



ONE HEALTH
HUMANS ANIMALS ECOSYSTEMS

Putting Pandemics Behind Us

Investing in One Health to Reduce
Risks of Emerging Infectious Diseases



WORLD BANK GROUP

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One Health is an investment in humanity’s future.

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Preface

The COVID-19 crisis brought home the high costs of pandemics, triggering a historic setback in the fight against poverty. It also reinforced the interconnections between people, planet and economy, calling attention to the zoonotic nature of pathogens spilling over from animals to people.

We publish this report with a sense of urgency. As damaging as COVID-19 has been, the number of infectious disease outbreaks—from avian influenza to Middle East respiratory syndrome to Ebola—has been increasing dramatically. Every year, zoonoses cause more than a billion human infections and a million deaths—a trend that we must put an end to because it jeopardizes human development and breeds larger outbreaks such as COVID-19, bringing much higher death tolls.

To decrease their burden, we must focus on prevention. The One Health approach proposes a way forward to reduce risk of spillover. Recognizing that the health and well-being of humans, animals, and their shared ecosystems are interdependent, One Health is designed as an integrated, practical, multisectoral framework for pandemic prevention.

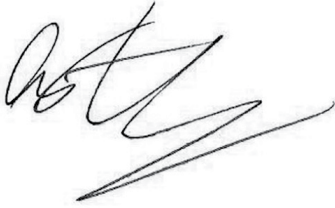
By stopping infectious diseases from spilling over to people and spreading to become pandemics, One Health provides a solid foundation for global health security and improved development outcomes at much lower societal and economic costs.

Despite these benefits, there has been far too little attention paid to prevention and the upstream drivers of emerging infectious diseases. Unlike spending on disaster response and recovery, there are few political incentives to invest in prevention because it is invisible: a pandemic prevented is a pandemic that is not seen.

This report aims to shed light on the benefits of prevention to serve as a wake-up call for policymakers and finance ministers alike. The report also outlines an investment framework and One Health architecture for zoonotic disease prevention. As you will read on these pages, compared to the sky-high cost of bringing pandemics under control, relatively modest investments in prevention will pay huge dividends.

After major tragedies, countries often make large investments to prevent recurring disasters. We hope that this “Titanic effect” holds true today. The twentieth cycle of the International Development Association (IDA20), our fund for the poorest, includes a strong commitment to support countries to mainstream One Health approaches. The new Financial Intermediary Fund for Pandemic Prevention, Preparedness, and Response, and ongoing efforts toward the global accord on

pandemics are among positive signs that we may be close to breaking the cycle of panic and neglect. It is up to the leaders of today to make the investments needed to avert the pandemics of tomorrow. We hope that this report will make a useful contribution to save lives, and create a safer, more prosperous world for future generations.



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ABBREVIATIONS AND ACRONYMS

AMR	Antimicrobial Resistance
EID	Emerging infectious disease
FAO	Food and Agriculture Organization of the United Nations
GAHP	Good animal husbandry practices
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
GHSA	Global Health Security Agenda
GPAI	Global Program for Avian Influenza
GPG	Global Public Good
HLIP	High Level Independent Panel
HPAI	Highly Pathogenic Avian Influenza
IDA	International Development Association
IEG	Independent Evaluation Group
IFI	International financial institutions
IHR	International Health Regulations
IMF	International Monetary Fund
INB	International Negotiating Body
IUCN	International Union for the Conservation of Nature
JEE	Joint External Evaluation (IHR Monitoring and Evaluation Framework)
MDB	Multilateral Development Bank
MERS-CoV	Middle East Respiratory Syndrome—Coronavirus
MOF	Minister of Finance
NBWs	National Bridging Workshops
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OH	One Health
PPR	Pandemic Prevention, Preparedness, and Response
PVS	Performance of Veterinary Services
REDISSE	Regional Disease Surveillance Systems Enhancement
REDD+	Reducing Emissions from Deforestation and forest Degradation Plus
RVF	Rift Valley Fever
SARS	Severe Acute Respiratory Syndrome
SCD	Systematic Country Diagnostic
SDG	Sustainable Development Goals
UN	United Nations
UNEP	United Nations Environment Programme
WHO	World Health Organization
WOAH	World Organisation for Animal Health, founded as OIE

Glossary

An **epidemic** refers to an increase, often sudden, in the number of cases of a disease in a particular area. Epidemics start as local **outbreaks**. A **pandemic** is defined as an epidemic occurring over a very wide area, or worldwide, crossing international boundaries and usually affecting many people.

Zoonoses (or **zoonotic diseases**) are infectious diseases transmissible between animals and humans. Most disease outbreaks with pandemic potential have a zoonotic origin, caused by a pathogen spillover event.

Spillover occurs when a pathogen host or reservoir population encounters a susceptible host population and causes infection. The pathogen is transmitted from the original population and may or may not be further transmitted within the new host population.

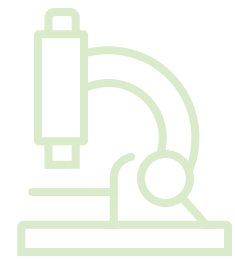
Emerging infectious diseases are infections associated with new or significantly expanded geographic scope or spread of zoonotic, vector-borne, or drug-resistant pathogens.

Human health is not only about absence of disease or disability but is also a state of physical, mental, and social well-being and a fundamental human right. **Public health** concerns the collective management of the health of a population, whether this involves treatment, prevention, education, or social hygiene. **Global health** is a field of study, research, and practice that prioritizes improving health and achieving health equity for everyone in the world. **Environmental health** covers aspects of human health, including quality of life, which are determined by physical, chemical, biological, social, psychosocial, and aesthetic factors of the environment. **Ecosystem health** is a broad term that typically refers to the condition and resilience of an ecosystem, including in relation to the array of services that are expected from it (such as disease



regulation). **Animal health** concerns both domesticated animals (pets and livestock) and wild animals. It is at once an ethical, economic, and health issue, as many diseases are zoonotic (e.g., can be transmitted to and from humans). The area of **veterinary public health** covers all activities directly or indirectly related to animals (or animal products or by-products) that contribute to the protection, preservation, and improvement of human health.

Health security means protecting people from threats to their health. Health security means protecting everybody, not only because it is an equitable thing to do, but because with infectious diseases true health security can only be achieved if everyone is protected. **Prevention** is a global health security pillar characterized by systems, policies, and procedures to determine, assess, avoid, mitigate, and reduce threats and risks by reducing vulnerability and exposure. **Preparedness** is the knowledge and capacities developed by governments, response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent, or current disasters.



One Health is an integrated approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, and safe and nutritious food; acting on climate change; and contributing to sustainable development. One Health is typically guided by systems thinking and transdisciplinary working.



Executive summary

The next pandemic may already be on the horizon. There is however nothing inevitable about the pace of outbreaks and emergence of infectious diseases, a growing number of which become pandemics. They are mainly the result of human activity, which is shaping the interactions among humans, animals, and the environment. Seventy-five percent of emerging infectious diseases (EIDs), and almost all recent pandemics, are zoonoses—diseases having their origin in animals. These diseases stem from increased contact between wildlife, livestock, and people, which allows microbes to ‘spill over’ from animals into human populations. The most important reservoirs of pathogens with pandemic potential are wild animals (especially mammals, particularly bats, rodents, and primates), some birds (especially water fowl), and livestock (e.g., pigs, poultry, cattle, and camels).

Effectively addressing the challenges posed by pandemics requires a departure from the old cycle of panic and neglect. Even after experiencing this cycle for recent diseases such as SARS, avian influenza, and Ebola and the enormous health, economic, and societal impacts caused by COVID-19, few leaders recognize the critical importance of pandemic prevention, which means stemming a local outbreak *before* it becomes a pandemic. The business-as-usual approach to pandemics has been based on containment and control after a disease has emerged. It relies primarily on reductionist approaches to vaccine and therapeutic development rather than on reducing the drivers of pandemic risk to prevent them before they emerge. This has proven to be enormously expensive and insufficient to protect people from serious economic and social consequences of large outbreaks or pandemics. Yet, prevention is almost always underfinanced relative to preparedness and especially to response.

Pandemic prevention is a global public good. It is non-excludable (no country can prevent others from benefitting) and non-rival (one country benefitting does not limit the extent to which other countries can benefit). Therefore, One Health, which sustainably balances and optimizes the health of people, animals, and ecosystems, is the quintessential global public good, which may explain underinvestment as countries hope to benefit without contributing (the classic ‘free-rider’ problem). Investment in pandemic prevention also has remained low because the benefits are largely invisible and uncaptured, in the form of crises that do not occur. Furthermore, some drivers of pandemics (e.g., forest exploitation, extractive industry, livestock farming, and urbanization) are closely tied to income generation and livelihoods, which can hinder necessary changes.

This report articulates an alternative approach that addresses pandemic risk at its source and is grounded in One Health strategies of systems thinking, whole-of-society planning, and collaboration across disciplines at the human-animal-ecosystem interfaces as a central path to global health security. The report highlights three main entry points to transition to this more effective approach.

First, timing. Now is the opportune time to push for this transition, when the ravages of COVID-19 are still ongoing and there are high-level discussions about designing an international accord on pandemics and a new financing mechanism for pandemic prevention, preparedness, and response.

Second, the report highlights the relatively modest cost of prevention compared to crisis response. Prevention guided by One Health principles is estimated to cost between approximately US\$10.3 billion and US\$11.5 billion per year. This includes \$2.1 billion per year to bring public veterinary services up to international standards, US\$5 billion to improve farm biosecurity, and US\$3.2- to-\$4.4 billion to reduce deforestation in higher risk countries. Prevention costs are less than 1 percent of the cost of responding to COVID-19 pandemic in one single year, 2020. And the fact that prevention done right would de-risk investments in preparedness and reduce the need for subsequent response related costs.

Third, the report emphasizes the many co-benefits of investing in prevention and One Health for sustainable and human development. These include reduction in CO₂ emissions, climate adaptation, improved food safety and nutrition, reduced economic burden from animal diseases, increased access to markets, and strengthening resilience of health systems by boosting awareness and multisectoral action. For example, low- and middle-income countries could reap substantial benefits for their agricultural sectors (specifically livestock), driven by reduced frequency and scale of costly disease control measures such as culling and expanded access to international and higher-margin markets for producers. From a health security perspective, investments in prevention can improve the resilience of health systems, make investments in preparedness more effective, drastically reduce the need for response, and lessen the broader economic and social impacts of pandemics. Such investments must be tailored to the country context, considering national risk profiles and circumstances.

