Policy brief

ONE HEALTH-BASED CONCEPTUAL FRAMEWORKS FOR COMPREHENSIVE AND COORDINATED PREVENTION AND PREPAREDNESS PLANS ADDRESSING GLOBAL HEALTH THREATS

SEPTEMBER 2021

U. Agrimi Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità
M. Carere Environment and Health Department, Istituto Superiore di Sanità
F. Cubadda Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità
O. Dar Public Health England
S. Declich National Center for Global Health, Istituto Superiore di Sanità
M.G. Dente National Center for Global Health, Istituto Superiore di Sanità
M. Farina Institute for Humanities and Social Sciences, Innopolis University
C. Ihiekweazu Nigeria Centre for Disease Control
A. Lavazza Centro Universitario Internazionale
L. Mancini Environment and Health Department, Istituto Superiore di Sanità
A. Mantovani Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità
S. Marcheggiani Environment and Health Department, Istituto Superiore di Sanità
A. Milano National Center for Global Health, Istituto Superiore di Sanità
M. Monaco Infectious Diseases Department, Istituto Superiore di Sanità
S. Morabito Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità
F. Riccardo Infectious Diseases Department, Istituto Superiore di Sanità
C. Robbiati National Center for Global Health, Istituto Superiore di Sanità
G. Scavia Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità
L. Villa Infectious Diseases Department, Istituto Superiore di Sanità
M. Villa Italian Institute for International Political Studies (ISPI)
ABSTRACT

Prevention and preparedness to health threats pose several challenges: to identify multifactorial drivers, to detect and evaluate risks as early as possible, to involve multiple actors and stakeholders, and to make information and data transversely and transparently accessible.

This requires a coordinated, multidisciplinary and multisectoral effort by the systems involved, which presently communicate with difficulty in a fragmented context.

One Health can provide strategic scientific support if governance, research and training aim to overcome the barriers that hamper interaction, collaboration and coordination between sectors and disciplines.

We call on the G20 to lead concrete actions that are capable of transforming the current One Health momentum into long-term commitments.
The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the COVID-19 pandemic, emerged and rapidly spread around the world with a devastating death toll (almost 4 million victims at mid-June 2021) and a predicted global economic loss set at over €18 trillion between 2020 and 2025 (IMF, 2021).

The COVID-19 pandemic showed that while global health threats may be triggered by individual agents, the scenario that emerges is necessarily one that involves a multitude of factors (such as socio-economic, cultural and environmental) that affect communities on a global scale, well beyond the specific biological effects of an individual agent. For this reason, the impact can be said to be “syndemic”; that is, determined by aggregated or synergistic interactions with other adverse health, socio-economic and environmental conditions.

At the same time, it is misleading to trace any pandemic to a single trigger without considering the multifarious causes, complex determinants and drivers that contributed to its occurrence.

Unfortunately, to date, health systems have operated in isolation, and global preparedness (in the form of collection and translation of knowledge, training of personnel, procedures and plans required in the event of a health emergency) has been sought without involving all the relevant disciplines and stakeholders.

This hampers evaluation of the possible consequences and unequal impacts of the pandemic on countries, communities and various sectors of society.

In addition, the prevailing approach to epidemics and pandemics attempts merely to control health hazards once they emerge (or re-emerge). An efficient global preparedness strategy should instead promptly assess the multiple potential risk factors that are involved before they become a threat, so as to prevent or mitigate their consequences.

The zoonotic origin of most emerging pathogens, the crucial role played by humans in the over-exploitation of the environment and the complexity of socio-economic drivers involved in the emergence and spread of epidemics requires a holistic One Health approach, which should be designed and implemented in order to improve the effectiveness of prevention and preparedness plans.

One Health represents a valid scientific strategy, but its adoption in plans and policies both at governmental and international level requires aspects of governance, research and training to be addressed, so that the current fragmentation and barriers (including silos in education and siloed funding) can be overcome, as these hamper the interaction, collaboration and coordination between sectors and disciplines that are required.

At present, stand-alone national One Health plans are often developed. However, in order to benefit from this approach, efforts should be made to appropriately integrate One Health strategies into relevant national and international plans.
It is therefore necessary to develop adequate frameworks and to identify procedures that allow this integration, together with effective implementation of comprehensive prevention and preparedness strategies.
RATIONALE FOR ENHANCING PREVENTION AND PREPAREDNESS PLANS WITH ONE HEALTH STRATEGIES

The need to prevent and early detect to reduce the societal costs of a pandemic

The cumulative societal costs of an outbreak were highlighted for the first time by the World Bank (World Bank, 2012) and then discussed by experts in emerging infectious diseases (IDs) (Zinsstag, 2020). The moment in which a system is able to detect signals of possible threats was correlated with the possible costs for the system. That is, the earlier the detection of these signals, the lower the costs for the systems involved (Fig. 1 in Appendix 1).

