

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Science in One Health

journal homepage: www.journals.elsevier.com/science-in-one-health

Review

Orientation of One Health development: think globally and act locally

Zhao-Yu Guo^a, Jinxin Zheng^{b,c}, Shi-Zhu Li^{a,b,d}, Xiao-Nong Zhou^{a,b,d,*}



^a National Institute of Parasitic Diseases at Chinese Center for Disease Control and Prevention (Chinese Center for Tropical Diseases Research), NHC Key Laboratory of Parasite and Vector Biology, WHO Collaborating Centre for Tropical Diseases, Shanghai, People's Republic of China

^b School of Global Health, Chinese Center for Tropical Diseases Research, Shanghai Jiao Tong University School of Medicine, Shanghai 200025, China

^c Department of Nephrology, Institute of Nephrology, Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, People's Republic of China

^d One Health Center, Shanghai Jiao Tong University-The University of Edinburgh, Shanghai, People's Republic of China

ARTICLE INFO

Keywords:

One Health
Systems thinking
Communication
Collaboration
Coordination
Capacity building

ABSTRACT

One Health is dedicated to maintaining and fostering a dynamic balance among humans, animals, and the environment. Since 2013, it has seen considerable developments globally. This review aims to encapsulate the history of One Health, as well as chart its future trajectory. Numerous research institutions founded under the principles of One Health have been established, and several pragmatic projects are currently underway. While it is imperative to solidify foundational education, further policy support is required to cultivate the One Health paradigm. Identifying research directions at a political level is necessary to provide the technical support needed for practical application. The future of One Health envisions a comprehensive approach to primary prevention, the utilization of open and shared data sets, as well as real-world surveys and interviews. This integrated approach is encapsulated in the concept of One Health Delivery. At this stage, One Health Delivery needs to build a systematic framework that focuses on integrating and communicating across disciplines and training researchers with complete practical skills.

1. Introduction

In the face of numerous macro factors, such as globalization, urbanization, the increasing prevalence of ageing societies, and climate change, the variety of diseases and their corresponding transmission channels have significantly expanded. Health challenges have grown in complexity, contributing to the global burden of disease, economic disparities, and, in certain regions, even inciting social unrest. A prime example of this complexity is the Coronavirus disease 2019 (COVID-19) pandemic, which has been unfolding since 2019 [1]. Addressing complex health issues necessitates interdisciplinary, cross-sectoral collaboration and an embrace of systems thinking to devise suitable solutions [2]. Global public health resources therefore need to go beyond clinical diagnosis and treatment. Urgent investments are required to improve early monitoring and response systems at the human-animal-environment interface, and at the same time, address the complex outcomes of emerging issues, such as zoonotic disease, antimicrobial resistance, food security and climate change, which present a constant threat to human health and ecological balance [3]. Researchers are increasingly emancipating themselves from a purely reductionist perspective, and devoting themselves to developing a research

paradigm based on the One Health concept [4]. When tackling issues, it is crucial not to concentrate exclusively on the immediate elements, but instead, engage them with a comprehensive understanding of the systemic and structural context.

When examining history, it is essential to adopt a learning stance to comprehend the critical challenges our planet is currently grappling with. Recognizing why One Health has garnered such extensive acceptance is key. From the standpoint of comparative politics, we must critically evaluate the contemporary global scenario. Despite discernible deficiencies, substantial advancements have been achieved in comparison to the past. Lastly, when deliberating on future trajectories, we should embody a forward-thinking mindset, for the future brims with boundless potential. One Health has gone through three major phases: (i) The scientific community proposed One Health as a science question that meets the needs of the times. One Health promotes the idea of harmonious coexistence between humans and nature, moving away from a human-centric perspective. This marks the emergence of One Health, where scientists have introduced a new perspective to address societal and environmental issues. The key characteristics of this phase are novelty and responsiveness, as scientists strive to shift towards a balanced relationship

* Corresponding author. National Institute of Parasitic Diseases at Chinese Center for Disease Control and Prevention (Chinese Center for Tropical Diseases Research), NHC Key Laboratory of Parasite and Vector Biology, WHO Collaborating Centre for Tropical Diseases, Shanghai, People's Republic of China.

E-mail address: xiao-nong.zhou@sjtu.edu.cn (X.-N. Zhou).

<https://doi.org/10.1016/j.soh.2023.100042>

Received 15 January 2023; Accepted 27 September 2023

Available online 30 September 2023

2949-7043/© 2023 School of Global Health, Chinese Center for Tropical Diseases Research, Shanghai Jiao Tong University School of Medicine. Published by Elsevier B.V. on behalf of Shanghai Jiao Tong University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

between humans and nature, (ii) One Health has been recognized by the international community as a theoretical framework [5–9]. One Health is not only limited to discussions within the scientific research community, but it has also been widely recognized and accepted by various international organizations, and is gradually being promoted to public science education, and (iii) This is the empirical research stage of One Health. One Health explores the complex relationships between people, animals, plants and the environment that sustains them, through interdisciplinary and cross-sectoral research [10–12]. One Health embodies an attitude, a perspective that looks at the world from multiple dimensions. It confronts issues that humanity often tries to ignore, bringing together all possible help and exploring ways to overcome challenges. However, One Health should not remain confined to books alone. One Health Delivery is an important part of this stage, transmitting information and experiences between different organizations and making efforts for the development of the real world. The primary actions and objectives should focus on the implementation of One Health, encapsulating elements of communication, collaboration, coordination, and capacity building. These three stages reflect the gradual evolution and development of the One Health concept, from the proposition of a scientific question to international recognition and exploration of its implementation in practice.

It is essential to analyze historical data with an intent to learn, evaluate the current situation through a comparative lens, and strategize for the future with a focus on development. Gaining insight into the history of One Health can assist us in comprehending the intricacy of these challenges, encourage us to approach scientific problems from a more expansive perspective, and aid in the formulation of responsive strategies. One Health is not a sudden concept, but a common problem that has been recognized after the long-term development of various disciplines. In contemporary times, the One Health concept has evolved for many years. Firstly, Calvin Shwabe introduced the concept of One Medicine, acknowledging the intimate interconnection between human and animal health [13–15]. Subsequently, the relationship between veterinary medicine and human medicine has been reconsidered with the development of comparative medicine [16]. After the publication of Silent Spring in 1962, environmental issues were brought to the fore [17]. Public consciousness has increasingly acknowledged the intricate link between ecological and environmental challenges and sustainable development, underlining the pressing need to address these issues. Anthropocentrism, biocentrism and ecocentrism were discussed, and the balance between humans, animals and the environment is receiving increasing attention. During this phase, many ideas were emerged that created more discussions and explorations, such as EcoHealth, planetary health and global health [18–21]. Public health is dedicated to the prevention of human disease, encompassing not

only physical aspects but also mental and societal well-being. The One Medicine concept emphasizes the synergistic exchange between human and veterinary medicine, fostering a collaborative approach towards health [22]. EcoHealth focuses on environmental and socio-economic issues [21]. Planetary health delves into the symbiotic relationship between the vitality of Earth's ecosystems and the health of humankind [20]. Global health concept has had a profound impact on a global scale [19]. The impact of this continued development is that global health has distilled the key scientific issues faced globally at the time, using global burden of disease as a paradigm for assessment; and Global Health Delivery as a paradigm for practice [23,24]. These concepts are not static or fixed but are continuously growing and adapting to new challenges, knowledge, and approaches. The intricacies of human society and the challenges it confronts are complex and enduring, and our actions and decisions can wield profound implications for the future. The concept of One Health aligns with the principles of Longtermism, emphasizing the need to think and act with foresight and long-term perspective, taking into account the interests and well-being of future generations. Adopting a long-term outlook allows us to perceive the interconnectedness of various elements and anticipate potential consequences. This perspective prompts us to prioritize sustainable solutions that address both immediate concerns and long-term effects.