One Health is an investment in humanity's future. The co-benefits are high but so, too, is the cost of inaction. To break the cycle of panic and neglect, within the broader PPR agenda, the report proposes a One Health Investment Framework for national, regional and global stakeholders to adopt.

This investment should be guided by five core principles of: (i) adopting an integrated One Health multisectoral approach that aims to sustainably balance the health of people, animals, and ecosystems, (ii) prioritizing prevention, a most overlooked component of health security, (iii) complying with existing minimum standards that are relevant for One Health, (iv) focusing on geographical locations with higher risks of spillover at the human-animal-ecosystem interfaces, and (v) reducing risks of spillovers in forests (or wildlife habitat), farms (livestock), and sprawling urban areas.

One Health is a coordination-heavy agenda that requires strong champions, to mobilize finance as a shared responsibility, and a strong institutional arrangement backed by solid technical capacity supporting its work. Thus, to support countries, there is an important role for technical agencies and financial institutions to coordinate global, regional and local activities by the public sector (for public goods such as public health systems, public veterinary systems, ecosystem management and protection, and surveillance data systems), the private sector (for livestock farmers, loggers, forest-based communities, and land developers) and the civil society.

A One Health investment framework needs to be adopted and implemented at the country level based on alignment with each country’s prioritized national action plans, risk factors and vulnerabilities for EIDs, and existing resources and programs in areas for which there is overlap with the One Health agenda from public and private sources. Doing so successfully would require: (i) removing the obstacles to prevention; (ii) financing prevention as a shared responsibility; and (iii) ensuring country ownership and enabling institutional arrangements.

Investing in One Health based prevention is the best way forward to break the cycle of panic and neglect—once and for all. If we fail to act now, we will be destined to become like Sisyphus, forever rolling a boulder uphill to manage the response to the next pandemics.





Introduction

The central argument of this report is that pandemic risk must be addressed at the source, via prevention, incorporating risk reduction and integration of human, animal, and ecosystem health, which is the basic premise of the One Health approach.

Pandemics are large-scale infectious disease events, most of which have their origin in domestic or wild animals. Before COVID-19, HIV/AIDS, Nipah virus disease, avian influenza, Ebola virus disease, severe acute respiratory syndrome (SARS), Middle East Respiratory Syndrome (MERS), and Zika were among the diseases that emerged from animals in contact with humans over the last few decades, and several of these fully realized their pandemic potential. Many of the major human infectious diseases, including some now confined to humans and absent from animals, such as measles, arose from contact with animals. Every year, zoonotic diseases sicken billions of people, killing millions, with low- and middle-income countries being most vulnerable. Even when animal diseases do not kill people, they frequently deepen poverty, diminish or destroy livelihoods, and undermine food security as livestock die prematurely or get culled for the purpose of disease control.

The impact of pandemics has increased, as the world has learned all too well from COVID-19. The International Monetary Fund (IMF)'s World Economic Outlook (IMF 2022) has projected the cumulative output loss from the pandemic through 2024 to be about US\$13.8 trillion. The cost is unprecedented, and the damage done to social cohesion, human capital, poverty, and sustainable development will be incalculable.

Decades ago, Albert Camus observed that there have been as many plagues as wars in history, yet plagues and wars always take people equally by surprise.¹ But

the pace of new, emerging, or re-emerging diseases has accelerated, and the next pandemic may already be on the horizon. There should be no surprise. As humans extend their footprint on the planet, encroaching into natural habitats and altering them, the potential for diseases to emerge has increased exponentially. In addition, our globalized, interconnected world makes societies increasingly vulnerable to the spread of diseases and eruption of pandemics. Risk anywhere becomes risk everywhere.

The accelerating trend of outbreaks results from our relationship with the planet and our relationship with each other.² Because of this, crises are not inevitable—we have several opportunities and a set of appropriate interventions that can prevent or mitigate adverse shocks caused by these outbreaks.

Reactive strategies on their own are insufficient and overly expensive. When drawing lessons from the avian influenza crisis, the World Bank IEG recommended moving from a response mode, which necessitates the use of emergency instruments and often massive resources, to a preemptive risk-reduction approach through cost-effective, regular country programs and operations that tackle the drivers of disease emergence.³

But most countries did not heed this recommendation, and prevention remains largely neglected. After each major incident, countries typically make limited investments in preventing the emergence of infectious diseases and reducing pandemic risks. After the outbreak is contained, attention begins to divert elsewhere and investments in prevention wane, feeding a cycle of panic and neglect that leads the world to once again become at risk for the next outbreak, as we saw in the years preceding COVID-19.

1 The Plague, a novel by Albert Camus. 1947

2 Laudato Si': On Care for Our Common Home, encyclical by Pope Francis. 2015

3 Responding to global public bads, a report by the World Bank Independent Evaluation Group. 2014



We can stop this cycle by implementing a One Health approach, especially in countries with a high risk of EIDs and spillovers, and leverage the One Health approach to both prevention and preparedness. One Health recognizes that human and animal health are interdependent and bound to the health of the ecosystems in which they exist. It offers a practical framework to reduce pandemic risks at the source and the necessary foundation to achieve global health security.

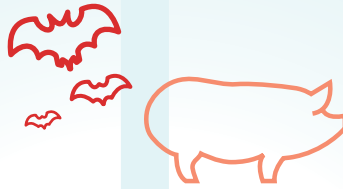
One Health has proven successful. It combated river blindness during the 1970s, combining public health and environmental interventions, and the global program on avian influenza in the 2000s included some essential One Health features, such as coordination mechanisms between human and animal health services. Years later, as COVID-19 still wreaks havoc on lives and economies, as monkeypox is declared a Public Health Emergency of International Concern, and as concerns arise from the detection of new zoonotic Langya virus, integrated approaches to prevention based on One Health foundations have become even more relevant and necessary.

This report builds on One Health's successes and lessons from many public health failures that did not take an integrated approach. It calls for urgent, long-term attention to prevention, a critically missing link in our current approach to pandemic risk. It organizes knowledge and understanding of the drivers of pandemic-prone emerging diseases and proposes to re-cast prevention to lessen the likelihood of spillover, de-risk investments in preparedness, and reduce the cost of response. Finally, the report proposes a framework to mobilize finance for prevention to reduce pandemic threats locally and globally.

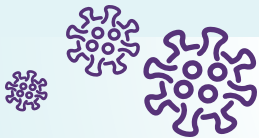
Former Liberian President Ellen Johnson Sirleaf and former New Zealand Prime Minister Helen Clark, co-chairs of the Independent Panel for Pandemic Preparedness and Response, described COVID-19 as the 21st century's "Chernobyl moment" and stressed that if investment doesn't occur now, "we will condemn the world to successive catastrophes."⁴ However, a year later, the co-chairs expressed their concern about the very slow progress on reforms. The world cannot afford to ignore their stark warning or the recommendations of this report.

4 The Independent Panel for Pandemic Preparedness and Response of the World Health Organization (WHO) published its findings in May 2021.

75% of emerging infectious diseases have their origin in animals



The pace of emerging infectious diseases has **accelerated**, increasing at an annual rate of **6.7%**



The impact of pandemics has increased, causing an annual income loss of **US\$490 billion**



Pandemic risk must be addressed via prevention

Pandemic risk can be reduced at the source by addressing drivers at the **human-animal-ecosystem** interfaces



One Health is a necessary foundation for health security



Addressing pandemic risk at the source

The pace of EIDs has accelerated at an annual rate of 6.7 percent from 1980, with the number of outbreaks growing to several hundred every year since 2000 (Morand 2020). The richness of microbes causing diseases also increased significantly over that period (Smith et al. 2014) and the yearly probability of an occurrence of large outbreaks could increase up to threefold in the coming decades (Marani et al. 2021). On average, more than five new diseases emerge in people every year, some of which have the potential to spread widely and become a pandemic. Diseases know no boundary, and the connectiveness of the world resulting from the movement of goods, vehicles, and people makes local outbreaks easier to spread globally.

About five years ago, annual loss from a pandemic was expected to be 0.6 percent of global income, or about US\$490 billion per year, with losses varying by income group from a little over 0.3 percent in high-income countries to 1.6 percent in lower-middle-income countries (Jamison 2017). This was an underestimation. In 2020, the global economy contracted by 4.4 percent from the impacts of the COVID-19 economic shutdown. That amounts to about US\$3.6 trillion worth of lost goods, services, and other outputs. This does not include the many ways people suffered in the downturn, including through illness, death, loss of livelihoods, or disruption of schooling. As of August 2022, more than 6.45 million people have died from COVID-19, according to official estimates (although the actual death toll might be between 16 million and 20 million, approximately equal to that of World War I), and the virus continues to spread.

1. A CAUTIONARY TALE—THE STORY OF NIPAH VIRUS DISEASE

Events started in 1998 in Nipah, a suburb of Ipoh, Malaysia, when villagers experienced febrile encephalitis for which there was no cure or treatment. Young people would be healthy one day and the next

day their brains would swell up. They couldn't walk or talk. About half the patients died. Within just a few months, nearly one in three families in Nipah had lost someone to the disease. In the beginning, the disease was mistakenly identified as the mosquito-borne Japanese encephalitis but spraying for mosquitoes did not bring the situation under control. Soon people realized that no Muslims were getting sick, and only farmers raising pigs were falling ill. The outbreak had been preceded by a respiratory illness and encephalitis in pigs in that same area. It was the pigs, not the mosquitoes, that caused the outbreak.

How did this happen? Fruit-bats have been identified as a natural reservoir of the Nipah virus. Over several decades before the outbreak, the forest habitat of these bats had been substantially reduced by deforestation and/or forest degradation for pulpwood or industrial palm plantations. A massive smoke haze occurred in 1997 and 1998 just before the outbreak, the result of slash-and-burn deforestation and/or forest degradation that blanketed much of the region and was exacerbated by a drought driven by a severe El Niño oscillation. The haze and drought led to a reduction in the availability of forest-foraging areas for fruit-bats and to an increased presence of bats into cultivated fruit orchards, where piggeries allowed transmission of the virus from bats to pigs and, ultimately, to humans. Pig farms themselves had changed over time. When Malaysia had a massive economic boom in the 1980s and 1990s, the number of middle-class families who could afford to eat pork several times a week ballooned. While farmers once raised only a few pigs, now they crowded pigs into tight quarters and industrialized the farms.

