective equipment (PPEs) (Chigevenga, 2020).

5.5.3.2 Limited Capacity of Animal Health Systems

Zimbabwe's animal health system has limited capacity in the management of animal diseases, evidenced by persistent livestock disease outbreaks, particularly cattle diseases (Auditor-General [AG] Report, 2018). A total of 166,997 cases of various cattle diseases and 22,895 cattle deaths were recorded countrywide for the period 2015 to May 2018 (Fig. 5.3). The cattle disease cases during this period included FMD with 53,026 cases and a case fatality rate (CFR) of 11%, tick-borne diseases with 23,224 cases and CFR of 27%, and anthrax with 288 cases with a CFR of 90% (AG Report, 2018). Zimbabwe also experienced major outbreak of tick-borne diseases with high CFRs during the 2019/2020 and 2020/2021 agricultural seasons. The 2019/2020 season recorded 46,715 tick-borne disease cases with a CFR of 72%, and the 2020/2021 season had 25,036 recorded cases and a CFR of 50% (The Herald Zimbabwe, 2022).

According to the Auditor General Report (2018), the DVS is facing challenges of limited resources which are limiting the capacity of the department in the prevention and control of livestock diseases. One of the challenges is inadequate laboratories as the DSV only have three provincial laboratories and a Central Veterinary Laboratory in Harare (AG Report, 2018). DSV is also facing a challenge of shortage of vehicles for their operations, and the available vehicles in 2018 only constituted 28% of the required fleet. In 2018, DSV had high vacancy rates of critical positions,

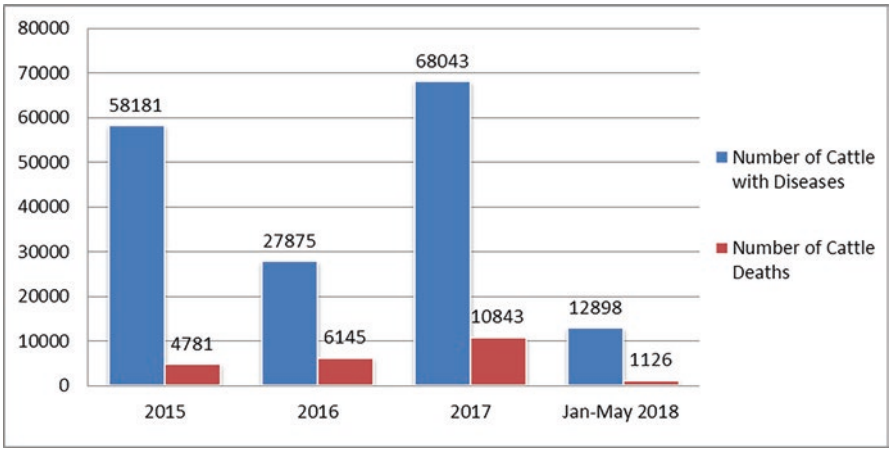

Fig. 5.3 Cattle disease cases and death (2015–May 2018). (Source: Authors, data from AG Report (2018))

which include district veterinary officers, government veterinary officers, and health inspectors, which had vacancy rates of 72%, 64%, and 62%, respectively (AG Report, 2018). In addition, there were no veterinary epidemiologists in all eight provinces, which is a key position in animal disease prevention and control.

The limited capacity of the animal health systems is affecting animal disease prevention and control strategies which include annual FMD and anthrax vaccination programmes. During the 2015–2018 period, the FMD and anthrax vaccination programmes were not being carried out regularly as expected, and most of the vaccinations were done in response to disease outbreaks (AG Report, 2018). The other affected programmes include dipping for prevention of tick-borne diseases and tsetse control programme for the prevention of trypanosomiasis. According to the AG Report (2018), the dipping programme missed its target of dipping session by 23% over the 2015–2018 period, and the tsetse control missed its target of tsetse eradication by 48% during the same period. Rabies prevention and control programmes have also been affected by limited resources, which have restricted dog vaccination programmes to fix-point vaccination campaigns (WHO, 2019). Zimbabwe has a Stepwise Approach towards Rabies Elimination (SARE) score of 1.5 out of 5 which shows limited capacity in the prevention and control of rabies (Coetzer et al., 2019).

5.5.3.3 Increased Human-Animal-Ecosystem Interface

In recent years, Zimbabwe has witnessed increased human-animal-ecosystem interface, thereby increasing the risk of diseases emerging and spreading between species (FAO, 2017). These interactions between humans, wildlife, and domestic animals have been more intense in areas close to national parks and conservancies. Wild animals are a reservoir for pathogens affecting humans and domestic animals (FAO, 2017; Mackenzie et al., 2014), and domestic animals are often regarded as an epidemiological bridge for infections between wildlife and human beings (UNEP, 2016). Zimbabwe is experiencing increased encroachment into wildlife habitats (national parks and protected areas) due to changing human settlement and land-use patterns, illegal livestock movement, and inadequate separation of buffalo/cattle populations in areas close to national parks (FAO, 2017). The boundary fences between game parks and farms that used to separate livestock from wildlife are no longer available due to non-maintenance and vandalism (AG Report, 2018).