The One Health initiative was advocated by the scientific community as a response to tangible real-world necessities. The formal introduction of the One Health concept occurred between 2003 and 2004 [8,18]. The outbreak of severe acute respiratory syndrome (SARS) has led to address the following questions: (i) Unknown pathogens may emerge, infect, transmit, and spread at any given moment, from any location, and from any animal source, posing a significant threat to the health, well-being, and economic stability of all individuals and communities across the globe, (ii) There is an immediate necessity for an international framework dedicated to early warnings, characterized by rapid response mechanisms and transparent information sharing, and (iii) The promotion and development of the One Health approach is necessary across all nations and regions [25,26]. The introduction and development of the One Health concept is closely linked to veterinary medicine and human-animal infections, as well as to the promotion of Non-Governmental Organization(NGOs), such as the Manhattan Principles, help to presented at the Wildlife Conservation Society conference, promote and update the One Health concept [27,28]. The development of the global One Health network was boosted by the launch of the One Health Commission in 2008 [29,30]. Different institutions and organizations have their own understanding of One Health concept, but the core concepts are similar [3,7,8,27]. Until 2021, the One Health High Level

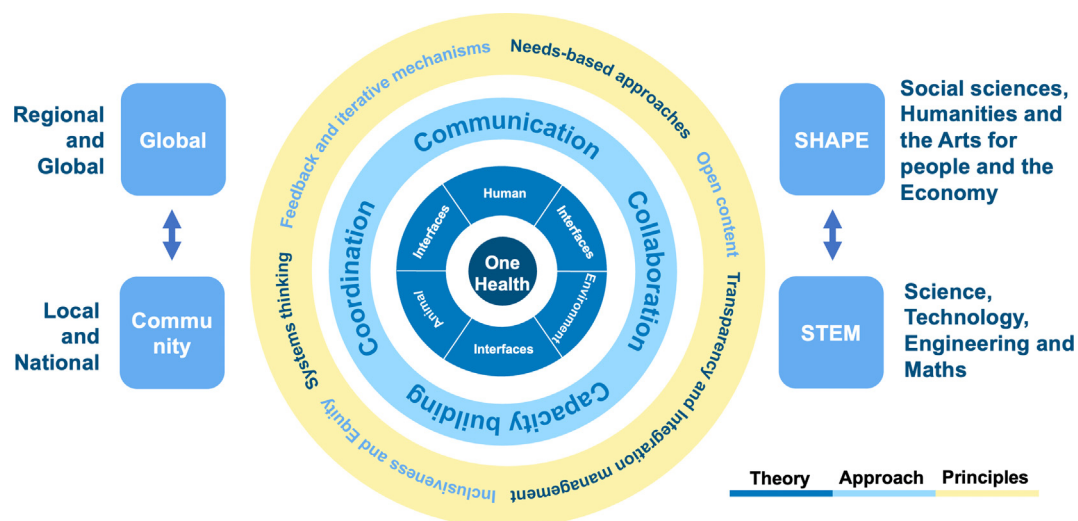


Fig. 1. Scientific questions arising from One Health.

Expert Panel (OHHLEP) gave the official definition of One Health [10,31, 32]. The updated definition presents a more inclusive framework, and its core strategies encompass communication, collaboration, coordination, and capacity building (Fig. 1) [10].

2. From past to contemporary: One Health Delivery in China

The concept of One Health, although dispersed in everyday life, is particularly exemplified in China. Historically, Chinese philosophers have long been invested in the harmonious coexistence of nature and society [33]. Recently, multi-disciplinary and multi-sectoral collaborations have been recognized and integrated into the nation's public health initiatives. For example, the national schistosomiasis control programme and Chinese patriotic public health campaign were initiated in the 1950s [34]; holistic philosophy has brought improvement of holistic health significantly since 1950, right after the founding of the People's Republic of China. Early stage schistosomiasis control strategies rely on policy support [35]. The China Central Schistosomiasis Control Leadership Group (CCSCLG) centralized resources and coordinated different sectoral involvement (Fig. 2), which was an early One Health practice in China [36]. From a retrospective perspective, the CCSCLG completed eight tasks, including multi-sectoral collaboration, full-cycle control, coordination, integration, multi-disease joint prevention, international cooperation, regional collaboration and good governance. Under the coordination of CCSCLG, while completing the work on the prevention and control of schistosomiasis, progress has also been made in the reform of China's healthcare system, and the relevant laws and administrative structures have been improved. Schistosomiasis control also promotes international collaboration in the field of public health [37]. Strong policy interventions have been effective in the initial stages of One Health Delivery [38]. However, sustaining long-term operations implies a significant investment of resources, and it is necessary to find new framework to alternative [38]. Managing the relationships between various departments and organizations will remain a persistent concern

for professionals in the global One Health field. Knowledge barriers exist between disciplines, so simplifying issues and ensuring efficient communication are essential. There are numerous supporting tools, such as *Robert's Rules of Order*, to assist us in clarifying goals and facilitating discussions.