Once the outbreak became apparent, the government ordered the culling of more than a million pigs—a hardship for pig farmers and a painful, dark episode for the local community. Out of fear or economic despair, some pig farmers affected by the outbreak sold pigs to

other farms across the country. In 1999, cases were recognized in other parts of the peninsula, southward from Kinta district, and were associated with surreptitious movements of infected pigs.

The Nipah story inspired the 2011 movie “Contagion,”⁵ a tale of viral transmission from deep forests to densely populated, globally connected areas and of spillover from wildlife to humans. But the Nipah story is also a tale of a changing climate, changing use of land and food systems, lack of adequate biosecurity on farms, urbanization, social inequities and tensions, human activities driving disease emergence, and total blindness to prevention.

2. UNDERSTANDING THE DRIVERS OF SPILLOVER TO REDUCE PANDEMIC RISK

Seventy-five percent of EIDs and almost all recent pandemics are zoonotic in nature. These diseases stem from increased contact among wildlife, livestock, and people, which allows microbes to ‘spill over’ from animals into human populations. The most important reservoirs of pathogens with pandemic potential are wild animals (especially mammals, primarily bats, rodents, and primates); some birds (especially water birds); and livestock (e.g., pigs, poultry, cattle, camels).

Spillover is a gradual process, with many dead-end events or stuttering chains before sustained infection in humans happens or human-to-human transmission occurs. Spillover is not a rare event or a “viral needle in a haystack,” but rather a pattern that suggests that a specific local ecological context is ripe for disease emergence and spread into human populations.

Human activities influence the rate of success of spillover events, the accelerating trend of EIDs, and increasing pandemic risk. The causal pathways leading to initial spillover, spreading to become epidemics, and in some cases leading to pandemics, are often complex, involving a mix of factors, also known as “drivers,” that shape risk and can increase vulnerability. Drivers modify

systems, incubating, accelerating, or amplifying changes. They can either intensify or attenuate the magnitude or frequency of risks arising from various sources. The successful identification of risks at their early inception is at the heart of public health and environmental protection (Robinson et al. 2012).

As humans have extended their footprint on the planet, encroaching into natural habitats, altering them to extract resources, globalizing trade, and moving goods and people, the potential for infectious diseases to emerge and spread has increased. Urbanization and climate change are reinforcing this trend by increasing pressure on land use and food systems and providing new, potentially more suitable, conditions for pathogens and diseases to develop and spread (Richardson et al. 2016). Human population displacements from economic, political, humanitarian, and, increasingly, climatic crises are another set of drivers for emerging diseases. Human population growth coupled with larger numbers of livestock needed for animal protein will only increase spillovers if nothing is done to mitigate risks. Table 1 provides details on how farms, forests, cities, climate change, and inequalities drive EIDs.

Drivers usually influence systems in complex, non-linear, and not necessarily causal interactions (see Box 1 for an example of drivers and the emergence of Ebola in West Africa). Nearly one-third of the planet’s land area has been transformed in the last 60 years, and nearly 90 percent of deforestation between 2000 and 2018 was related to agriculture. Sixty percent of the drivers of the 100 biggest outbreaks since 1974 fall within the domains of land-use change, especially related to forests and food systems, in particular livestock operations (Stephens et al. 2022).

While there is usually broad agreement about the critical factors driving disease emergence, there has been little consistency on how to organize these drivers and their relationships to key foci of risk. Based on our bibliographic review⁶, we propose to organize drivers

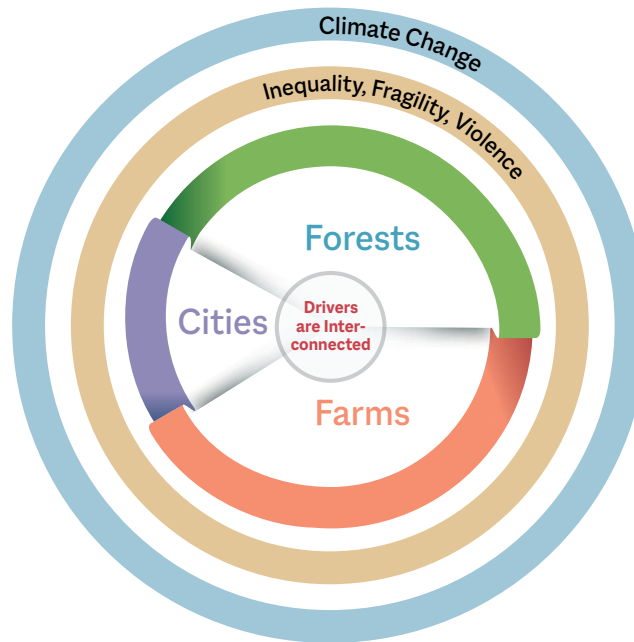
5 Contagion is a 2011 film directed by Steven Soderbergh.

6 See the technical report published as a companion document to this report.

TABLE 1:
Examples of elements driving EIDs at the human, animal, ecosystem interfaces

Farms	Food systems open active interfaces among humans, animals, and the environment (Richardson et al. 2016). The production, distribution, and consumption of food can bring pathogens closer to people, and these activities channel waste back to the environment. Inadequate animal husbandry; lack of biosecurity; unsanitary conditions in farming, transport, slaughter, or marketing; and poor handling of animals and animal products have been identified as critical channels for transfer of pathogens across species and transmission of diseases. Higher concentration of farms and animals and more extensive production systems vulnerable to disease increase the risk for infectious diseases to emerge and spread, resulting in increasing threats to public health.
Forests	Land use change fuels the emergence of infectious diseases through agricultural encroachment, deforestation, forest degradation and fragmentation, encroachment into wildlife habitat (including for activities such as tourism), irrigation, wetland modification, mining, expansion of urban environments, pollution, and coastal zone deforestation, forest degradation and fragmentation. These activities generate cascades of factors that can modify, accelerate, or amplify the dynamics of pathogens and diseases (Patz et al. 2004). More than a third of EIDs reported since 1960 are attributed to land-use change, including deforestation, forest degradation and fragmentation, and 15 percent have been linked to forests. Deforestation, forest degradation and fragmentation, particularly in the tropics, has been associated with an increase in infectious diseases.
Cities	Urbanization has increased rapidly and creates another set of drivers (Alirol et al. 2011), where new cities can be incubators for epidemics, and zoonotic diseases can spread more rapidly and become worldwide threats (Neiderud 2015). Risk factors in the urban environment include population density, poverty, and inadequate housing or sanitation, which can cause exposure to, and proliferation of, insect- and rodent-borne diseases and water- and soil-transmitted diseases (Himsworth et al. 2013). Growing urbanization has also shifted some infectious diseases that have traditionally been rural illnesses, such as Dengue fever, to cities. New housing on the outskirts of big cities can potentially be meeting points for wildlife and humans, with livestock acting as bridges for zoonotic diseases.
Climate Change	A changing climate modifies the geography of diseases, strongly influences all other drivers, and aggravates over half of known human pathogenic diseases (Mora et al. 2022). It causes shifts in natural ecosystems both in altitude (e.g., retreating alpine glaciers) and latitude (e.g., sub-tropical forests expanding in temperate areas), affecting the geographical ranges of animal species, vectors, and reservoirs and susceptible hosts. Use of biological transmission models had shown the potential spread of falciparum malaria into northern latitudes, including Europe and North America (Rodgers and Randolph 2000). Some invasive and disease-carrying species of mosquitoes are proliferating across Europe and becoming a mounting health concern. Extreme weather events, in turn, can create conditions conducive to unusual clusters of insect-, rodent-, and water-borne diseases. Natural disasters lead to outbreaks, such as the re-emergence of leptospirosis in China following Typhoon Nali in 2001 (Watson, Gayer and Connolly 2007) and the re-emergence of plague in Madagascar that was influenced by El Niño and the Indian Ocean Dipole (Kreppel et al. 2014), while weather also affects the timing and intensity of outbreaks. Also, as the climate changes, wild animals relocate their habitats, often to regions with large human populations, increasing likelihood of spillover (Carlson et al. 2022).
Inequality, Fragility, Violence	Increasing inequality, fragility, and violence in large parts of the world make people and systems more vulnerable to pandemics, whether from poor housing conditions, food insecurity, forced migration, or armed conflict. Conflicts and the resulting fragility and violence, the displacement of populations, and the increase of refugees and asylum seekers can have a range of health consequences, including deteriorating hygiene, overcrowding, breakdown of health and social services, and heightened risk of disease transmission. Conflict settings can hamper access to basic prevention, detection, and containment measures. In addition to new exposures and potential reliance on wild animals for protein, people may also move with their livestock to escape conflict situations, leading to increased risk. Armed conflict can also complicate disease response efforts, in part because of its secondary effects (e.g., mistrust, misinformation, gaps in surveillance, and cautious implementation of public health control measures).

FIGURE 1:
Drivers of
EIDs: Core and
cross-cutting
domains



Forests, farms, and cities depict the three core domains related to land use, food systems, and urbanization, respectively. These core domains are influenced by two crosscutting domains—climate change and inequality, fragility, and violence. Core and cross-cutting drivers are highly interconnected.

across three main domains pertaining to farms, forests, and cities (Figure 1)—and two crosscutting domains of influence—climate change and inequality, fragility, and violence.

While oceans are absent from the drivers depicted in Figure 1, there is an increasing recognition of the relationship between human health and oceans (Flemming et al. 2006), which may elevate their importance as a driver domain in the future. Changes in water temperature, ocean acidification, and deoxygenation, leading to changes in oceanic circulation and chemistry, rising sea levels, increased storm intensity, and the diversity and abundance of marine species (IUCN 2017) are among the changes that can affect human health and welfare (Parmesan and Attrill 2016, Talukder et al. 2022), further influencing drivers of EIDs.

The analysis of drivers cannot predict where and when the next pandemic will start, or which pathogen will cause it. Each disease has its own history, root causes, and trajectory from spillover events to large outbreaks. The next pandemic will most likely be different from past ones. Like Thucydides' observations⁷ about past

events, and those that may recur in similar ways, analyzing drivers can focus attention on high-risk areas and factors that can be addressed through policy interventions. The analysis of drivers is critical to identify and evaluate risks and the combined effects of sparks (where an outbreak is likely to arise) and spread (how it may diffuse through human populations).