The impacts on the systems that are called to respond to any epidemics vary in accordance with their local fragilities (e.g. availability of services, economic development, poverty, social inequity, health coverage, presence of other epidemics, societal turmoil and wars). Therefore, the impact on services and related health and socio-economic repercussions should be evaluated according to context (Economist at Large, 2011; Gongal, 2020).

A recent review on the long-term societal impacts of COVID-19 outlined a series of important social, economic and cultural effects on three main areas of society: health and well-being (including physical and mental health and the environment); communities, culture and belonging; and knowledge, employment and skills (British Academy, 2021). It has been reported that the pandemic highlighted and also significantly worsened social inequalities, with dramatic consequences for vulnerable groups (Tsai, 2020; Solis, 2021).

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Workshop Report on Biodiversity and Pandemics (2020) provides numerous evidence-based actions that could start a paradigm shift: “The current pandemic preparedness strategy involves responding to a pandemic after it has emerged. Yet, the research reviewed in this report identifies substantial knowledge that provides a pathway to predicting and preventing pandemics. This includes work that predicts geographic origins of future pandemics, identifies key reservoir hosts and the pathogens most likely to emerge, and demonstrates how environmental and socioeconomic changes correlate with disease emergence” (IPBES, 2020).

The need to consider integrated drivers for epidemic/pandemic preparedness

Many of the upstream drivers of disease occur outside the human health sector (e.g. animal health, land use, loss of biodiversity, urbanization, conflicts and climate change), and are multifactorial. Understanding and addressing them requires greater attention to be placed on the prevention and detection of threats, ideally before they cause disease outbreaks. Effectively addressing these drivers brings in a wider range of potential partners, including...
government, society and the private sector, which can combine resources, strategies and solutions to create better global and local public health policies.

Behind the development of surveillance tools for ID events, growing research suggests that untapped driver signals could be quantified and monitored to anticipate emergence risk as a new form of epidemic intelligence. Temperature and precipitation data are already used to forecast meteorologically sensitive IDs, but more driver data could support improved predictive models covering a much broader range of health threats. Logically, further strengthening of public health could take place through the expansion of surveillance, so that the full spectrum of ID emergence drivers are monitored (Fig. 2 and Table 1 in Appendix 1) (Olson et al., 2015).

The mainstreaming of disease prevention into national plans for climate adaptation, biodiversity, environmental protection and other sectors can help to reduce risks upstream and promote early warning for disease threats (Machalaba et al., 2018).

The need to consider the multiplicity of the actors, stakeholders, disciplines and related interests involved in prevention and preparedness measures

There are many intervention areas that should consider the multiplicity of the factors involved. Emblematic of these is the example of the implementation of biosecurity measures in live animal markets, intensively farmed chickens and pigs, and in other interfaces between animals (wildlife and domestic species). Drastic measures (e.g. the closing of markets, an increase in the spacing between animals on farms) can lead to a loss of income, and to poverty and hunger for large numbers of small-scale farmers. There are also ethical and cultural issues that need to be considered (Zahouli et al., 2017).

For this reason, all stakeholders (e.g. farmers, traders, butchers, consumers, communities, administrators and scientists) should be involved to identify locally adapted biosecurity and animal welfare measures, while maintaining economic activity. To prevent future pandemics, there is a pressing need to deepen the understanding of pathogen transmission between the environment, wildlife, domestic animals and humans as part of a complex social and ecological system (Zinsstag, 2020).

The potential social and economic impact, and related ethical aspects, should also be carefully considered when formulating policies that are aimed at protecting the environment and its biodiversity. For example, it is instructive to understand how to counter the correlation that has emerged between vector-borne and zoonotic disease outbreaks and changes in forest cover and oil palm expansion. With an increase in plantation monocultures, which has decreased afforestation, an increase in epidemics of zoonotic diseases has been recorded, as well as an increase in the transmission of IDs by insects (Morand and Lajaunie, 2021).

This is likely to take place because that some species act as a filter to diseases and guarantee a natural regulation of diseases, which is lost as biodiversity decreases. As the protection of global biodiversity is instrumental in preventing the emergence of future pandemics, deforestation should be stopped as soon as possible.
In this case, it is necessary to consider how to operate at various levels. Impositions from above are unlikely to succeed, with effective compliance being better achieved through participative involvement. For this reason, ethical issues are very significant: farmers who lose their income when changing crops ought to be compensated or helped to convert their activities. More generally, the potential health problems related to their activities and the overall well-being of those involved ought to be considered (Morand et al., 2021). The same applies to the regulation of wet markets and other economic activities or traditions that have not only an economic but also a cultural value (Zahouli et al., 2017).

Community engagement is the other critical aspect to consider when enhancing preparedness to potential threats (WHO, 2020b) and ensuring a rapid response aimed at reducing rather than exacerbating social and health inequities (Alberti, Lantz and Wilkins, 2020).