Over the past decade, many policies at the national level in China have exhibited a strong correlation with One Health. Since 2012, the Chinese government has advanced two significant concepts: Community with a Shared Future for Mankind and Clear Waters and Green Mountains are as Valuable as Gold and Silver Mountains. [39–41] (Fig. 3). Consequently, there has been an increase in interest regarding additional One Health activities and practices. For example, in 2013, academician Wen Yumei and Professor Ning Shoubao launched the One Health Foundation at Fudan University Medical School to reward researchers who have excellent performance in the field of One Health. In 2014, the First International Symposium for One Health Research was hosted by the School of Public Health, Sun Yat-sen University and Duke University. In January 2014, the School of Animal Medicine at Nanjing Agricultural University signed an agreement with the University of California, Davis to build the One Health Center. Subsequently, One Health-related research centers or institutes were established at the School of Public Health of Sun Yat-sen University (2014), Duke Kunshan University (2016), City University of Hong Kong (2016), Shanghai Jiao Tong University (2020), Hainan University (2021), and Hainan Medical College (2022). In 2020, the Hainan One Health Symposium was hosted by the Hainan Provincial Government, China, and attempted to build a One Health paradigm project. In 2021, the Chinese Consortium for One Health was established in Shanghai. In 2022, Shanghai Jiao Tong University released the global One Health index, creating the first One Health inter-country assessment system [5,6,42]. Two books related to One Health have been published in China, including *The Concept and Examples of a One Health Approach* (2019) and *Advances in One Health* (2021), and two open access journals, named after One Health, have been launched in English by Chinese institutions, including *One Health*

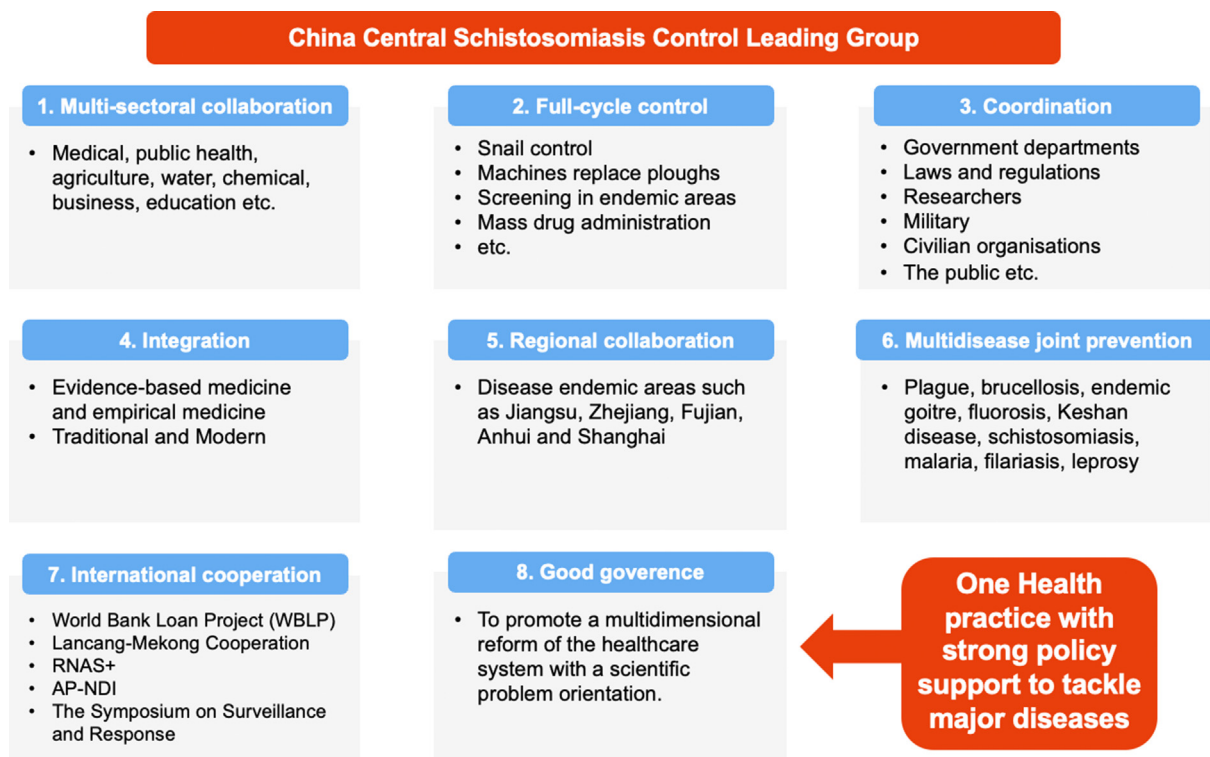


Fig. 2. One Health practices at local level toward elimination phase of the schistosomiasis control programme. RNAS+: The Regional Network for Asian Schistosomiasis and Other Helminth Zoonoses. AP-NDI: Asia-Pacific Network on Drug and Diagnosis Innovation on Neglected Tropical Diseases.

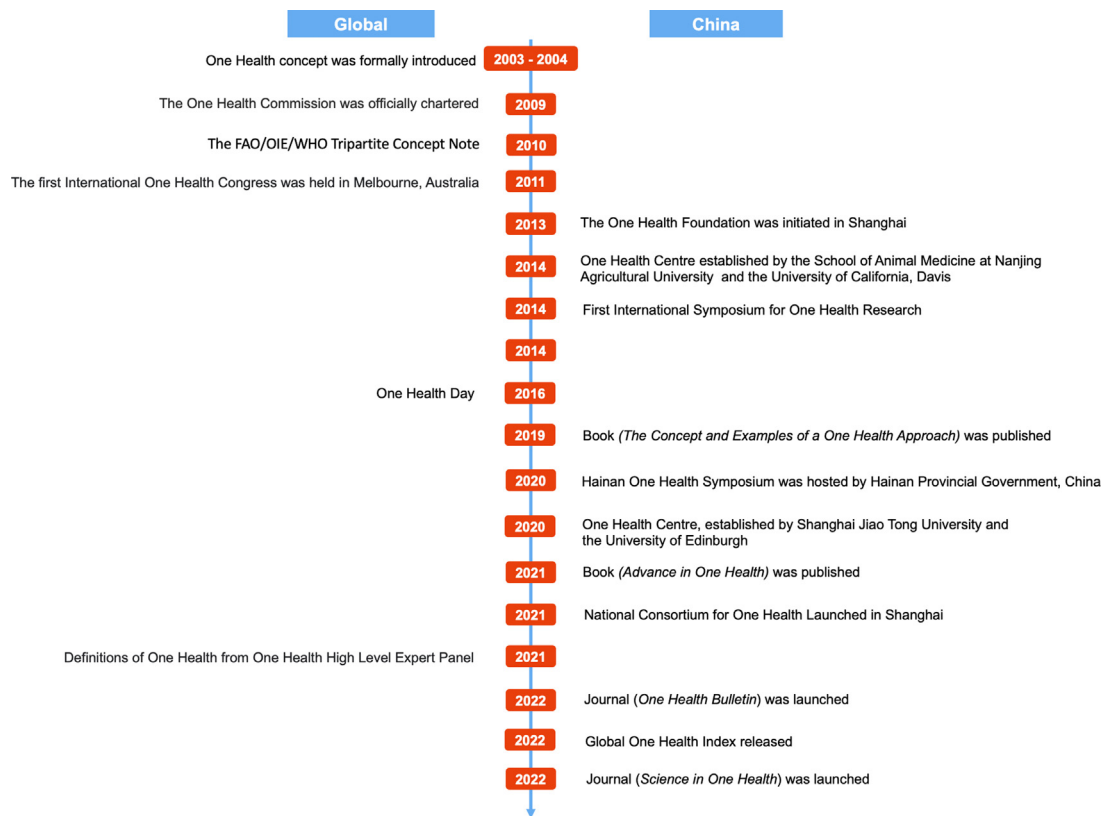


Fig. 3. Brief One Health history. FGO: Food and Agriculture Organization of the United Nations. OIE: Office International des Epizooties (In May 2022, the Organisation ceased using the historical acronym OIE and adopted the new acronym WOAH.). WHO: World Health Organization.