An increase in the interface between livestock and wildlife has also been witnessed in the Great Limpopo Transfrontier Conservation Area (GLTFCA), as the adjacent rural communities move their livestock into the game park in search of pastures and water (Gadaga et al., 2016). This creates opportunities for spillover events (Gadaga et al., 2016), and as a result, transboundary animal diseases (TADs) are on the rise, posing a threat to the health and livelihoods of these local rural communities (FAO, 2017). For example, rural communities neighbouring Gonarezhou National Park, in Chiredzi South, are experiencing recurrent outbreak of FMD commonly transmitted by the wild buffalo to livestock (FAO, 2017; Gadaga et al., 2016; Guerrini et al., 2019).

Zimbabwe is also witnessing increased mining activities in protected areas, which is also intensifying human-wildlife interactions, thereby increasing the chances of spillover events. There were coal mining activities in Hwange National Park, which were later stopped after objections were raised by several stakeholders. There are also on-going mining activities (mainly illegal) in Chimanimani National Park, Umfurudzi Game Reserve, and Matusadona and Mana Pools, and several other national parks are under consideration for prospecting and exploration activities (Ndlovu et al., 2021). Despite a lot of effort to clear tsetse flies from the Zambezi valley, the flies and trypanosomiasis disease persist, mainly due to increased human, livestock, and wildlife interactions (Cunningham et al., 2017b).

5.5.3.4 WASH Challenges

Zimbabwe is continuously experiencing a water, sanitation, and hygiene (WASH) crisis which often leads to recurrent waterborne disease outbreaks. The water and sanitation challenges have been attributed to the two major cholera outbreaks, one in 2008/2009 with over 100,000 cases and over 4000 deaths and in 2018/2019, which had 10,000 cases and 69 deaths (Government of Zimbabwe, 2018). According to Zimbabwe's WASH statistics (Fig. 5.4), 60% of the population has access to basic drinking water, and only 37% has access to basic sanitation facilities. The WASH challenges are worse in the rural areas where access to basic drinking water and sanitation is at 51% and 34%, respectively, meaning the majority of the population has no access to clean water and sanitation.

The WASH challenges are largely a result of limited investment in water and sanitation services. WASH expenditure in Zimbabwe has only averaged 3.3% of the national budget over the 2018–2021 period, which falls short of the Sanitation and Water for All (SWA) recommendation of 7% per year (UNICEF, 2021c). WASH investments are also affected by disproportionate budget allocation, with water resources investments dominating WASH budget (Jones et al., 2019; UNICEF, 2021c). The budget allocation for dam construction has averaged 60% of the total WASH spending, which is crowding out critical downstream investments such as water supply, reticulation, and wastewater disposal (UNICEF, 2021c). In dealing with inadequate WASH investments, in 2021, the Zimbabwean government embarked on an initiative to drill boreholes in both urban and rural areas, under the presidential borehole drilling scheme. The programme is expected to improve access to basic drinking water in both urban and rural areas. However, urban areas should prioritize investments in the main water supply systems, with boreholes being used on complementary basis.

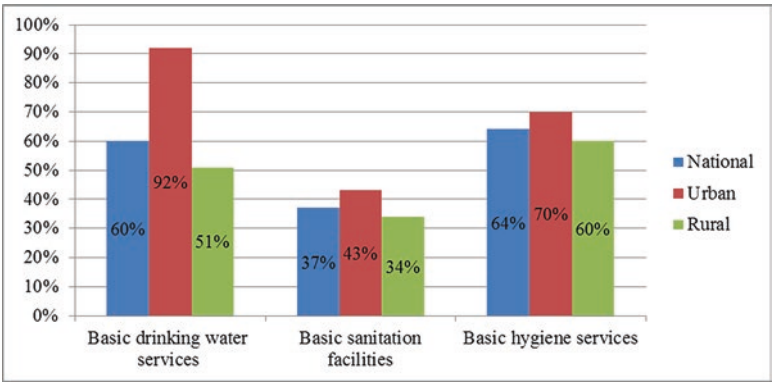

Fig. 5.4 Population with access to basic water, sanitation, and hygiene services. (Source: Authors, data from ZIMSTAT and UNICEF (2019))

5.5.3.5 Risk Cultural and Behavioural Practices

Socio-cultural factors are important in the success of the OH concept. Culture determines the success of all intervention strategies in the health sector, more so, where health outcomes are determined by an intersection of human, animal, and environment. There are some religious beliefs such as the indigenous apostolic doctrines, particularly the Johanne Marange apostolic sect, which negatively shape healthcare-seeking behaviour through emphasis on faith healing (Machekanyanga et al. 2017; Mapingure et al. 2021). The doctrine of these religious groups is against the use of vaccinations, and this practice exposes the followers and others to vaccine-preventable diseases and deaths. The 2009–2010 measles outbreaks in Southern Africa were linked to objections and vaccine hesitancy by apostolic sect members (Gerede et al., 2017; Machekanyanga et al. 2017). Therefore, poor healthcare-seeking behaviour, such as vaccine hesitancy among the apostolic groups, presents challenges on the operationalization of the OH approach.