In order to build trust and empower multiple stakeholders, countries must prioritize a locally tailored One Health approach to community engagement. Communities’ involvement and an appropriate risk communication strategy can substantially mitigate an outbreak’s severity as well as enhance communities’ long-term resilience (Dickmann et al., 2018).

Investing and actively promoting “whole of society” approaches, in order to ensure preparedness strategies and capabilities that detect, respond to and mitigate the effects of emergent health threats across the entirety of society by establishing and strengthening relationships between health and non-health sectors is pivotal (Machalaba et al., 2018).

The more all the sectors involved collaborate to deploy an integrated prevention and preparedness strategy, the more the cumulative societal costs of a possible pandemic can be reduced.

The need to promptly access and share information and data transparently

Effective access to, and use of, data from National Public Health Institutes (NPHIs) or their equivalent is a critical building block of national preparedness. To enhance NPHI functioning, it is essential that they routinely access and monitor a broad set of priority indicators that are selected to reflect the country-specific context (Fig. 3 in Appendix 1) (Khan et al., 2020).

As the COVID-19 pandemic has shown, information and data collected by all the relevant sectors/stakeholders, both public and private, should be made available to allow multisectoral analysis and provide evidence for appropriate decisions and related actions (Naguib et al., 2020).

Education plays a decisive role in training a new generation of policymakers, scientists, public managers and community leaders capable of promoting and making operational a multidisciplinary and multisectoral approach that makes possible data sharing and coordinated analysis through knowledge, innovation and international academic collaboration (Chan and Fu-Chun, 2021).
OPERATIONALIZATION OF ONE HEALTH

Considering the challenges we have discussed, the implementation of One Health strategies represents added value both for prevention and preparedness.

One Health deals with complex health issues and addresses risk factors and threats at the human–animal–environment interface, thereby enhancing and contributing to preparedness capacity.

Prevention strategies based on One Health principles raise awareness that protection of ecosystem balance and biodiversity are priority actions to reduce the risk of pandemics. Through the integration of data from various disciplines, One Health encourages coordination, collaboration and communication among the social and the biomedical sciences, while promoting integrated (ethically and epistemically sound) public health policies.

The adoption of One Health strategies can help to reduce the risks of potential epidemics (prevent), support the early identification of epidemic risks (alert); contribute to the reduction of the impact of potential epidemics/pandemics (mitigate).

In recent years, and even more so in light of the consequences of the COVID-19 pandemic, there have been many international calls and initiatives that have been advocating for a global paradigm shift based on One Health (Richardson et al., 2016; WHO, FAO, OIE, 2019; European Commission, 2020; IPEBS, 2020; Bronzwaer et al., 2021; Gruetzmacher et al., 2021), and the One Health approach is now often advocated by national pandemic plans.

On 16 March 2021, the Pan-European Commission on Health and Sustainable Development (Pan-European Commission on Health and Sustainable Development, 2021) called on governments, economic and social stakeholders, and international organizations to rethink their broad policy priorities, to step up investment in and reforms of health and social care systems, and to upgrade the global governance of public goods, such as health and the environment. The One Health approach is the fulcrum of all the identified priorities. It facilitates full, universal and sustained compliance with the World Health Organization (WHO) International Health Regulations (IHR-2005) and adopts strategies and approaches that recognize multisectoral responses are vital (Machalaba, 2018).

The G20 Health Working Group, the Global Health Summit 2021, the G20 Rome Declaration and finally the Carbis Bay G7 Summit 2021 have raised awareness of One Health preparedness, recognizing that (re)emerging of threats to health are caused by a disequilibrium at the human-animal-environment interface. In such a context, we should promptly address those organizational, ethical, educational, resource and epistemic aspects that reduce the operationalization of One Health at national and international level (Landford, 2012; Marcotty et al., 2013; Connolly, 2017; Berthe et al., 2018; Johnson et al., 2018; van Herten et al., 2019; Dos S Ribeiro et al., 2019; etc.).
RECOMMENDATIONS FOR THE G20

With this momentum apparent, the G20 should play a leading role in overcoming the barriers and the lukewarm global engagement and commitment that are still hampering One Health’s contribution to prevention and preparedness policies. We therefore put forward the following recommendations for consideration:

- **Promoting the adoption of a One Health-Based Conceptual Framework for operationalization at national level**: a strategy to promote the use of One Health approaches in prevention and preparedness is the implementation of a One Health-based Conceptual Framework (OHCF) that ensures the adoption of comprehensive risk analysis and preparedness plans and their harmonization with identified priorities for action. The OHCF is a multidisciplinary effort aimed at prevention, identification of risks for pandemics and the related possible impacts on society. The information and data collected, analysed with a One Health approach, support the elaboration and updating of prevention and preparedness plans and provide evidence for appropriate decisions and related actions (Appendix 2).