Bulletin (2021) and *Science in One Health* (2022), respectively [25]. The educational yield of these initiatives may not be immediately discernible, but they will, undoubtedly, cultivate a plethora of specialists versed in One Health thinking, benefitting both China and the world at large. Regions such as Hainan, Jiangxi, and Chongming in Shanghai have implemented comprehensive One Health practices, bolstered by the support of the Chinese central and local governments, the World Bank, the China Medical Board, and others. These projects, integrating with the national strategy for rural revitalization, are enhancing the top-level design, fostering local economic development in alignment with One Health practices.

3. One Health Delivery: from global to community

The implementation of One Health delivery requires the establishment of a universally applicable framework, a structure that secures consensus and recognition on a global scale. Since 2019, the WHO has unveiled a series of guidelines and toolkits anchored in One Health. These guidelines, inherently interrelated, are progressively coalescing into a unified system (Fig. 4). First and foremost, to ensure that the evaluation system of each publication is standardized and based on scientific principles, all guidelines are developed in accordance with the WHO Handbook for Guideline Development [43]. This ensures the potential for fostering mutual trust, facilitating exchange, and promoting collaboration among diverse projects. Numerous projects necessitate guidelines and toolkits from a wide range of disciplines. Having a standardized format enables experts from diverse fields to effectively communicate and enhance overall efficiency. This systematic structure further facilitates effective communication between policymakers and researchers while establishing a robust and evidence-based evaluation system. The framework provided by the WHO can also serve as a valuable reference for undertaking large-scale projects in China. Co-infection is often present in areas with a high prevalence of neglected tropical

diseases (NTDs). The NTDs guidelines and the human schistosomiasis guidelines share the same structure, and are both based on the PICO (Population, Interventions, Comparisons and Outcomes) framework and evidence-based theory, ensuring that the guidelines are scientific and systematic [43–47]. Practice with the One Health concept requires a combination of local realities and the toolkit provided by WHO in different regions [45,48–51]. As an example, the WASH project plays a crucial role in the prevention and control of numerous tropical diseases. By pooling resources and enabling collaboration among multiple project teams, interventions can be effectively implemented. The connecting points between projects can be found through a standardised guide.

Additional information systems, such as the Global One Health Intelligence System (GOHIS) and the International Society for Disease Surveillance (ISDS), are playing a crucial role in gathering and integrating information. These systems contribute to the consolidation of global data and the establishment of early warning systems for emerging infectious diseases. Open knowledge and data serve as the foundation for fostering interdisciplinary communication. The Open Knowledge Network (OKN) represents a commendable initiative in this regard, aiming to facilitate such communication by promoting the sharing of knowledge and data across disciplines. Open Knowledge balances the distribution of interdisciplinary interests with openness as its core and uses data as a public language to reduce the cost of communication for researchers. China has developed National Notifiable Diseases Surveillance System (2004) and China Infectious Disease Automated-alert and Response System (2008) for infectious diseases surveillance [52,53]. Any integrated information systems that have the potential to be implemented globally are worth encouraging [54]. In addition, many toolkits, such as EJP Decision Support Tool (<http://cohesive.onehealth.jp.eu/>), One Health Risk Analysis System (OHRAS) and OHEJP Outcome Inventory (OHOI), are also very useful to One Health implementational research [55]. After the publication of human schistosomiasis WHO guidelines, a team of Chinese experts summarised the difficulties faced

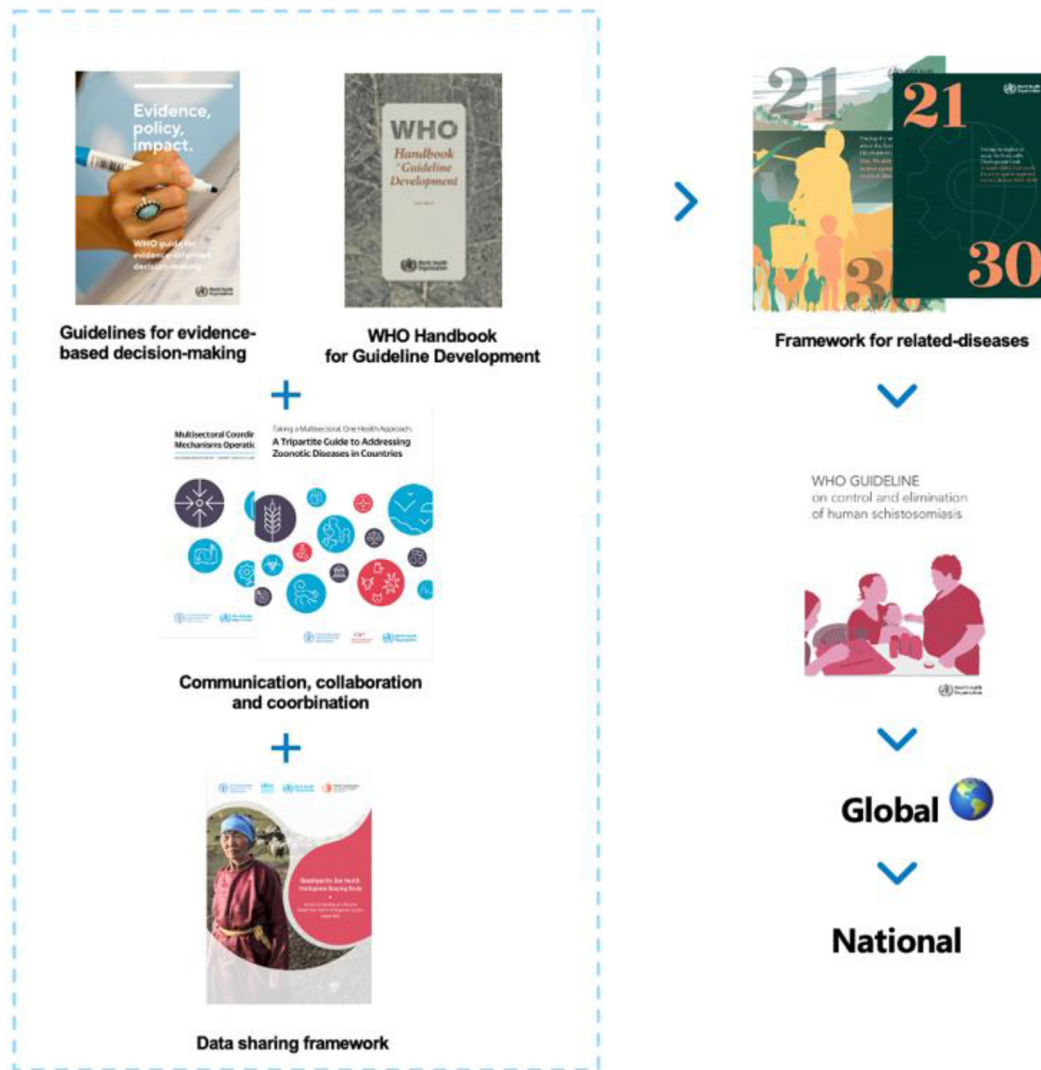


Fig. 4. Inclusiveness and integration framework for neglected tropical diseases and human schistosomiasis.

by China and the objectives for the future [56–59]. It is important to combine these guidelines with practice.