3. ONE HEALTH AS A NECESSARY FOUNDATION OF PANDEMIC PREVENTION

Most drivers of EIDs are outside the health sector, and prevention needs to address these drivers across multiple sectors. Pandemic prevention encompasses the systems, policies, and procedures to determine, assess, avoid, mitigate, and reduce public health threats and risks. For effective prevention to take place, multisectoral interventions are needed to mitigate risk and reduce the likelihood of spillover events at the human, animal, or ecosystem interfaces that go far beyond the confines of the health sector.

⁷ "Yet if they are judged useful by any who wish to look at the plain truth about both past events and those that at some future time, in accordance with human nature, will recur in similar or comparable ways, that will suffice." Thucydides, History of the Peloponnesian War, 431–404 BC

One Health is an integrated, unifying approach that recognizes that the health of humans, domestic and wild animals, and their shared ecosystems are closely linked and inter-dependent (Figure 2). One Health mobilizes multiple sectors, disciplines, and communities at different levels of society to work together to foster well-being and tackle threats to health and ecosystems while addressing the collective need for clean water, energy, and air; safe and nutritious food; climate change resilience; and sustainable development (OHHLEP et al. 2022).⁸

The interconnectedness of health for humans, non-human animals, and the ecosystems they share may seem trivial, and it has been recognized for ages in different cultures and civilizations (Raworth 2017), but

it has been undervalued in the approach to public health that has dominated since the 20th century.

The term itself, One Health, was coined by William B. Karesh in a Washington Post article from 2003, followed by the Manhattan Principles (2004), and since then modified by numerous groups and constituencies to the Berlin Principles (Gruetzmacher et al. 2021), sometimes overlapping with similar but different concepts of planetary health, and eco-health.⁹

In March 2022, the United Nations Environment Programme (UNEP) joined the Food and Agriculture Organization (FAO), World Organisation for Animal Health (WOAH), and the World Health Organization (WHO) in their collaborative agreement (replacing the 2010 “Tripartite” with the “Quadripartite” Alliance).

BOX 1:
Drivers of Ebola emergence in West Africa—zooming on Liberia

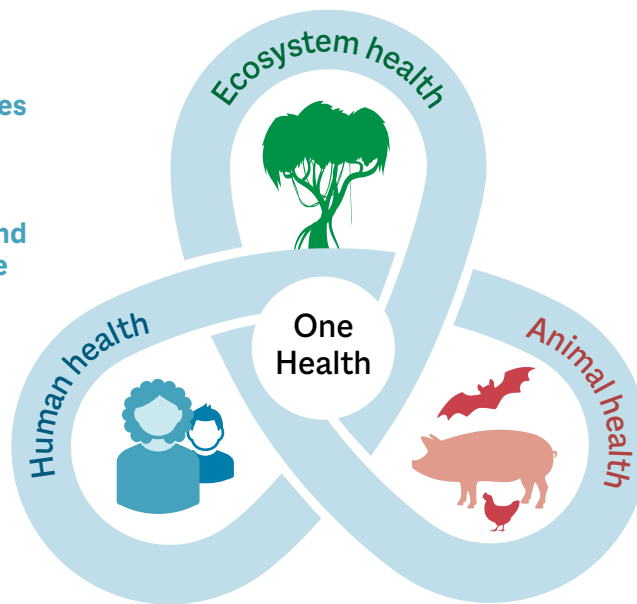
In March 2014, the World Health Organization (WHO) reported cases of Ebola in the forested rural region of southeastern Guinea. This marked the beginning of the West Africa Ebola epidemic, the largest in history. A 2015 study identified 142 linkages among 40 drivers of Ebola spillover event (Grotto and Ricci 2015); the main ones being deforestation and/or forest degradation, hunting, ecosystem changes, industrial plantations, changes in demand for wild animal meat, food security, and forest fragmentation. This highlights the interconnections among human activities, animal populations, and ecosystem integrity. Liberia was part of the epicenter of the outbreak, with significant socio-economic impacts (Korkoyah and Wreh 2015) that led to restrictions on trade and transportation, reduced tourism, and decreased agricultural production and mining activity. The One Health Liberia case study, a companion document to this report, depicts the drivers that increase interactions between humans, wildlife and livestock, along with the country’s vulnerabilities (World Bank, 2022a).



8 One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy, and air; safe and nutritious food; taking action on climate change; and contributing to sustainable development. .

9 Ecohealth promotes an ecosystem approach to health, focusing primarily on environmental and socioeconomic issues. Planetary Health considers the planet’s environmental limits—physical and biological—within which human health, well-being, and equality can flourish by examining issues from a political, economic, and social perspective. Planetary health considers the health of human civilization and the state of the natural systems on which it depends.

FIGURE 2:
One Health recognizes the connections and interdependency among the health of humans, domestic and wild animals, and the health of the ecosystems they share



The One Health approach improves the ability to effectively **prevent; detect; respond to, and recover** from, outbreaks; prepare for future pandemics; and accomplish development goals such as improved health and economic security, climate resilience, and food safety.

Under this much needed collaboration, a One Health Joint Plan of Action (2022-2026) is being launched to guide implementation. The Plan has six main action tracks: enhancing countries’ capacity to strengthen health systems under a One Health approach; reducing the risks from emerging or resurfacing zoonotic epidemics and pandemics; controlling and eliminating endemic zoonotic and neglected tropical or vector-borne diseases; strengthening the assessment, management and communication of food safety risks; curbing the silent pandemic of antimicrobial resistance (AMR) and better integrating the environment into the One Health approach.

Multilateral Development Banks are adopting the approach. The World Bank has developed its operational framework to strengthen human, animal, and environmental public health systems at their interfaces (World Bank, 2018), as has the Asian Development Bank (ADB, 2022). Twenty-three countries have adopted strategic One Health action plans¹⁰ and many more are engaging on this path.

Although One Health applies broadly to health matters, including non-communicable diseases and climate-change impacts on health outcomes, in this report, One

FIGURE 3:
Increasing investment in prevention means de-risking investments in preparedness and reducing cost of response

PREVENTION

Actions to reduce the likelihood or consequences of spillover events

- Strengthen animal health, veterinary services**
- Improve on-farm biosecurity**
- Reduce deforestation and/or forest degradation, improve conservation**
- Improve urban planning**

Note: Animal health systems are a core element to prevention. Prevention also relates to interventions at the farm, forest, and city levels. Examples given here are indicative. Priority actions that constitute prevention are risk-based and related to the local context. Adapted from Carlin et al., 2019.

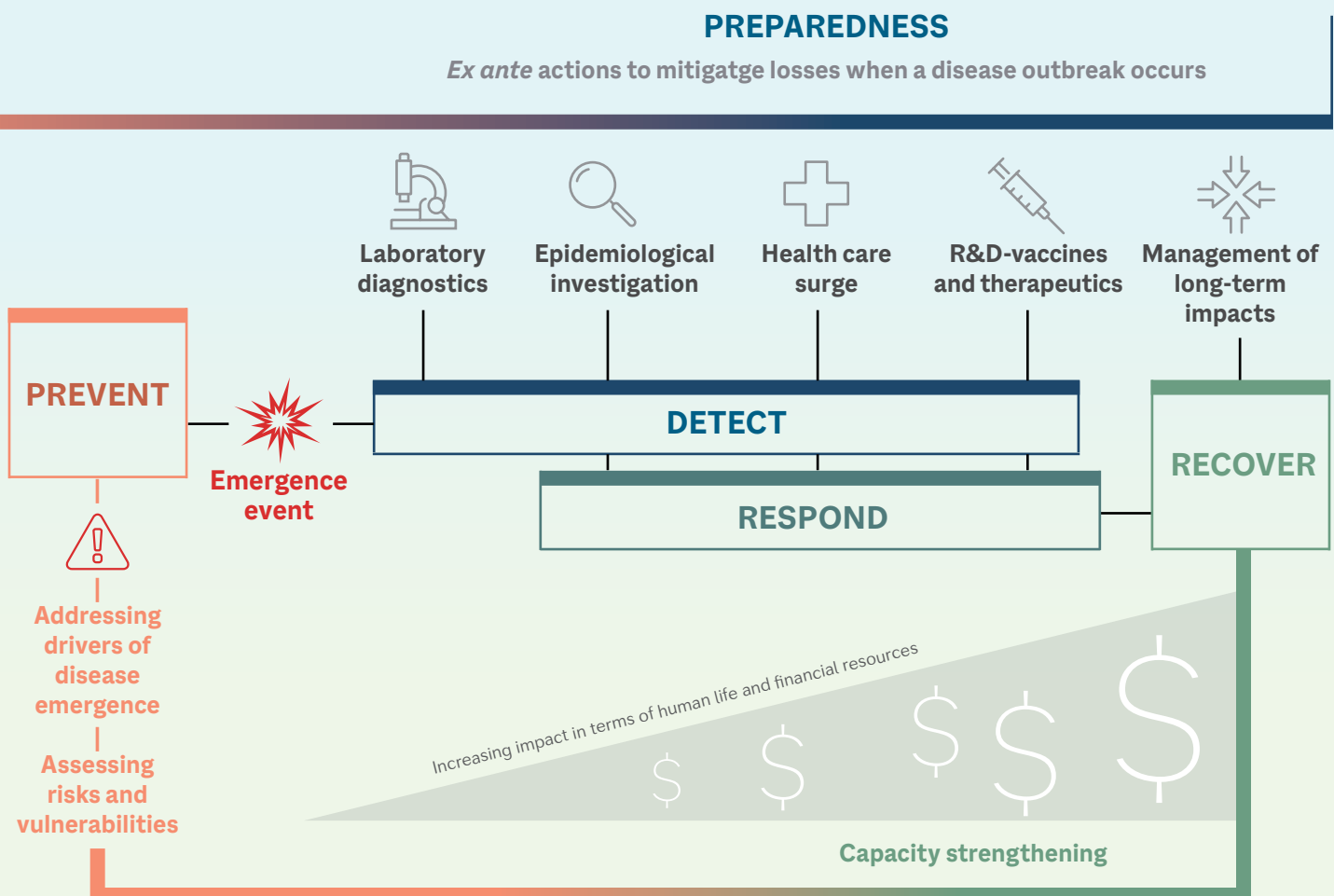
¹⁰ See compilation by the One Health Commission, https://www.onehealthcommission.org/en/resources__services/one_health_strategic_action_plans/

Health focuses on zoonoses and pandemics. While the One Health approach is core to health security over all, this report specifically focuses on a neglected aspect — pandemic prevention.