- **Governance**: mandating to relevant international bodies the formulation of guidance and related enforcement mechanisms for a specific governance structure across sectors and disciplines at national and international level, to ensure harmonized institutionalization of One Health strategies (including guidance for setting means for integrated data collection and analysis, risk assessment, resource allocation, after action reviews and training). Lessons learned from individual countries should be considered in relation to different contexts of implementation such as in the establishment of One Health centres, a One Health directorate and a One Health national steering committee.

- **Integration of One Health strategies in all relevant national and international plans**: mandating to international relevant bodies the formulation of guidance and related enforcement mechanisms to integrate One Health strategies in all relevant prevention and preparedness plans developed at national level and in all relevant international regulations and communications as well as in related simulation exercises. Moreover, a locally tailored One Health strategy for community and civil society engagement through awareness and effective risk communication should be included in the integrated plans.

- **Integrated risk assessments**: building international guidance and tools to integrate One Health risk assessment of relevant threats at national and subnational level. This approach should mediate between approaches that already exist and new forms of risk assessment in different sectors, thus capitalizing on the strengths of tested methodologies.

- **Cost-effectiveness evaluation**: mandating to international relevant bodies the development, in coordination with the countries that are already implementing One Health strategies, of a harmonized cost-effectiveness evaluation framework, with modular options to tailor for local conditions, including ad hoc operational research, to assess and quantify the added value of One Health strategies in the fields of prevention and preparedness.
• **Training and capacity building:** promoting and supporting, with adequate resources at national level, the integration of One Health strategies in relevant curricula, and facilitating the development of a common culture of preparedness. This includes the capacity to design and conduct integrated One Health simulation exercises and advance knowledge sharing and capacity building in all priority technical sectors (e.g. data collection, sharing and analysis; communication, modelling, after action evaluation, joint risk assessment and One Health preparedness planning).

Accordingly, we suggest that the G20 should include the following wording in its final communiqué:

Promote the adoption of a One Health-Based Conceptual Framework for integration of One Health in prevention and preparedness at national level.

International relevant bodies, in coordination with the governments implementing One Health Strategies, should provide guidance and related enforcement mechanisms for:

- a specific One Health governance structure across sectors and disciplines, and for integration of One Health in all relevant national and international plans;
- conducting integrated One Health risk assessment of relevant threats at national and sub-national level; and
- a harmonized cost-effectiveness evaluation framework, with modular options to tailor for local conditions, including ad hoc operational research, to assess and quantify the added value of One Health strategies in the fields of prevention and preparedness.

Promote and support with adequate resources at national level the integration of One Health strategies in relevant curricula and facilitate the development of a common culture of preparedness.

Progress towards these priorities will be discussed at the G20 2022.
APPENDIX 1

Figure 1. The cumulative societal costs of an outbreak
(Zinsstag, 2020)

Figure 2. Drivers of emerging diseases and digital detection
(Olson, 2015)
Table 1. Potential disease drivers

<table>
<thead>
<tr>
<th>Driver theme (references)</th>
<th>Global data examples†</th>
<th>Regional data examples†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human susceptibility to infection (1,2,4)</td>
<td>Vaccine rumor surveillance, product distribution data from manufacturers, self-reported immunization status</td>
<td>US influenza vaccination rates, measles vaccination rates from the Mozambique Health Information System</td>
</tr>
<tr>
<td>Climate and weather (1,2,4)</td>
<td>Numerous satellite products, National Oceanic and Atmospheric Administration, Climatic Research Unit, Center for Sustainability and the Global Environment, vulnerability to climate change</td>
<td>Climate data, social media reports of climate and air pollution effects on Twitter and Sina Weibo</td>
</tr>
<tr>
<td>Human demographics and behavior (1,2,4)</td>
<td>Night time lights, Gridded population of the world, mobile phone operator data</td>
<td>National census data products, Twitter, world population</td>
</tr>
<tr>
<td>Economic development (1,2,4)</td>
<td>International Monetary Fund, World Bank</td>
<td>National departments of economics</td>
</tr>
<tr>
<td>Land use and ecosystem changes (1,2,4)</td>
<td>Global agricultural lands, Center for International Earth Science Information Network, Global Forest Change 2000–2012, Global Forest Watch, global livestock distribution densities</td>
<td>National departments of agriculture, croplands in western Africa, Africa mining digital news reports, IMazon Deforestation Alert System</td>
</tr>
<tr>
<td>Technology and industry (1,2,4)</td>
<td>Digital news, United Nations Global Pulse</td>
<td>NA</td>
</tr>
<tr>
<td>Human wildlife interaction (2,4)</td>
<td>Species distribution grids, digital news reports</td>
<td>State-level hunting data</td>
</tr>
<tr>
<td>Breakdown of public health measures (1,2,4)</td>
<td>Natural disaster hotspots</td>
<td>News of impending natural disasters (i.e., predicted hurricane landfall)</td>
</tr>
<tr>
<td>Poverty and social inequality (1)</td>
<td>Center for International Earth Science Information Network, Global Observatory</td>
<td>National census data</td>
</tr>
<tr>
<td>War and famine (1,2,4)</td>
<td>Famine early warning system, digital news and social media</td>
<td>Syria Tracker</td>
</tr>
<tr>
<td>Lack of political will (7)</td>
<td>Historical records, Transparency International, Cline Center for Democracy</td>
<td>NA</td>
</tr>
<tr>
<td>International travel and commerce (1,2,4)</td>
<td>Flight and shipping data</td>
<td>Regional distribution data of food products</td>
</tr>
</tbody>
</table>