4. One Health Delivery: needs-based approach

One Health collaboration needs to build cross-sectoral and interdisciplinary capacity. On-site staff from various departments are highly specialized in one area but lack a multidimensional knowledge structure. The future requires the development of people with a multidimensional knowledge structure and One Health philosophy, completing fieldwork to find scientific problems and solutions from the real world. The One Health concept promotes multi-disciplinarity, not only in terms of the integration of different technologies, but also in terms of the integration of SHAPE (Social sciences, Humanities and the Arts for People and the Economy) and STEM (Science, Technology, Engineering and Maths) [60]. The combination of STEM and SHAPE enhances human insight, identifies real-world science issues and promotes community resilience and One Health implementation [61]. WHO has published *Mental Health of People with Neglected Tropical Diseases* in 2020, which reinforces the integration of social sciences and psychology [63]. ONE – Health, Environment, Society – Conference in Brussels summarised the challenges of COVID-19 and climate change, and highlighted the importance of incorporating social sciences into interdisciplinary research [62]. In

addition, integrating One Health and SHAPE could strengthen people's sense of belonging to research and work. Recently, there are already many projects in China exploring the advantages of multidisciplinary integration, such as the UK–China AMR Partnerships Initiative between Fudan University and the University of Bristol in the UK. The project aims to analyse AMR issues from fieldwork to the laboratory, combines anthropological studies with biological studies [64]. Conducting additional on-site surveys can provide a more profound understanding of the relationships between various stakeholders, thus establishing the groundwork for cross-sectoral communication. A deeper comprehension of the diverse regional populations is essential to dispel prejudices and devise scientific solutions.

A combination of qualitative and quantitative interdisciplinary research is necessary. Donna Haraway believed that any single qualitative study is biased, which is why a longitudinal in-depth study, and a cross-sectional study are necessary. Epidemics are social matter as well as biological phenomena at regional and global levels. Only part of the problem can be solved at the macro level; more problems need to be identified at the micro level. Randall Packard has mentioned that many social factors influence malaria elimination programmes, such as traditional agricultural practices, labour migration patterns and global inequities in resource allocation [65,66]. In this context, malaria elimination requires emphasis on biosocial analysis and historical

reflection [66]. Clonorchiasis, caused by *Clonorchis sinensis*, is an important food-borne parasitic disease in China and Southeast Asia countries. A key factor in the prevalence of clonorchiasis is the local population's habit of eating raw freshwater fish [67–69]. Traditional management of the disease is not effective in interventions of the disease transmission. There is a need to identify the links between consumers, sellers, restaurants, regulatory authorities, tourism boards and many other sectors to improve the efficiency of multi-sectorial collaborative interventions. Let well-trained researchers delve into the real world in order to establish connections between scientific questions and sort out complex multi-dimensional frameworks. Yichen Wang's project delved into the intricate interplay between environments, ecosystem services, the human predilection for raw fish consumption, and the practice of sharing raw fish dishes, all in relation to the risk of liver fluke infection in the Lower Mekong Basin, specifically in Northeast Thailand [70]. Goylette F. Chami's research delves into the examination of the interplay between the dissemination of therapeutic approaches within social networks and the implementation of mass drug administration (MDA) [71]. Comparable methodologies can be extended to address analogous issues in the context of Clonorchiasis. Furthermore, the methodological framework of fieldwork can contribute significantly to elucidating how both individuals and communities navigate the terrain of health-related decision-making within diverse socio-cultural landscapes.

5. One Health Delivery: new training models for the modern era

To fulfill this objective in the future, interdisciplinary expertise serves as the foundation for tackling complex scientific problems. It is imperative to cultivate full-stack researchers who embrace the One Health vision, ready to respond to potential future challenges. One Health full-stack researchers with knowledge of the One Health concept and the ability to coordinate and conduct field investigations in complex environments. At the practical level, new ways of communication need to be constructed, including bottom-up and top-down approaches. For bottom-up approach, there is a need for an information analysis platform based on field research and monitoring systems to advance intervention and evaluation. For top-down approach, a paradigm of guidelines and a collection of data sharing frameworks is needed to facilitate communication and trust between communities, countries, regions and the globe. However, it is difficult for a single individual to master such complex multidisciplinary knowledge, and it is important to separate quality building from knowledge building. Knowledge and experience packaging and delivery systems need to be valued by local and international organizations. There is a need to combine field experience with reports provided by authoritative bodies and then reorganize and break down these actions into many packages. A reasonable packages delivery strategy will help field staff to acquire assessment and practice skills more quickly. For example, while conducting fieldwork in an area, water samples, animal tissue samples, plant samples, etc. can be collected and given together to the laboratory team. Clarifying needs and communication is important in this process. Therefore, it is urgent to understand advances in One Health research with a focus on the strategy to achieve holistic health from concept to practice at global and local levels. Furthermore, the emergence of large AI models like ChatGPT has opened up new opportunities for the training of full-stack researchers. These models are constructed using vector databases, which assist researchers in identifying connection points between various materials and allow them to concentrate more on advancing their thinking. What must be emphasized is that what One Health Delivery pursues is not elitism, but to shorten the training cycle of practitioners in the One Health field by combining tools and methodologies of the new era.

6. Conclusion

The diversity and complexity of One Health characterize the distinctiveness of its research paradigm. First, strong policies help to

improve the initial effectiveness of One Health practices, but they need to be overtaken to a sustainable stage. Three elements of policy change, including the knowledge base, political willingness, and social strategy, deserve our attention. Second, the construction of universal primary prevention is essential. The development of infrastructure requires not only policies but also the support of international organizations and institutions. Third, the establishment of a scalable One Health Delivery paradigm is necessary. Efficient and bias-reduced communication and collaboration are key to the implementation of One Health approach. Fourth, methodologies such as fieldwork and participant observation need to be developed to find scientific questions in the real world. Fifthly, in the new era, there is an urgent need for new training programmes that shift from a knowledge-based educational philosophy to one that focuses on thinking. For the strategy on development of One Health in China, we need to focus on both theoretical and practical aspects. At a theoretical level, OHHLEP has given the full meaning of One Health. However, as the concept of One Health encompasses a broader range of meanings, its original significance becomes diluted. And the imperative thing for researchers is to clearly delineate its practical implications in real world scenarios.

Funding

The project was supported by China Medical Board (No. 20-365) and Shanghai Jiao Tong University Integrated Innovation Fund (No. 2020-01).