The Global Health Security Agenda (GHSA) aims to accelerate progress toward a world safe and secure from infectious disease threats and to promote global health security (White House 2014). Its framework is organized around three main pillars: prevent and reduce the likelihood of outbreaks; detect threats early to save lives; and respond rapidly and effectively using multi-sectorial coordination and communication. Using this framework, a review of prominent global health security

initiatives showed that prevention is scarcely addressed and most underappreciated (Carlin et al. 2019). Prevention continues to be the missing link to more comprehensively mitigate pandemic risk.

Figure 3 illustrates the continuum between prevention and preparedness, along the GHSA framework to prevent; detect; and respond to outbreaks. It displays the key elements of prevention, e.g., the core need for animal health systems, along with a focus on farms, forests, and sprawling cities. Upstream investments in prevention to reduce spillover are expected to de-risk investments in preparedness and reduce cost of response.





Guiding investments towards prevention of pandemics

An investment framework is needed, with tools and approaches adopting the One Health approach, and above all recognizing the importance of prevention, which has been missing from past strategies.

This investment framework is guided by five core principles. First, it adopts an integrated One Health multisectoral approach that aims to sustainably balance the health of people, animals, and ecosystems. Second, it prioritizes prevention, a most overlooked component of health security. Third, it requires compliance with existing minimum standards that are relevant for One Health. Fourth, it takes a risk-based approach, prioritizing geographical locations with higher risks of spillover at the human-animal-ecosystem interfaces. Fifth, it focuses investments on reducing risks of spillovers in forest (or wildlife area), farm (livestock), and urban areas.

1. ADOPTING ONE HEALTH

An investment framework for prevention needs to include the health of humans, animals, and ecosystems. It must not be a siloed framework but instead should be mainstreamed into broader development and crisis response financing through the systematic application of a One Health “lens.” It needs to guarantee that there are no missing links in the complex risk management chain spanning prevention, preparedness, response and recovery that brings together disparate public agencies unaccustomed to collaborating and coordinating. Investments in prevention can only be successful through a multisector public-private policy framework that allows decision-makers to determine appropriate fund flow to various sectors and geographical areas based on risk assessments and cost-benefit analysis within each country’s specific context.

One Health has been coming of age through the G7 and G20 leadership, and explicitly referred to in an increasing number of ministerial declarations. Those leaderships,

however, have been slow in knitting the One Health approach into the Pandemic Prevention, Preparedness and Response (PPR) agenda. The World Bank, with WHO and partners, is currently working on establishing a new Financial Intermediary Fund (FIF) for pandemic PPR adopting One Health as a guiding principle, responding to the urgent need for a new multilateral financing mechanism dedicated to PPR (World Bank 2022). On another front, work is underway to amend the International Health Regulations (IHR 2005), and WHO established an intergovernmental negotiating body (INB) and has initiated the process of drafting an international accord on pandemics that could help deliver some of the required elements to more effectively prevent pandemic threats. These ongoing initiatives are expected to strengthen the global governance for health security, within which an investment framework would contribute to effective global One Health implementation support architecture for zoonotic disease prevention.

The Quadripartite’s global One Health Joint Plan of Action provides an overall strategic framework for increasing coordination and attention to under-invested areas in capacity, infrastructure, and tools such as information management system interoperability. Its ownership by the four institutions is historic.

Operationalizing a One Health approach requires improving coordination, communication, and collaboration between sectors, reinforced by sustained capacity strengthening. This requires a shift from largely vertical programs focused on specific diseases to those that can strengthen overall systems and their collaboration across sectors. Importantly, for prevention, this requires actions that may be far upstream from disease events and health and economic outcomes. Key stakeholders may be different than those previously engaged in health efforts, such as livestock keepers, park rangers, extractive industries, and community members responsible for environmental stewardship.

Countries and regional bodies are increasingly establishing One Health coordination platforms (see Box 2 for an example in Vietnam). These platforms provide a mechanism to bring together ministries with mandates on human and animal health and the environment and, in some cases, a broader range of actors (e.g., ministries of education, rural development, and security; civil society; and academia). Strong political will and commitment are seen as key enablers of success, with some platforms chaired at the Prime Minister or Vice President level. The adoption of policies and governance manuals sets expectations for participation, though in practice the relevance and value addition are not necessarily broadly understood, and some sectors lack the capacity or workforce to engage fully. Finally, the multisectoral coordination and collaboration that is required for One Health is extensive with a high transaction cost and cannot be sustained on good will alone without strong political commitment and adequate institutional arrangements.

2. SHIFTING TO PANDEMIC PREVENTION

Taking a risk-based approach, pandemic prevention requires moving away from a paradigm grounded in

crisis response using emergency instruments and toward incorporating risk reduction, risk management, and long-term capacity strengthening in country programs and operations.

There is an economic argument for this shift. The cost of prevention is moderate, with high returns on the investments. The set of prevention actions presented in a previous analysis by the World Bank was estimated to generate an annual rate of return of up to 86 percent (World Bank, 2012). Considering COVID-19's heavy human and economic toll the return on investment would most likely be much higher, especially if the set of actions addressed the broader spectrum of prevention and curbed key drivers across forests, food systems, and cities.

The G20 High Level Independent Panel (HLIP) estimated the amount in international financing for pandemic preparedness that would be required every year for five years at \$15 billion, along with significant increases in domestic spending, to address current gaps. Recently, WHO and the World Bank estimated the total amount at US\$31.1 billion annually, of which US\$10.5 billion of international financing is needed annually for the next five years (WHO and World Bank 2022). These estimates only incorporate the requirements for early detection and rapid

BOX 2: The Vietnam One Health framework



Vietnam is on the global map for hotspots and a country prone to emergence of infectious diseases with pandemic potential. A combination of vulnerability to climate change, low access to health care, growing livestock sector, proximity to wildlife and expanding urban areas create opportunities for spillover. In response, the Ministry of Agriculture and Rural Development, together with the Ministry of Health and the Ministry of Natural Resources and Environment, launched the One Health Partnership Forum for Zoonotic Disease, currently in its second phase until 2025. The One Health Partnership exemplifies enhanced communication and multidisciplinary collaboration between Ministries and programs focused on prevention by addressing the human-animal-ecosystem interfaces. The One Health Vietnam case study provides further insights into the country's profile and specific context for critical interventions. (World Bank 2022b).

response (monitoring and detection of zoonotic spillovers), leaving untended areas along the prevention and preparedness continuum (Figure 3). Estimating the cost of prevention requires including core competencies of the veterinary services and interventions aiming at reducing risk related to main EID drivers such as land use, food systems, or urban sprawl.

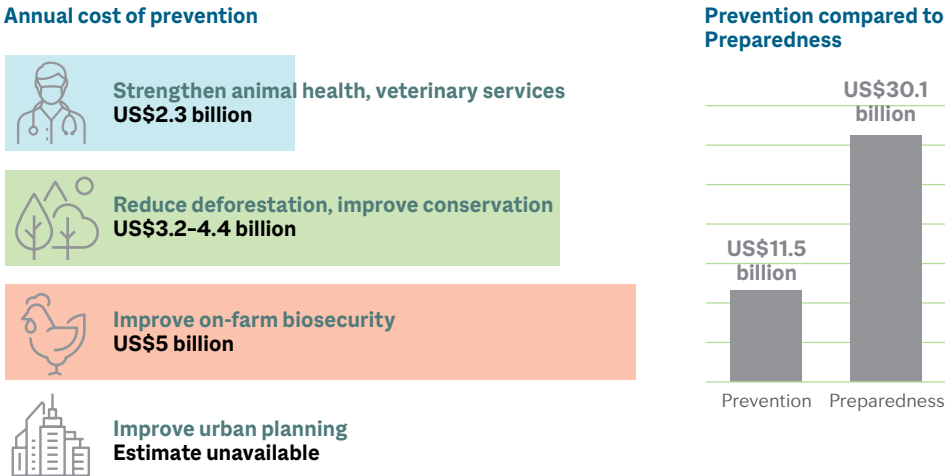
To correct for this omission, we updated the World Bank’s 2012 estimate for veterinary public health systems, bringing the cost to approximately US\$2.1 billion per year,¹¹ of which US\$1.1 billion should come from international support.¹² This is less than 10 percent of the cost for preparedness, and about 0.05 percent of the cost of COVID-19 in 2020. Moreover, investment in prevention would substantially reduce the likelihood of spillover and pandemic risk, thereby de-risking or reducing the need for investments in preparedness and reducing the cost of response (Figure 3).

The estimate above is core and central to prevention. However, it does not comprehensively address the broader spectrum of prevention or curb key drivers related to farms, forests, and sprawling cities.

Estimating these costs is a challenge, as it should be based on country-specific assessments, making any global figures a mere approximation. Here, we estimate another US\$5 billion to improve farm biosecurity¹³ and US\$3.2-to-4.4 billion to reduce deforestation in higher-risk countries.¹⁴ No figure could be calculated for prevention in urban settings, which remains to be addressed. These estimates, however, need to be considered in the context of synergistic agendas (e.g., biodiversity conservation or forest restoration) and country-based approaches. With that caveat, this means that our global estimate of prevention guided by One Health principles ranges from US\$10.3 billion to US\$11.5 billion per year (Figure 4).

The economic case seems irresistible but, despite the obvious economic benefits, prevention is usually grossly underfunded. However, suggesting that more money alone will solve the problem is not credible. Even with financing available, the political economy of investing in prevention such as One Health is complex, and the benefits of successful prevention are less visible than expenses for response and relief. Thus, it is important to emphasize the significant co-benefits to

FIGURE 4.
Cost of prevention estimated for animal health services, farm biosecurity, reduction of deforestation, and improved conservation



11 This figure is based on the updating of the 2012 World Bank estimate (World Bank 2012) adjusted to 2020-dollar value, under the assumption that no meaningful progress has taken place in animal health systems in LMICs since 2012. See also the technical report published as a companion document to this report (World Bank 2022d).

12 This is calculated under the assumption that low-income countries receive international support to cover 88 percent of financing needs for health security, while middle-income countries receive 24 percent.