*The table is purposely not exhaustive but provides a survey of types of available digital data that are associated with different drivers. NA, not applicable. †See online Technical Appendix Table 1 (http://wwwnc.cdc.gov/EID/articles/21/8/14-1156-Techapp1.pdf) for available references.

(Khan, 2020)

Figure 3. Some of the diverse sources of data (including non-health) that NPHI may need to access for preparedness (horizontal bars), and complexities that need to be considered when accessing data (vertical arrows)

(Khan, 2020)
Figure 4. Multisectoral approach to data collection and analysis

(Inspired by F. Dorea-National Veterinary Institute, Sweden)
A strategy to promote the use of a OH approach in prevention and preparedness is the development of a **One Health-Based Conceptual Framework (OHCF)** to ensure comprehensiveness in risk analysis, preparedness plans and their harmonization.

The OHCF is a multidisciplinary effort aimed at prevention, identification of risks for pandemics and related impacts on society.

The information and data collected, analysed with a One Health approach, support the elaboration and updating of prevention and preparedness plans and provide evidence for the appropriate decisions and related actions (Fig.5).

One Health applies to all related actions, including the identification of priorities through the systematic collection and interpretation of integrated data, multisectoral capacity building and risk assessment, and the regular update and monitoring of existing plans across sectors.

---

**Figure 5. OHCF support for the preparedness cycle**
(Modified from the European Observatory on Health Systems and Policies, 2015)
The risk indicators should be applicable worldwide, with options to tailor to local conditions, and they should be assessed and analysed at country level to highlight prevailing vulnerabilities. Risk indicators include aspects related to potential health threats identified at the human–animal-environment interface, as well as key fragilities of national systems (health, social, economic, etc.).

The risk analysis will also provide information that helps to improve prevention plans and actions in a continuum of processes fed and supported by the OHCF (Fig. 6).

Taking into consideration other frameworks that have been developed for other purposes but with similar comprehensive strategies (UNISDR, 2015; WHO, 2016, 2020; Machalaba, 2018; Alberti, 2020) and more specific One Health frameworks (Dente et al., 2018; ECDC, 2018, 2021; Machalaba, 2018; Farag, 2019; Pelican et al., 2019; WHO, FAO, OIE, 2019; Africa CDC, 2020; Amato, 2020; FAO, 2020), the following One Health-Based Conceptual Framework is proposed.

It aims to support the detection of threats at the human–animal–environment interface, assessing potential risks for pandemics, evaluating possible impacts at system levels and providing back strategies to improve and strengthen prevention.

It addresses priorities for action to be considered at national (by governments) and international (by international organizations and agencies) level.

Some countries might have already started One Health operationalization, and therefore some priorities might have been already accomplished. Each country will implement the OHCF in accordance with local situations and contexts.
The establishment of One Health National Centres (OHNCs) is a strategic opportunity to facilitate the national coordination of all the sectors/stakeholders/institutions involved and consistency in the identification of priorities for research and action. This will facilitate governance and efficient utilization of available resources.

International institutions will have the main role of facilitating the networking of OHNCs and supporting the harmonization of procedures and trainings by formulating guidance and related enforcement mechanisms.
# One Health-Based Conceptual Framework

## Scope and Purpose of the Framework

The present framework aims at guiding the relevant national sectors to implement harmonized and context-driven One Health strategies in the prevention and preparedness to threats to health.

## Expected Outcome

Prevention and preparedness plans benefiting from information and data collected and analysed with a One Health approach.

## Goal of the Strategy

To facilitate detection of threats at the human–animal–environment interface, assess potential risks for pandemic, support evaluation of possible impacts at system levels and provide back strategies to improve and strengthen prevention.