Institutional review board statement

Not applicable.

Informed consent statement

Not applicable.

Data availability statement

No additional data is available.

Conflict of interest

The authors declare no competing interests regarding the publication of this paper. Xiao-Nong Zhou is the Editor-in-Chief of *Science in One Health*.

Acknowledgement

We specially give thanks to colleagues from the School of Global Health, Chinese Center for Tropical Diseases Research, Shanghai Jiao Tong University School of Medicine for kindly review and comments in revisions.

Abbreviations

AMR	Antimicrobial resistance
COVID-19	Coronavirus Disease 2019
CCSCLG	China Central Schistosomiasis Control Leadership Group
FAO	Food and Agriculture Organization
GOHIS	Global One Health Intelligence System
NGO	Non-governmental organizations
OHC	One Health Commission
OHHLEP	One Health High Level Expert Panel
OHRAS	One Health Risk Analysis System
TCM	traditional Chinese medicine
ISDS	International Society for Disease Surveillance
STEM	Science, technology, engineering and maths

SHAPE Social sciences, humanities and the arts for people and the economy
 WHO World Health Organization
 WOA World Organization for Animal Health

References

- [1] T.P. Velavan, C.G. Meyer, The COVID-19 epidemic, *Trop. Med. Int. Health* 25 (2020) 278, <https://doi.org/10.1111/tmi.13383>.
- [2] Q. Li, R. Bergquist, L. Grant, J.-X. Song, X.-Y. Feng, X.-N. Zhou, Consideration of COVID-19 beyond the human-centred approach of prevention and control: the ONE-HEALTH perspective, *Emerg. Microb. Infect.* 11 (2022) 2520–2528, <https://doi.org/10.1080/22221751.2022.2125343>.
- [3] J. Wu, L. Liu, G. Wang, J. Lu, One Health in China, *Infect. Ecol. Epidemiol.* 6 (2016) 33843, <https://doi.org/10.3402/iee.v6.33843>.
- [4] J.P. Sturmburg, C.M. Martin, D.A. Katerndahl, Systems and complexity thinking in the general practice literature: an integrative, historical narrative review, *Ann. Fam. Med.* 12 (2014) 66–74, <https://doi.org/10.1370/afm.1593>.
- [5] N. Zhou, Z. Cheng, X. Zhang, C. Lv, C. Guo, H. Liu, K. Dong, Y. Zhang, C. Liu, Y. Chang, et al., Global antimicrobial resistance: a system-wide comprehensive investigation using the global One Health index, *Infect. Dis. Poverty* 11 (2022) 92, <https://doi.org/10.1186/s40249-022-01016-5>.
- [6] X.-X. Zhang, J.-S. Liu, L.-F. Han, S. Xia, S.-Z. Li, O.Y. Li, K. Kasagne, M. Li, K. Yin, Q.-Q. Hu, et al., Towards a global One Health index: a potential assessment Tool for One Health performance, *Infect. Dis. Poverty* 11 (2022) 57, <https://doi.org/10.1186/s40249-022-00979-9>.
- [7] S.R. Rüegg, B.J. McMahon, B. Häslar, R. Esposito, L.R. Nielsen, C. Ifejika Speranza, T. Ehlinger, M. Peyre, M. Aragrande, J. Zinsstag, et al., A blueprint to evaluate One Health, *Front. Public Health* 5 (2017), <https://doi.org/10.3389/fpubh.2017.00020>.
- [8] J. Zinsstag, E. Schelling, D. Waltner-Toews, M. Tanner, From “one medicine” to “One Health” and systemic approaches to health and well-being, *Prev. Vet. Med.* 101 (2011) 148–156.
- [9] B. Hasler, L. Cornelsen, H. Bennani, J. Rushton, A review of the metrics for One Health benefits, *Rev. Sci. Tech. OIE* 33 (2014) 453–464, <https://doi.org/10.20506/rst.33.2.2294>.
- [10] Panel (OHHLEP), O.H.H.-L.E., W.B. Adisasmito, S. Almuhairi, C.B. Behraves, P. Bilivogui, S.A. Bukachi, N. Casas, N.C. Becerra, D.F. Charron, A. Chaudhary, et al., One Health: a new definition for a sustainable and healthy future, *PLoS Pathog.* 18 (2022) e1010537, <https://doi.org/10.1371/journal.ppat.1010537>.
- [11] WHO, G.; UNICEF Contributing to One World, One Health. A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface, 2008.
- [12] J. He, Z. Guo, P. Yang, C. Cao, J. Xu, X. Zhou, S. Li, Social insights on the implementation of One Health in zoonosis prevention and control: a scoping review, *Infect. Dis. Poverty* 11 (2022) 48, <https://doi.org/10.1186/s40249-022-00976-y>.
- [13] C.W. Schwabb, *Veterinary Medicine and Human Health*, *Vet. Med. Hum. Health* 01 (1969) 01–12.
- [14] J.M. Lindenmayer, G.E. Kaufman, One Health and one welfare, in: *One Welfare in Practice*, CRC Press, 2021, pp. 1–30. ISBN 1-00-321833-4.
- [15] A. Jeenah, One Health: the driver of solutions to 21st century health challenges, *South Afr. Gen. Pract.* 2 (2021) 223–224, <https://doi.org/10.36303/SAGP.2021.2.6.0105>.
- [16] L. Wilkinson, *Animals and Disease: An Introduction to the History of Comparative Medicine*, Cambridge University Press, 1992. ISBN 0-521-37573-8.
- [17] R. Carson, *Silent spring*, in: *Thinking about the Environment*, Routledge, 2015, pp. 150–155. ISBN 1-315-69872-2.
- [18] J. Zinsstag, K. Hediger, Y.M. Osman, S. Abukhattab, L. Crump, A. Kaiser-Grolimund, S. Mauti, A. Ahmed, J. Hattendorf, B. Bonhof, et al., The promotion and development of One Health at Swiss TPH and its greater potential, *Diseases* 10 (2022) 65, <https://doi.org/10.3390/diseases10030065>.
- [19] J.P. Koplan, T.C. Bond, M.H. Merson, K.S. Reddy, M.H. Rodriguez, N.K. Sewankambo, J.N. Wasserheit, Towards a common definition of global health, *Lancet* 373 (2009) 1993–1995, [https://doi.org/10.1016/S0140-6736\(09\)60332-9](https://doi.org/10.1016/S0140-6736(09)60332-9).
- [20] R. Horton, S. Lo, Planetary health: a new science for exceptional action, *Lancet* 386 (2015) 1921–1922, [https://doi.org/10.1016/S0140-6736\(15\)61038-8](https://doi.org/10.1016/S0140-6736(15)61038-8).
- [21] S. Harrison, L. Kivuti-Bitok, A. Macmillan, P. Priest, EcoHealth and One Health: a theory-focused review in response to calls for convergence, *Environ. Int.* 132 (2019) 105058, <https://doi.org/10.1016/j.envint.2019.105058>.
- [22] H. Lerner, The philosophical roots of the “one medicine” movement: an analysis of some relevant ideas by rudolf virchow and Calvin schwabe with their modern implications, *Stud. Philos. Est.* 6 (2013) 97–109, <https://doi.org/10.12697/spe.2013.6.2.07>.
- [23] S. Theobald, N. Brandes, M. Gyapong, S. El-Saharty, E. Proctor, T. Diaz, S. Wanji, S. Elloker, J. Raven, H. Elsej, et al., Implementation research: new imperatives and opportunities in global health, *Lancet* 392 (2018) 2214–2228, [https://doi.org/10.1016/S0140-6736\(18\)32205-0](https://doi.org/10.1016/S0140-6736(18)32205-0).
- [24] J.Y. Kim, P. Farmer, M.E. Porter, Redefining global health-care delivery, *Lancet* 382 (2013) 1060–1069, [https://doi.org/10.1016/S0140-6736\(13\)61047-8](https://doi.org/10.1016/S0140-6736(13)61047-8).