13 In medium- and high-risk areas defined by intersections of livestock (pigs and chicken), density above 85th global percentile, and human population density above 200 people per km². See the technical report published as a companion document to this report (World Bank 2022d).

14 By halving deforestation in high-risk countries as per Allen et al. 2017. See the technical report published as a companion document to this report (World Bank 2022d).

invest in prevention as well as the high cost of inaction as the world is witnessing now with COVID-19.

3. COMPLYING WITH COUNTRIES' OBLIGATIONS AND MINIMUM STANDARDS

Routine health-systems strengthening broadly contributes to prevention. More specifically, the IHR 2005 and the WOAHA Codes and Manuals set out standards that are relevant to prevention.

The IHR (2005)¹⁵ integrates zoonoses and the relevance of coordination and collaboration with the animal health system. The JEE¹⁶ assessment of country capacities includes critical competencies from a One Health perspective that are core to prevention, such as coordination with the public and animal health sectors on zoonotic diseases;¹⁷ AMR,¹⁸ biosafety and biosecurity;¹⁹ and coordination, communication, and advocacy.²⁰

However, the IHR does not cover the capacity of veterinary services themselves, which are outside its remit. Veterinary services are, however, critically important for the prevention of diseases in animal populations; early detection of pathogenic agents, including zoonotic agents; their reporting and control; and preventing their spread. This is assessed through the PVS pathway, which provides a comprehensive evaluation of countries' strengths and weaknesses in implementing WOAHA standards.²¹ Most of the core competencies described through the PVS pathway²² are critical to prevention.

Countries are obligated to comply with IHR (2005) and WOAHA standards. However, levels of compliance remain generally low, as shown by outcomes of the WHO's Joint External Evaluation (JEE) and WOAHA's Performance of Veterinary Services (PVS) pathway.

An effective investment framework for One Health to minimize the risk of future pandemics will only be achieved by having an appropriate set of incentives and disincentives, along with dedicated long-term commitment toward building needed institutional capacity in a multi-sectoral manner.

In the longer term, compliance with standards should be considered, for example by the World Bank, in assessing pandemic prevention and preparedness capacity, and could be incorporated into the Country Policy and Institutional Assessment (CPIA) tool with the rating included in the overall country score used as part of the International Development Association (IDA) allocation formula (IWG 2017). The Bank could also incorporate analysis of EID risks and vulnerabilities, compliance with standards and One Health based pandemic prevention in country-specific Systematic Country Diagnostics (SCD) that identify a set of priorities through which a country may most effectively and sustainably achieve poverty reduction and shared prosperity goals.

4. FOCUSING ON HOTSPOTS

Selectivity is needed in the face of huge uncertainties about where the next pandemic might originate and the costs of adopting comprehensive prevention measures in a certain location. Pandemic risks and vulnerabilities are global,

15 The International Health Regulations (2005) (IHR) are an instrument of international law that is legally binding on the 194 World Health Organization (WHO) Member States. It provides an overarching legal framework that defines countries' rights and obligations in handling public health events and emergencies that have the potential to cross borders and become pandemics

16 The Joint External Evaluation (JEE) is a voluntary, collaborative, and multisectoral process to assess country capacities to prevent, detect, and respond to public health risks. The third edition includes 19 technical areas, and 56 indicators.

17 JEE Area P.4.1: Coordinated surveillance systems in place in the animal health and public health sectors for zoonotic diseases/pathogens identified as joint priorities.

18 JEE Area P.3.3: Infection prevention and control.

19 JEE Areas P.6.1: Whole-of-government biosafety and biosecurity system in place for all sectors including human, animal, and agriculture facilities and P.6.2: Biosafety and biosecurity training and practices in all relevant sectors.

20 JEE Areas P.2.1: A functional mechanism established for the coordination and integration of relevant sectors in the implementation of IHR; P.4.2: Mechanisms for responding to infectious and potential zoonotic diseases established and functional; R.1.2: National multisectoral multi-hazard emergency preparedness measures, including emergency response plans, are developed, implemented, and tested; and R.5.5: Addressing perceptions, risky behaviors, and misinformation.

21 The Animal (Terrestrial and Aquatic) Health Codes and Manuals of the World Organization for Animal Health (WOAHA) provide international standards for the improvement of animal health and veterinary public health.

22 I.1 to I.6 for human, physical and financial resources, II.1 to II.7 for technical capacity, and III.1 to 3 and III.5 for interactions with stakeholders.

though unevenly distributed (Madhav et al. in Jamison 2017). The best strategy in the face of uncertainty about when and where the next emergence and outbreak will strike is to focus on areas and practices of higher risk, also called hotspots (Allen et al 2017).

Concretely, resource allocation should prioritize appropriate prevention financing instruments based primarily on geographical risk profiles that identify hotspots. Hotspots are areas where the likelihood of a spillover is highest. A robust assessment of spillover risks at the country level is needed to determine national risk profiles to guide prioritization in where to channel funds.

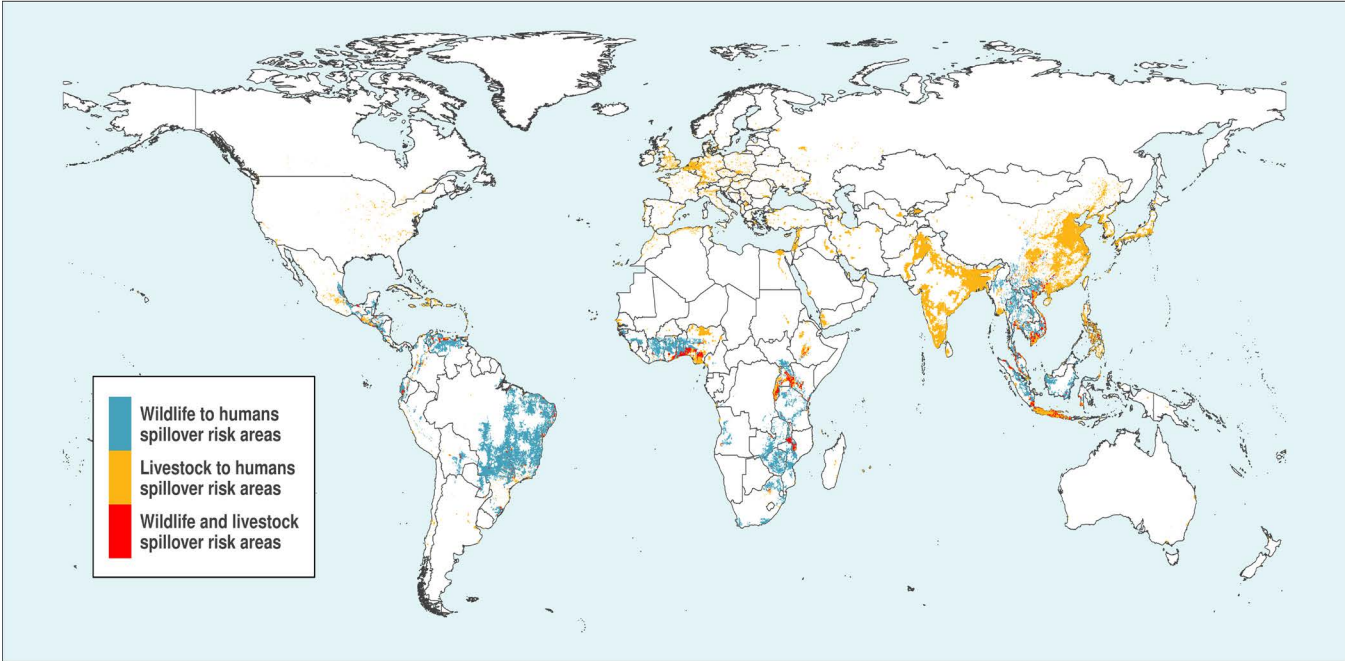
The causal pathways leading to initial spillover events, localized outbreaks spreading to become epidemics, and, in some cases, leading to pandemics, are most often complex, involving a mix of drivers that shape risk and increase vulnerability. Although it may not be possible to predict the next pandemic, analyzing drivers

can support country risk assessments and help identify interventions to reduce the likelihood of spillover.

The likelihood of spillover is essentially a function of the opportunity or frequency of encounters between animal microbes and humans, which generally depend on i) diversity and abundance of animal hosts and their microbes, ii) risk behaviors that bring people and animals into contact and provide the interface for transmission, and iii) environmental changes that drive spillover across these interfaces. Where there are many humans and host species it is more likely that there are active interfaces. Figure 5 shows a map of intersections between dense human and animal populations, combined with rich biodiversity and risk of deforestation and/or forest degradation. The areas that are highlighted are where we must focus greatest attention on prevention. This suggests an approach to identify hotspots based on higher resolution mapping at the country level or to locations within the country.

FIGURE 5.
Map for active interfaces between wildlife, livestock and humans

Note: Highlighted areas represent the intersections of: Deforestation risk of 70 percent up to 2030 Hewson (2019); biodiversity, defined as the number of species above the 85th global percentile for all birds, rodents, primates, or bats from biodiversitymapping.org; livestock (pigs or chickens) density above 85th global percentile from FAO; and population density above 200 people per km² from UN World Gridded Population.²³



23 More detailed maps are available in the Technical Report, a companion document to this report (World Bank 2022d).

Most active interfaces are in low- and middle-income countries (Figure 5). About fifty-five—or 75 percent—of IDA borrowing countries harbor the bulk of high-risk areas for EIDs originating in wildlife (Allen et al. 2017). Many middle-income countries and transitioning economies are also highlighted on the risk map, essentially because of high density of human and domestic animal populations. These high-risk areas are not just of local concern but also pose potential global threats. Because of the world’s interconnectedness, risk anywhere is risk everywhere, and there is a strong need for collective accountability, incentives, and disincentives.

5. DE-RISKING FARMS, FORESTS, AND URBAN SPRAWL

The proportion of the world’s population living in urban areas by 2050 is projected to increase from 55 percent to 68 percent, or close to 7 billion people. The average annual forest loss has significantly increased in low-income countries from the period of 1995-2000 to 2010-2020. Growth in consumption of meat is projected to increase by 12 percent from the period of 2017-2019 to 2020-2029, steering increase in livestock production. Those trends are diverse among regions and within regions and countries but illustrate the need to mitigate risks at the source.