## Targets

<table>
<thead>
<tr>
<th>National legislative and procedural framework that allows/imposes mainstream One Health approaches in all the prevention strategies and allocates the necessary resources</th>
<th>Prevention and preparedness plans developed, implemented and monitored with a One Health approach, including community empowerment strategies, for the prevention and containment of health threats.</th>
<th>National sectors driven database interoperable and accessible to all the institutions/sectors involved in the One Health Team</th>
<th>National training plan on One Health strategies agreed between institutions and integrated in the relevant national plans</th>
<th>Evaluation plans to assess the effectiveness of One Health in reducing the risks of potential epidemics (prevent); in supporting the early identification of epidemic risks (alert); in contributing to the reduction of the impact (mitigate)</th>
<th>International Framework enabling harmonized integration of One Health strategies in all relevant regulations and communications</th>
<th>International training plans and tools aimed at facilitating OH training at national and cross-country level</th>
</tr>
</thead>
</table>

(Follows)
<table>
<thead>
<tr>
<th>Priorities for Action</th>
<th>National Level</th>
<th>International Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority 1</td>
<td>Priority 2</td>
<td>Priority 3</td>
</tr>
<tr>
<td>Governance</td>
<td>Prevention and Preparedness</td>
<td>Data Collection and Analysis</td>
</tr>
<tr>
<td>Establishing a national multisectoral and multi-institutional team to set principles, rules and procedures to allow operationalization of One Health strategies. Assessing the opportunity and benefits of setting up a One Health National Centre (OHNC)</td>
<td>Connecting One Health strategies to prevention and preparedness plans by establishing a multisectoral team (One Health Team) in charge of development, implementation and monitoring of plans</td>
<td>Identification of national priority areas to be monitored and related monitoring indicators/metrics</td>
</tr>
<tr>
<td>Enacting laws and identifying resources for One Health operationalization</td>
<td>Verifying available sources of information and data</td>
<td>Development of integrated and interoperable database connected with early warning and surveillance systems</td>
</tr>
</tbody>
</table>
Framework notes

[1] The One Health team may be or may be not the one that has developed the governance (National Institutional Team). In fact, One Health strategies can benefit several sectors and domains, so an appropriate institutional team should develop a governance that considers all the stakeholders involved. For the sake of this framework, the One Health team should include all the competencies and disciplines relevant for prevention and preparedness purposes.

[2] Priority areas refer to areas that may be at risk of favouring the development of epidemic events (Zahouli et al., 2017; Nuzzo et al., 2019; Meyer et al., 2020; Ministero della Salute, 2021; Plowright et al., 2021)

Therefore, in this context, a priority area might be:

- a vast market zone trading in wild animals;
- an area with migration movements/camps;
- an area subjected to intense climatic variations and/or manmade exploitation;
- an ecosystem particularly stressed favouring spillover events;
- populations professionally exposed to possible transitions of species;
- a fragile area in terms of low level of health coverage, low preparedness capacity, missing data collection and sharing.

[3] Indicators/metrics should consider what has already been developed and implemented in the context of relevant surveillance/early warning/preparedness national and international systems and the priority area/s identified.

[4] The integrated and interoperable database should consider relevant platforms developed/being developed at national and international level (e.g. VEO, 2021)
The concept of drivers is used in different fields, including economics, social sciences, technology, health and environmental sciences. Drivers are defined as issues that shape the development of a society, organization, industry, research area, technology, etc. They may act as facilitators or modifiers of effect on the onset of emerging risks. Namely, drivers can either amplify or attenuate the magnitude or frequency of risks arising from various sources (Richardson et al., 2016).

Whole of government and whole of society approaches are grounded in strategies that enhance joined-up government, improved coordination and the integration and diffusion of responsibility for health throughout government and society. Health is an emerging property of many societal systems; therefore it requires action in many systems, sometimes with and sometimes without the involvement of the health sector (WHO Regional Office for Europe, 2011).

Carbis Bay G7 Summit Communiqué, 13 June 2021 Statements and Releases “Improving integration, by strengthening a ‘One Health’ approach across all aspects of pandemic prevention and preparedness, recognising the critical links between human and animal health and the environment”: https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/13/carbis-bay-g7-summit-communique/?mc_cid=0a36c74d2b&mc_eid=UNIQID.

REFERENCES


Marcotty T, et al. (2013). Intersectoral collaboration between the medical and veterinary professions in low-resource societies: the role of research and training institutions. Comparative Immunology, Microbiology and Infectious Diseases, 36(3):233–239


Zahouli JBZ, et al. (2017). Effect of land-use changes on the abundance, distribution, and host-seeking behavior of *Aedes* arbovirus vectors in oil palm-dominated landscapes, southeastern Côte d’Ivoire. *PLOS ONE*, 12, [https://doi.org/10.1371/journal.pone.0189082](https://doi.org/10.1371/journal.pone.0189082), accessed 12 July 2021

ABOUT THE AUTHORS

Umberto Agrimi  Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità

Agrimi is a Veterinary pathologist with 30 years experience in vet public health and research on zoonosis and prion diseases. Since 2009 he is the Director of the Dept. of Food Safety, Nutrition and Veterinary Public Health, at the Italian National Institute of Health (ISS). He is member of the Scientific Steering Board of the One Health European Joint Program and member of the Governing board of the MedVetNet Association. He has published over 110 peer reviewed publications.