- [25] X.-N. Zhou, M. Tanner, Science in One Health: a new journal with a new approach, *Sci. One Health* 1 (2022) 100001, <https://doi.org/10.1016/j.soh.2022.100001>.
- [26] C. David Butler, Comparing and contrasting two united nations environment programme reports on COVID-19, *Sci. One Health* 1 (2022) 100003, <https://doi.org/10.1016/j.soh.2022.100003>.
- [27] J.S. Mackenzie, M. Jeggo, The One Health approach—why is it so important? *Trop. Med. Infect. Dis.* 4 (2019) 88, <https://doi.org/10.3390/tropicalmed4020088>.
- [28] J.S. Mackenzie, M. McKinnon, M. Jeggo, One Health: from concept to practice, in: *Confronting Emerging Zoonoses*, Springer, 2014, pp. 163–189.
- [29] M.S. Khan, P. Rothman-Ostrow, J. Spencer, N. Hasan, M. Sabirovic, A. Rahman-Shepherd, N. Shaikh, D.L. Heymann, O. Dar, The growth and strategic functioning of One Health networks: a systematic analysis, *Lancet Planet. Health* 2 (2018) e264–e273, [https://doi.org/10.1016/S2542-5196\(18\)30084-6](https://doi.org/10.1016/S2542-5196(18)30084-6).
- [30] L.C. Streichert, L.P. Sepe, P. Jokelainen, C.M. Stroud, J. Berezowski, V.J. Del Rio Vilas, Participation in One Health networks and involvement in the COVID-19 pandemic response: a global study, *Front. Public Health* (2022) 10, <https://doi.org/10.3389/fpubh.2022.830893>.
- [31] Organization, W.H. Tripartite And UNEP Support OHHLEP's Definition Of “One Health”, 2021.
- [32] A.S. Bernstein, A.W. Ando, T. Loch-Temzelides, M.M. Vale, B.V. Li, H. Li, J. Busch, C.A. Chapman, M. Kinnaird, K. Nowak, et al., The costs and benefits of primary prevention of zoonotic pandemics, *Sci. Adv.* 8 (2022) eabl4183, <https://doi.org/10.1126/sciadv.abl4183>.
- [33] X. Yao, H. Yao, *An Introduction to Confucianism*, Cambridge University Press, 2000. ISBN 0-521-64430-5.
- [34] Z. Hong, L. Li, L. Zhang, Q. Wang, J. Xu, S. Li, X. Zhou, Elimination of schistosomiasis japonica in China: from the One Health perspective, *China CDC Wkly.* 4 (2022) 130–134, <https://doi.org/10.46234/ccdcw2022.024>.
- [35] D. Blumenthal, W. Hsiao, Privatization and its discontents—the evolving Chinese health care system, *Mass Med. Soc.* 353 (2005) 1165–1170. ISBN 0028-4793.
- [36] Ban, H. The historical experience of the Party's leadership in the eradication of schistosomiasis in the 1950s (Chineses) Available online: <https://www.dswxyjy.org.cn/n1/2020/04/15/c219022-31674393.html> (accessed on 3 October 2023).
- [37] Y.A.N. Yiwei, International collaboration during China's anti-schistosomiasis movement in the 1950s: visit of the Japanese schistosomiasis delegation, *Stud. Hist. Nat. Sci.* 38 (2021) 257–277.
- [38] Q. Li, J. Xu, S.-Z. Li, J. Utzinger, D.P. McManus, X.-N. Zhou, Short-, mid-, and long-term epidemiological and economic effects of the World Bank loan project on schistosomiasis control in the People's Republic of China, *Diseases* 10 (2022) 84, <https://doi.org/10.3390/diseases10040084>.
- [39] U. Khan, H. Wang, I. Ali, A sustainable community of shared future for mankind: origin, evolution and philosophical foundation, *Sustainability* 13 (2021) 9352, <https://doi.org/10.3390/su13169352>.
- [40] X. Qian, R. Ren, Y. Wang, Y. Guo, J. Fang, Z.-D. Wu, P.-L. Liu, T.-R. Han, Members of Steering Committee, S. of G.H., Fighting against the common enemy of COVID-19: a practice of building a community with a shared future for Mankind, *Infect. Dis. Poverty* 9 (2020) 34.
- [41] C. Springer, S. Evans, J. Lin, D. Roland-Holst, Low carbon growth in China: the role of emissions trading in a transitioning economy, *Appl. Energy* 235 (2019) 1118–1125, <https://doi.org/10.1016/j.apenergy.2018.11.046>.
- [42] X.-X. Zhang, J.-S. Liu, L.-F. Han, G. Simm, X.-K. Guo, X.-N. Zhou, One Health: new evaluation framework launched, *Nature* 604 (2022) 625, <https://doi.org/10.1038/d41586-022-01108-0>.
- [43] World Health Organization, WHO Handbook for Guideline Development, second ed., World Health Organization, Geneva, 2014. ISBN 978-92-4-154896-0.
- [44] World Health Organization, WHO Guideline on Control and Elimination of Human Schistosomiasis, World Health Organization, Geneva, 2022. ISBN 978-92-4-004160-8.
- [45] World Health Organization *Evidence, Policy, Impact: WHO Guide for Evidence-Informed Decision-Making*, World Health Organization, Geneva, 2022. ISBN 978-92-4-003987-2.
- [46] World Health Organization *Ending The Neglect To Attain The Sustainable Development Goals: One Health: Approach for Action Against Neglected Tropical Diseases 2021-2030*, World Health Organization, Geneva, 2022. ISBN 978-92-4-004241-4.
- [47] World Health Organization *Ending The Neglect to Attain the Sustainable Development Goals, A Sustainability Framework for Action against Neglected Tropical Diseases 2021-2030*, World Health Organization, Geneva, 2021. ISBN 978-92-4-001902-7.
- [48] Quadripartite One Health Intelligence Scoping Study Available online: <https://www.who.int/publications/m/item/quadripartite-one-health-intelligence-scoping-study> (accessed on 03 October 2023).
- [49] Joint Risk Assessment Operational Tool (JRA OT): An Operational Tool of the Tripartite Zoonoses Guide: Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries Available online: <https://www.who.int/publications-detail-redirect/9789240015142> (accessed on 03 October 2023).
- [50] F.A.O. WHO, WOA multisectoral coordination mechanisms operational Tool, FAO WHO OIE (2022) 46.
- [51] World Health Organization = Organisation mondiale de la Santé Taking a Multisectoral, One Health approach: a tripartite guide to addressing zoonotic diseases in countries, WHO FAO WOA (2021), 96(i-xlvi).
- [52] W. Yang, Z. Li, Y. Lan, J. Wang, J. Ma, L. Jin, Q. Sun, W. Lv, S. Lai, Y. Liao, et al., A nationwide web-based automated system for outbreak early detection and rapid response in China, *West. Pac. Surveill. Response J. WPSAR* 2 (2011) 10–15, <https://doi.org/10.5365/WPSAR.2010.1.1.009>.
- [53] L. Wang, X. Ren, B.J. Cowling, L. Zeng, M. Geng, P. Wu, Z. Li, H. Yu, G. Gao, Systematic review: national notifiable infectious disease surveillance system in China, *Online J. Public Health Inform.* 11 (2019) e414, doi:2013.
- [54] L. Li, X. Guo, X. Zhang, L. Zhao, L. Li, Y. Wang, T. Xie, Q. Yin, Q. Jing, T. Hu, et al., A unified global genotyping framework of dengue virus serotype-1 for a stratified