There are also risk behavioural practices in the rural communities which include consuming meat from livestock dying from unknown causes and butchering moribund animals for consumption purposes (Chirundu et al., 2009; Gombe et al., 2010; Makurumidze et al., 2021). The previous anthrax outbreaks in Zimbabwe have been attributed to these risk practices (Chirundu et al., 2009; Gombe et al., 2010; Makurumidze et al., 2021). Studies have also shown that the risk factors associated with contracting rabies include lack of comprehensive knowledge about rabies and owning unvaccinated dogs (Chikanya et al., 2021; Spargo et al., 2021).

5.6 Discussion

The results show that Zimbabwe is not currently prioritizing the operationalization of the OH approach. The identified OH initiatives are being implemented on an ad hoc basis with a narrow focus on human and animal health issues. The scope of all the on-going initiatives fails to adequately integrate environmental issues, particularly ecosystem integrity, which is the case with most OH initiatives being implemented across the globe. Several studies (e.g. Destoumieux-Garzón et al. (2018); Fasina et al. (2021); Mackenzie et al. (2014); Schmiege et al. (2020)) have shown that most OH initiatives fail to adequately include the environmental (natural and built) issues by focusing narrowly on human-animal health issues. Although the on-going initiatives fail to meet the holistic and integrated quality of OH approach, they provide a good base for extending the scope in the future. According to Mackenzie et al. (2014), there is a general consensus on the need for a narrow and practical focus while developing the necessary capacities for a broader approach in the future.

The on-going OH initiatives being implemented show that there is recognition of OH in Zimbabwe as an alternative approach of responding to the increasing health threat of infectious diseases. This appreciation of OH approach is expected to be reinforced by the on-going COVID-19 pandemic. The frequent emergence of infectious diseases and their associated impacts in Zimbabwe call for the need to establish national OH platforms, policies, and strategic frameworks, utilizing the existing capacities such as the supporting legal and institutional framework. The Zimbabwe OH AMR National Action Plan of 2017–2021 is a valuable governance strategy that provides a good platform, which can be used in formulating comprehensive national and subnational OH strategic frameworks.

The highlighted constraints show that Zimbabwe has some challenges to overcome in operationalizing OH approach. One of the critical constraints is the limited capacity in the public health systems evidenced by failure to meet the minimum thresholds for universal healthcare set at regional and global scale. Zimbabwe's public health system is characterized by high vacancy rate of key health positions and a staff establishment below the SDGs index threshold of 4.45 doctors, nurses, and midwives per 1000 population. The domestic health expenditure as a share of the national budget averaging 8.3% also falls short of the Abuja Declaration recommended threshold of 15%. There is also high dependency on external funding in the public health system, with external sources contributing 57% on average to the actual public health expenditure. Two of the on-going OH health projects, namely, PACMAN and SAFE, are being funded from outside the country, which also shows dependency on external funding and sponsorships. This high dependency on external funding is unsustainable, and it is a challenge affecting most countries in sub-Saharan Africa. External sources are contributing more than 90% of OH funding in sub-Saharan Africa (Fasina et al., 2021).

According to Mackenzie et al. (2014), limited resources necessitate collaborations among relevant sectors, and this is one of the factors promoting the successful implementation of OH programmes in developing countries. Therefore, in

operationalizing OH in Zimbabwe, the limited resources can be taken as an opportunity of fostering coordination and collaboration among different sectors responsible for implementing the OH approach. Although the WASH challenge and increased human-animal-ecosystem interactions are highlighted as constraints, these two issues also provide the rationale for operationalizing OH approach in Zimbabwe. These factors and the recurrent outbreak of livestock diseases and rabies show that the country is at high risk of infectious diseases, thereby necessitating the OH approach.

5.7 Conclusion

The on-going COVID-19 pandemic has reinforced the importance of One Health (OH) approach in responding to infectious diseases at the human-animal-ecosystem interface. The purpose of this chapter was to assess the prospects and constraints of operationalizing OH approach in Zimbabwe. The results show that Zimbabwe is not currently prioritizing the operationalization of the OH approach. To successfully implement the OH approach, the country needs to build on the existing legal and institutional framework, taking advantage of the available DBMS and geospatial technology opportunities. There is also a need to address challenges of limited capacities in the public and animal health systems and inadequate water and sanitation. The study recommends the development of holistic and integrated national OH platforms, policies, and strategic frameworks necessary for the operationalization of OH approach.

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