Francesco Cubadda  Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità

Research scientist and team leader at the Italian National Institute of Health. He works in the areas of food safety, chemical risk assessment, environmental and human health in the Unit of Human Nutrition and Health of the Department of Food Safety, Nutrition and Veterinary Public Health. Research interests include exposure assessment, trace elements and micronutrients, nanomaterials and environmental particles with regard to effects on human health. Expert in >10 EFSA working groups.

Mario Carere  Environment and Health Department, Istituto Superiore di Sanità

Carere is a Biologist, Senior Researcher at the Department Environment and Health of the Italian Institute of Health. He has a long science-policy experience in the field of exposure and risk evaluation linked to the chemical contamination of aquatic ecosystems. He is co-chair of the WG Chemicals in the context of the Common Implementation Strategy of the EU Water Framework Directive. His current research work is related to the use of effect based methods and to the evaluation of the chemical risks in the ecosystems. He is author of several national and international publications.
Osman A Dar Public Health England

Dar is a Fellow of the Royal College of Physicians and a Fellow of the Faculty of Public Health. At Chatham House, he is director of the One Health (OH) Project - an umbrella term referring to the Institute’s work on emerging infections and AMR, ecological approaches to disease control, environmental public health and health inequalities, and sustainable livestock development. For the UK Health Security Agency, he is co-lead on OH for the IHR capacity building programme and sits on the UK cross-government technical working group on OH. Since May 2021, he has been an elected member of the UN OH High Level Expert Panel.

Silvia Declich National Center for Global Health, Istituto Superiore di Sanità

Biologist and epidemiologist, started working in Africa in NGOs cooperation Projects in the field of Primary Health Care and Nutrition. From 1993 works with the Italian National Institute of Health (ISS): currently a senior researcher at ISS-National Centre for Global Health, she has extensive experience in leading scientific research projects, at national and international level, and on different areas related to communicable diseases, including those pertinent to one health, migrant health and preparedness.

Maria Grazia Dente National Center for Global Health, Istituto Superiore di Sanità

University degree in pharmacy, post-graduate specialization in human nutrition and Master Diploma in Primary Health Care Management, is senior researcher at the Center for Global Health of the Italian National Institute of Health (ISS). She is public health expert and experienced coordinator of international projects in the fields of preparedness, surveillance and control of infectious diseases and migrant health. She has collaborated with research institutes and non-governmental organizations with long periods of work in low- and middle-income countries.

Mirko Farina Institute for Humanities and Social Sciences, Innopolis University

Farina is an Assistant Professor of Philosophy and Computer Science at Innopolis University. His interests fall at the confluence of philosophy of mind, moral philosophy, bioethics, and computer science. A/Prof Farina has forty-one peer-reviewed publications with several articles in top-tier [Q1] journals in both philosophy and computer science and many chapters in prestigious edited collections (such as Oxford University Press, MIT Press). Personal Website: https://mirkofarina.weebly.com/.
Chikwe Ihekweazu Nigeria Centre for Disease Control

Ihekweazu is the Director General of the Nigeria Centre for Disease Control and, until January 2018, the Acting Director of the Regional Centre for Disease Control for West Africa. He trained as an infectious disease epidemiologist and has over 20 years’ experience working in senior public health and leadership positions in several National Public Health Institutes, including the South African National Institute for Communicable Diseases, the UK’s Health Protection Agency, and Germany’s Robert Koch Institute. He has led several short-term engagements for WHO, mainly in response to major infectious disease outbreaks around the world. He was part of the first WHO COVID-19 international mission to China, in February 2020.

Andrea Lavazza Centro Universitario Internazionale

Lavazza is a senior research fellow at Centro Universitario Internazionale, Arezzo, and adjunct professor of Neuroethics at University of Pavia, Italy. As a moral philosopher and neuroethicist, his main areas of research are human enhancement, cognitive integrity, neurolaw, memory manipulation, and human cerebral organoids. Lavazza has published over 80 papers and 11 books both as author and editor. His full list of publication is available at: https://www.cui.org/andrea-lavazza.

Laura Mancini Environment and Health Department, Istituto Superiore di Sanità

Degree in Natural Sciences. Master’s degree in Environmental Economics and Sustainable Development. She is currently the director of the Ecosystems Health Unit of the Italian National Institute of Health (ISS). Her research group works and publishes extensively on Health and Climate Change, Environmental and Global Change, Ecosystems Health. Editorial board member in international journals. Reviewer of scientific journals. Author and co-author of international papers, monographs, technical reports and guidelines.