- coordinated surveillance strategy of dengue epidemics, *Infect. Dis. Poverty* 11 (2022) 107, <https://doi.org/10.1186/s40249-022-01024-5>.
- [55] R. Dewar, C. Gavin, C. McCarthy, R.A. Taylor, C. Cook, R.R.L. Simons, A user-friendly decision support Tool to assist one-health risk assessors, *One Health* 13 (2021) 100266, <https://doi.org/10.1016/j.onehlt.2021.100266>.
- [56] J. Xu, S.-Z. Li, J.-G. Guo, X.-N. Zhou, A.G. Djirmay, The WHO new guideline to control and eliminate human schistosomiasis: implications for the verification of transmission interruption and surveillance of *schistosoma japonicum* in China, *Infect. Dis. Poverty* 11 (2022) 79, <https://doi.org/10.1186/s40249-022-01003-w>.
- [57] G.U.O. Zhao-yu, F. Jia-xin, Z. Li-juan, Z. Yi-biao, Z. Jie, Y. Kun, L.I.U. Yang, L.I.N. Dan-dan, L.I.U. Jian-bing, D. Yi, Analysis of the new WHO guideline to accelerate the progress towards elimination of schistosomiasis in China (Chinese), *Chin. J. Schistosomiasis Control* 34 (2022) 217.
- [58] X.U. Jing, L.I. Yi, Decoding the evolution of preventive chemotherapy schemes for schistosomiasis in China to improve the precise implementation of the WHO guideline on control and elimination of human schistosomiasis (Chinese), *Chin. J. Schistosomiasis Control* 34 (2022) 223.
- [59] W. Tian, Sharing the WHO guideline on control and elimination of human schistosomiasis to achieve the goal of schistosomiasis elimination in China (Chinese), *Chin. J. Schistosomiasis Control* 34 (2022) 235.
- [60] M.M. Jones, D. Abrams, A. Lahiri, Shape the future: how the social sciences, humanities and the arts can SHAPE a positive, post-pandemic future for peoples, economies and environments, *J. Br. Acad.* 8 (2020) 167–266, <https://doi.org/10.5871/jba/008.167>.
- [61] H. Shah, COVID-19 recovery: science isn't enough to save us, *Nature* 591 (2021) 503–504, <https://doi.org/10.1038/d41586-021-00731-7>.
- [62] S. Bronzwaer, M. Catchpole, W. de Coen, Z. Dingwall, K. Fabbri, C. Foltz, C. Ganzleben, R. van Gorcom, A. Humphreys, P. Jokelainen, et al., One Health collaboration with and among EU agencies – bridging research and policy, *One Health* 15 (2022) 100464, <https://doi.org/10.1016/j.onehlt.2022.100464>.
- [63] World Health Organization *Mental Health of People with Neglected Tropical Diseases, Towards a Person-Centred Approach*, World Health Organization, Geneva, 2020. ISBN 978-92-4-000452-8.
- [64] Bristol, U. of Strategies to Reduce the Burden of Antibiotic Resistance in China Available online: <http://www.bristol.ac.uk/population-health-sciences/centres/star-china/> (accessed on 03 October 2023).
- [65] L. Stratton, M.S. O'Neill, M.E. Kruk, M.L. Bell, The persistent problem of malaria: addressing the fundamental causes of a global killer, *Soc. Sci. Med.* 67 (2008) 854–862, <https://doi.org/10.1016/j.socscimed.2008.05.013>.
- [66] R.M. Packard, *The Making of a Tropical Disease: A Short History of Malaria*, 1st Edition, Johns Hopkins University Press, 2011. ISBN 978-1-4214-0396-0.
- [67] M.-B. Qian, J. Utzinger, J. Keiser, X.-N. Zhou, Clonorchiasis, *Lancet* 387 (2016) 800–810, [https://doi.org/10.1016/S0140-6736\(15\)60313-0](https://doi.org/10.1016/S0140-6736(15)60313-0).
- [68] Z.-L. Tang, Y. Huang, X.-B. Yu, Current status and perspectives of *Clonorchis sinensis* and clonorchiasis: epidemiology, pathogenesis, omics, prevention and control, *Infect. Dis. Poverty* 5 (2016) 71, <https://doi.org/10.1186/s40249-016-0166-1>.
- [69] M.-B. Qian, C. Patel, M.S. Palmeirim, X. Wang, C. Schindler, J. Utzinger, X.-N. Zhou, J. Keiser, Efficacy of drugs against clonorchiasis and opisthorchiasis: a systematic review and network meta-analysis, *Lancet Microb.* (2022), [https://doi.org/10.1016/S2666-5247\(22\)00026-X](https://doi.org/10.1016/S2666-5247(22)00026-X). S266652472200026X.
- [70] Y.C. Wang, A. Law, J. Namsanor, et al., Examining ecosystem (dis-)services on liver fluke infection in rural Northeast Thailand, *Infect. Dis. Poverty* 12 (2023) 38, <https://doi.org/10.1186/s40249-023-01079-y>.
- [71] G.F. Chami, A.A. Kontoleon, E. Bulte, et al., Diffusion of treatment in social networks and mass drug administration, *Nat. Commun.* 8 (2017) 1929. <https://doi.org/10.1038/s41467-017-01499-z>.