Depending on their risk profiles, countries need to identify risk mitigation options targeted to the specific drivers for EIDs in their national context, such as broadly

- (i) limiting disturbance of ecosystems with high presence of potential hosts by controlling land use changes and restricting human and domestic animal access to these ecosystems (e.g., caves with bats and forests with high concentration of primates);
- (ii) improving biosecurity in production, transportation, and retailing of livestock and restricting encroachment with wildlife in risky ecosystems and contact with humans through appropriate barriers (e.g., fencing, dedicated clothing when working on the farm, and controlled extensive grazing); and

- (iii) controlling urban sprawl through enforced land zoning to restrict overlaps between urban areas, wild areas with host concentrations, and livestock units (e.g., production, transportation, and retailing).

The minimum requirements for prevention would be based on the obligations of countries to comply with IHR (2005) and WOAHA international standards and bring their animal and public health system to their expected levels of capacity. This core prevention is critical. In addition, depending on their risk profiles, countries need to integrate other elements of prevention, addressing specific drivers for EIDs such as animal production (e.g., good animal husbandry practices), land use (e.g., landscape management and habitat conservation), or urbanization (Figure 3). We published three case studies prepared for Vietnam, Liberia, and Assam state (India) as companion documents to this report (World Bank 2022a, b and c) to illustrate how local context matters to delineate prevention, based on a One Health approach, tailored to specific risks and vulnerabilities. More systematic country-level risk assessments, such as the WHO Strategic Tool for Assessing Risks (STAR) for example, are necessary to better implement One Health and risk reduction interventions at local levels since prevention is not a one-size-fits-all proposition; it requires actions to be adjusted to the local context. Table 2 shows examples of such interventions designed to reduce risk from wildlife and livestock.

More options are discussed in the technical report published as a companion document to this report (World Bank 2022d). Prevention requires a set of interventions corresponding to the national and local context. While systematically de-risking farms, forests, and urban sprawl, more interventions must be identified and tailored to the local risk profile, comprehensively considering drivers of EIDs.

TABLE 2: Examples of interventions to potentially reduce spillover risk from wildlife and livestock

Reducing risk from wildlife connected to deforestation, forest degradation and fragmentation

<p>Landscapes Ecological interventions</p>	<ul style="list-style-type: none"> • Buffer zones • Disease risk considerations in concession decisions • Use restrictions (e.g., entry in caves) • Restrictions on agricultural areas and practices proximal to forests and wetlands • Establishment of protected and conserved areas • Habitat restoration and species management programs • Landscape design (contiguous forest versus forest patches) • Limited-impact infrastructure (e.g., restricted access and temporary roads)
<p>Communities Communication and participatory practices</p>	<ul style="list-style-type: none"> • Risk communication and community engagement for behavioral change, e.g., for good health behaviors, reduced exposure to wildlife, and safer handling practices • Payment for ecosystem services and other forest stewardship incentives • Support programs aimed at reducing human exposure to (high-risk) wildlife, including alternative protein sources and strategies to avoid contamination in food acquisition and food preparation practices. • Occupational health programs incorporating zoonotic disease awareness and safer practices • Upgrading market and trade infrastructure and facilities to reduce wildlife-livestock, wildlife-wildlife, and wildlife-human contact and potential for pathogen amplification and spillover <p>Note: Other development activities may need measures to mitigate risks. These include oil, gas, or mineral extraction; road building, tourism or recreation in wildlife habitat or protected and conserved areas, and urban expansion.</p>

Reducing risk related to livestock

<p>Farms Biosecurity and good animal husbandry practices (GAHP)</p>	<ul style="list-style-type: none"> • Location of housing and avoiding proximity to (high-risk) wildlife • Housing and fencing to avoid direct contact with other animals or humans • Animal volume and density management • Animal breeding management • Animal feed storage and other contamination via food sources • Drinking water safety and security • Veterinary hygiene • Preparation and consumption of animals and animal products • Livestock waste management and environmental protection • Recording and filing activities
<p>Communities Communication and participatory practices</p>	<ul style="list-style-type: none"> • Risk communication for behavioral change, (e.g., health behaviors, GAHP, and reduced exposure to wildlife) • Policies and incentives for certain industries based on ecological and epidemiological conditions • Support programs aimed at reducing human exposure to (high-risk) animals, including via animal rearing, food preparation, and food consumption practices • Occupational health programs incorporating zoonotic disease awareness and safer practices • Demonstration of disease prevention and control measures in agriculture, livestock, and aquaculture farms, including AMR using One Health approach • Upgrade of market and trade infrastructure and facilities to reduce wildlife-livestock, livestock-livestock, and livestock-human contact and potential for pathogen amplification and spillover

Reducing risk related to urban sprawl

<p>Urban planning and community engagement</p>	<ul style="list-style-type: none"> • Preserve key wildlife habitat and resources to avoid wildlife-human conflict • Improve housing conditions to avoid wildlife intrusions • Avoid supplemental feeding of wildlife • Develop effective waste management systems • Community engagement, regulations, and enforcement to curb illegal and/or unsafe wildlife trade • Market enhancements (e.g., improved ventilation, off-site slaughter)
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Overcoming the lack of incentives to invest in prevention

There is an urgency to finance a One Health approach to pandemic prevention. More than ever, however, countries are facing multi-layer economic, health, and environmental crises caused by climate change, COVID-19, and the war in Ukraine. These crises affect every facet of peoples' lives including livelihoods, health and welfare, the quality of their environment, and prospects for the next generation. Investments are needed across a wide swath of society to minimize backsliding on gains made on Sustainable Development Goals (SDG). In this context, governments are increasingly challenged by the difficulties of mobilizing private and public sector involvement and financing toward a common goal, deciding which sectors to invest in while managing trade-offs, and balancing short-term crisis response measures with medium-to-long-term development investments to build back better.

1. REMOVING THE OBSTACLES TO PREVENTION

Because government leaders have much less interest in investments to prevent future events than they do in responding to current crises, an investment framework is needed to facilitate more, sustained attention and investments in critical interventions to bolster One Health and pandemic prevention.

There is an opportunity to increase financing of One Health measures to prevent the emergence of zoonotic diseases under governments' existing or committed allocations, decreasing the need for new funding to respond to outbreaks. This could be achieved by ensuring that the One Health agenda is more systematically considered not only in pandemic PPR, but also in plans to address biodiversity loss and climate change and funding mechanisms such as REDD+, the UNFCCC framework to reduce emissions from deforestation and sustainably manage forests, in the areas with higher risk of future spillover (see Box 3).

Pandemic prevention is a global public good (GPG). It is non-excludable (no country can prevent others from benefitting) and non-rival (one country benefitting does not limit the extent to which other countries can benefit). Therefore, One Health, which sustainably balances and optimizes the health of people, animals, and ecosystems, is the quintessential GPG, which may explain underinvestment as countries hope to benefit without contributing (the classic 'free-rider' problem).

However, precisely because it is a global public good, and despite the increasing pandemic risk, countries typically underinvest in pandemic prevention and preparedness, hoping to benefit from other countries' investments without contributing their own. Such 'free-riding' behavior and the unique difficulty of investing in something whose successful outcome cannot be observed (and thus not credited) has been fueling the cycle of panic and neglect. Therefore, international coordination of policy and financing is needed to ensure adequate investment, mitigate neglect, and limit such free-riding behavior.

Many activities that drive EIDs (e.g., mining or other extractive industry, agricultural expansion, housing developments) are also positive additions to the economic output of a country, measured by its gross domestic product (GDP). While these activities generate revenues, they can also generate negative externalities, such as pathogen spillover. Most often, such externalities are not quantified or factored into countries' development planning. For example, compared to an estimated global market value of US\$10 trillion, food systems impose hidden costs of US\$12 trillion annually, more than half of which is related to their impact on human health (The Food and Land Use Coalition 2019).

On the other hand, investments in One Health based prevention can potentially reduce risk for large and growing areas of economic activity, such as agriculture and food.

Such investments and the multiple sectors of relevance can yield substantial co-benefits to tackling some of society's most pressing challenges including biodiversity loss, ecosystem degradation, and broken food systems.

Reduced greenhouse gas (GHG) emissions and increased resilience against climate change or natural disasters and ongoing sources of pollution, are among other co-benefits listed in Table 3 as examples. Under a One Health approach, potential trade-offs would also be assessed and managed, such as rebound effect or potential for increased pressure in other parts of the systems under consideration. Most prevention interventions guided by the One Health approach will generate co-benefits to other sectors of sustainable and human development (economic, environmental, and human health). As an example, a One Health approach to prevention would generate ancillary benefits of US\$4.3

billion²⁴ from reduction in CO2 emissions (Dobson et al. 2020). Benefits to the agricultural sector (specifically livestock producers) could be substantial, driven by reduced frequency and scale of costly disease control measures such as culling, as well as expanded access to international and higher-margin markets for producers in low- and middle-income countries that put prevention measures in place (World Bank 2022d).

The role of international financing institutions and the Ministry of Finance or others in charge of resource allocation such as Ministries of Planning in some countries, is critically important in the operationalization of One Health, though such roles are often poorly embedded in the design, monitoring, and evaluation of national and global coordination activities. These agencies bring unique tools and capabilities that can be applied to support prevention and risk reduction by playing a powerful role in

BOX 3:
Synergy with climate change action on efforts to reduce deforestation and/or forest degradation



Governments, and Ministries of Finance and Economy in particular, can use their policy, regulation, planning, and budgeting levers to drive holistic structural economic reform that reduces the impact of drivers for EIDs, such as unsustainable deforestation and/or forest degradation, food production or urbanization, among others. To illustrate this, Indonesia and deforestation provide an interesting example. We estimate that each year there are about 0.47 million ha of forests at high risk of deforestation in Indonesia, which have a high density of bats, primates, or rodents. The Indonesia Nationally Determined Contribution (NDC) to the Paris Agreement is to avoid 3.7 million ha of deforestation between 2021 and 2030, or about 0.37 million ha per year, of which a fraction could target areas of high density of wildlife to maintain the integrity of their habitats. Given the importance of deforestation and/or forest degradation as a driver for EIDs in Indonesia, the government could include One Health and pandemic prevention considerations in planning to curb deforestation and/or forest degradation and ensure that its focus is on areas with higher risk of spillover of infectious diseases. The World Bank, like other actors and partners, has a long-standing forest policy dialogue with Indonesia, which could provide an entry point to mainstream pandemic prevention policies and programs without necessarily requiring large amounts of additional funds. (World Bank, 2022d).