Alberto Mantovani Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità

Mantovani is a senior toxicologist of the Italian National Institute of Health (ISS), with a long-standing expertise on risk assessment, e.g. at EFSA. The interdisciplinary collaboration in risk assessment drove him toward One Health. Under this respect, his activities include “The Environment-Animal-Human Web: A “One Health” View of Toxicological Risk Analysis” (Frazzoli & Mantovani, eds.), Front Public Health 2018; and the international OHEJP Summer School (2021). “Environmental issues in One Health”.

One Health-Based Conceptual Frameworks for Comprehensive and Coordinated Prevention

27
Stefania Marcheggiani  Environment and Health Department, Istituto Superiore di Sanità

Italian National Institute of Health (ISS), PhD Biology, proven experience in Environmental microbiology and biotechnology research focus on innovative tools for the detection of pathogens from aquatic ecosystems with 34 peer-reviewed publications. Since 2009 Italian expert on diatom - WG Ecological Status (ECOSTAT) CIS WFD 2000/60/CE. She has been actively involved in European research projects (PULVIRUS, IntCatch H2020, BlueHealth H2020, µAQUA -FPVII, µPAD- FPV).

Alessia Milano  National Center for Global Health, Istituto Superiore di Sanità

Milano is a PhD student at the Italian National Institute of Health (ISS) with a bachelor’s degree in Biological Sciences and a master’s degree in Ecobiology. The objective of her PhD is to contribute to the strengthening of prevention and preparedness plans with the integration of One Health Strategies with specific operational studies on integrated surveillance and early warning of arbovirus infections mainly in non-EU countries.

Monica Monaco  Infectious Diseases Department, Istituto Superiore di Sanità

Monaco is a staff researcher (PhD) in the Department of Infectious Diseases at the Italian National Institute of Health (ISS). She carries on research and institutional activities in the field of antibiotic-resistance, in the framework of the National Surveillance of the Antibiotic-Resistance AR-ISS, included in the European network EARS-Net (ECDC), and in the field of vaccine-preventable diseases (Diphtheria) within the European Diphtheria Surveillance Network EDSN (ECDC). For these activities, she has institutional positions at the Ministry of Health and the ECDC.

Stefano Morabito  Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità

Director of the Unit of Food-borne diseases at the Italian National Institute of Health (ISS). Director of the EU Reference Laboratory for E. coli. Develops genomics-based solutions for the study of food-borne bacterial pathogens and to improve signalling of food borne outbreaks. Author of about 80 peer-reviewed publications and editor of the book “Pathogenic Escherichia coli, molecular and cellular microbiology” (Caister Academic press).
Flavia Riccardo  Infectious Diseases Department, Istituto Superiore di Sanità

Riccardo is an MD, PhD and an infectious disease specialist, currently a senior researcher in the Department of Infectious Diseases of the Italian National Institute of Health (ISS). Among her interests are the implementation of the International Health Regulations, pandemic preparedness, One Health surveillance, outbreak response, epidemic intelligence, risk assessment and operational research. She is currently engaged in COVID-19 national surveillance and risk assessment in Italy.

Claudia Robbiati  National Center for Global Health, Istituto Superiore di Sanità

Robbiati is a visiting researcher at the National Centre for Global Health of the Italian National Institute of Health (ISS). She is interested in applying a One Health approach in prevention and preparedness to threats to global health security. Claudia is a global health specialist with 8+ years international experience in designing, implementing, monitoring and evaluating researches, projects and programmes that address global health challenges, by applying an evidence-based approach supported by field research.

Gaia Scavia  Food Safety, Nutrition and Veterinary Public Health Department, Istituto Superiore di Sanità

(DVM) Scientist at the Dep. of Food Safety, Nutrition and Veterinary Public Health, staff member of the EURL for E. coli., Italian National Institute of Health (ISS). Deputy of National Focal Point for ECDC-Foodborne and Waterborne Disease program. Expertise in One-Health epidemiological surveillance, risk assessment, training and communication in foodborne zoonoses and outbreaks investigation in both human and food/veterinary sectors. She participated in many research and institutional initiatives at national and EU level.

Laura Villa  Infectious Diseases Department, Istituto Superiore di Sanità

Villa works at Italian National Institute of Health (ISS), as Researcher in charge and coordinates human national surveillance of Enterobacteria and she has institutional positions at the ECDC. She has a broad expertise in genome sequencing for clinical microbiology to elucidate mechanisms of AMR transmission via different mobile genetic elements (resistome and mobilome) and to trace the emergence of high-risk and new clone, useful in surveillance studies.
Matteo Villa Italian Institute for International Political Studies (ISPI)

Villa is Research Fellow at the Italian Institute for International Political Studies (ISPI). Over the past year, he has been actively monitoring the evolution of the COVID-19 pandemic, studying present dynamics and future trends through weekly data-driven analyses.