24 Based on an assumption of 118 fewer metric tons of annual CO2 emissions from 50 percent less deforestation (Dobson et al. 2020).

TABLE 3. Examples of expected co-benefits for One Health interventions to reduce pandemic risk

Interventions	Potential Co-Benefits
Conservation of primary forest	<ul style="list-style-type: none"> • Increased access to climate finance (e.g., REDD+) • Protection of ecosystem services including carbon sequestration • Protection of biodiversity
Reforestation	<ul style="list-style-type: none"> • Increased carbon sequestration • Reduced chemical runoff into aquatic ecosystems • Reduced soil erosion and improved resilience against disasters • Increase/restore ecosystem • Increased/restored wildlife habitat • Creation of green jobs
Improved biosecurity in livestock operations	<ul style="list-style-type: none"> • Reduced inappropriate use of antimicrobials • Improved animal health and welfare • Reduced endemic disease risk and incidence • Reduced wildlife-livestock conflict • Reduced likelihood of economic shocks or disruptions from disease • Expanded access to markets (exports, premium domestic products) • Improved management of risks by private sector

addressing common barriers to ensure that priority actions on prevention in the appropriate sector(s) are adequately budgeted and executed. In addition, existing national action plans (particularly for biodiversity, health security, and AMR) remain under-financed and often developed in a fragmented, siloed manner, leaving deficits in their ability to be implemented and missed opportunities for synergies.

We can hardly over-emphasize the economic case for One Health (i.e., the cost of prevention is extremely modest compared to the cost of managing and responding to pandemics) as well as its many co-benefits to other sectors of sustainable and human development and take advantage of the growing consensus and momentum of the critical importance of One Health at all levels of society, especially in the wake of COVID-19.

2. FINANCING PREVENTION AS A SHARED RESPONSIBILITY

A pandemic is an epidemic occurring over a wide area, or worldwide, crossing international boundaries and usually affecting many people. Outbreaks start locally, however, and it may be difficult at the onset of a local event to predict its pandemic potential. Prevention brings benefits both locally and globally.

Prevention needs to mobilize multiple financing sources based on who benefits most from the interventions, with priority around forests, farms and urban sprawl. A first best approach to determine financing responsibilities for One Health based prevention is to assign financial responsibilities to the people who benefit most from the interventions. One Health based prevention is above all a GPG, and prevention that stems a local outbreak before it becomes a pandemic is a global public good. However, there are many pathogens that are less contagious and less likely to lead to a pandemic, despite generating local infections and burdens of disease. The main beneficiaries from prevention in this case might be the population of a country or group of countries or regions within a country. Prevention here has more the nature of a domestic public good, since most benefits accrue to a localized population, and global risks are small. And finally, there are diseases that may infect some people, but with limited human-to-human transmission. In this case, prevention takes the nature of a private good or benefit. Financing should assign responsibilities for high pandemic risk reduction to global sources, which should be passed on as grants or highly concessional financing to implementing units in national governments. Low pandemic risk infections, on the

other hand, should fall under domestic governments of the jurisdiction at risk. Finally, where private benefits are identified, financing should fall to the person likely to benefit.

While this first thinking offers some guidance on how to assign financing responsibilities, reality is more complicated. First, there are considerable co-benefits from One Health prevention. For example, reducing ecosystem disturbance by avoiding deforestation and/or forest degradation to reduce the risks of infections from a localized (non-global) vector, which is a domestic public good, would also reduce GHG emissions, which is a GPG accruing to the world at large. Likewise, improving biosecurity to reduce domestic animal endemic infections of low pandemic risk, while a domestic public good, would have global benefits in that it might also reduce the risks of other pathogens that may evolve into forms with a potential global reach. Secondly, most often than not, national governments may not have the resources to make the incremental effort, for example to strengthen public veterinary services, to address the domestic infection risk. Similarly, many poor private livestock keepers may not have the resources to invest in measures required to prevent them from getting sick from pathogens with low human and animal spillover risk.

The reason to focus on a pathogen's likely economic impact, that is, the potential cost of a spillover and spread, is to understand the incentives for financing prevention actions, which determines who should pay for which measures. The case for investing more in prevention for pandemics such as COVID-19 is clear across the board—in donor countries and low-income countries. Given the GPG nature of these actions, international financing should be provided as grants or loans with high concessionality. However, it is obvious that localized outbreaks (e.g., the Nipah virus) which carry localized, but high, economic costs are of equal concern for the countries affected. Moreover, given that prevention measures are usually not pathogen-specific (e.g., reducing deforestation and/or forest degradation, farm biosecurity, or urban-rural land planning), prevention measures for these pathogens will also have an impact on preventing other pathogens that have the

potential to develop into pandemics. Therefore, there is a case to be made for international financing for this class of pathogens in low-income countries that will otherwise underinvest in prevention. For pathogens with minimal spread, the burden of prevention may primarily be borne by the individual most likely to be affected. The actual determination of who pays for which kind of prevention actions requires a negotiating process in specialized One Health focused governance structures in each country.

This reasoning suggests a shared, but separate, responsibility that considers spillover risks, beneficiaries from reducing these risks, and financing capacity. Key elements are captured in Table 4. First, domestic governments would commit to comply with their obligations under IHR (2005) (capability to detect and report potential public health emergencies) and WOAH international standards (core competencies for preventing animal disease and zoonoses in human populations). Reaching these levels could be financed from domestic sources (government revenues) or from market-based or concessional loans such as from IDA. Second, international financing (either grants or high concessional loans) would cover the incremental costs to reach levels of pandemic management including prevention above what those minimum standards require. This financing should be prioritized for high-risk areas and can be sourced by reassigning some existing funds to actions that also bring pandemic prevention benefits, and by mobilizing additional dedicated funding. For example, certain climate funds could be retargeted to high-risk areas and the PPR FIF could bring additional funding. These funds should be provided as grants. Third, financing resources would also need to be made available to low-income people, such as poor livestock keepers, who cannot afford or access the relevant health and veterinary services, for them to undertake the One Health interventions needed to prevent private, low pandemic risk infections. These public veterinary and health service resources could be provided as grants (based on poverty levels), insurance, or credit in contexts where household budget is insufficient.

TABLE 4:
One Health-based
prevention financing:
sources and
destinations

		BENEFICIARIES			
		Global population, global spread (e.g., COVID-19)	Local population, localized spread (e.g., Nipah virus)	Poor households, minimal spread (e.g., rabies)	
SPILLOVER RISK	High risk areas (hotspots)	International resources transferred to domestic agencies	Grants (new funding source or from existing sources such as climate financing)	Market or concessional loans	High-Concessional loans
		Domestic resources	-	Public services	Income support/public services
		Private resources	-		Microfinance, insurance, Household budget
	Lower risk areas	International resources transferred to domestic agencies	High-Concessional loans	-	-
		Domestic resources	-	Public services	Income support/public services
		Private resources	-		Microfinance, insurance, household budget

Note: Hyphen ("-") denotes areas that are not priority areas for One Health financing.

The investment framework needs to consider already financed co-benefits. As mentioned earlier, prevention actions may coincide with other global agendas, both in geographical focus and objectives of interventions. For example, reducing deforestation and/or forest degradation will also prevent pandemic risks from ecosystem disturbance, a One Health goal, in addition to reducing GHG emissions and protecting biodiversity, which already have dedicated global funding sources. It may be feasible to redirect some of those programs to also address pandemic risk without reducing the benefits accruing to their initial objectives. For example, efforts to reduce deforestation and/or forest degradation covered by climate funding could be retargeted to pandemic hotspots, and within those, to ecosystems where the abundance of hosts is highest.

A new financing instrument for PPR and an international accord on pandemics are expected to strengthen the global health architecture, within which prevention cannot be narrowly defined to health sector actions but need to be broad enough to encompass other sectors based on a One Health approach.

3. ENSURING COUNTRY OWNERSHIPS AND ENABLING INSTITUTIONAL ARRANGEMENTS

In laying foundations for global health security, the framework needs to be implemented at the country level with policy makers and technical partners to assess risks of EIDs, identify country vulnerabilities, review national financing, and explore resource mobilization options across sectors, including public and private sources, aligned with countries' prioritized national action plans.

Ultimately, investments for prevention must be made at the country level, especially in countries with spillover hotspots. Once the SARS-CoV-2 virus started spreading, it reached every corner of the globe, and no country was spared COVID-19's health and economic losses. Pandemic risk may have been perceived as hypothetical and a concern for high-income countries, while endemic diseases already burden lower-income

countries. However, the burden of pandemics is heavy also in low- and middle-income countries along many dimensions, not least of which are increased food insecurity, slower economic growth, and loss in human capital. Because we cannot predict exactly where or when the next virus of pandemic potential will arise, every country must mainstream One Health into their development frameworks. Investing in One Health is closely aligned with human and sustainable development goals that countries are already pursuing and, as such, will allow countries to leverage significant co-benefits.

Investing in pandemic prevention is the ultimate GPG. High-income countries that have the most to gain in preventing the next pandemic must support low- and middle-income countries where spillover hotspots exist by providing adequate international financing. The global community has a role to play in raising awareness of the issue, ensuring that prevention based on One Health is not sidelined in new mechanisms that are currently being developed such as the FIF for pandemic PPR or the global accord on pandemics currently being negotiated by the INB. It also requires developing further and enforcing minimum standards for what constitutes One Health spending, supporting countries' technical capacity to deliver on One Health related tasks, and developing an accountability structure to ensure that One Health investments are sustained even when the current threats recede.

There is a need to further integrate the relevant standards into a One Health framework for pandemic prevention. Also, standards must be expanded to address the root causes of pandemics, namely the drivers that increase the interaction between humans and animals (e.g., deforestation and/or forest degradation and urban sprawl that create zones with high human-animal interaction).

One Health is a coordination-heavy agenda that requires strong champions and a strong institutional arrangement backed by solid technical capacity supporting its work. Thus, to support countries, there is an important role for global technical agencies, and

primarily the Quadripartite Alliance, and international financial institutions (IFIs), and even regional institutions to coordinate global and regional activities by the public sector (for public goods such as public health systems, public veterinary systems, and surveillance data systems) and the private sector (e.g., livestock farmers, loggers, forest-based communities, and land developers).

WOAH and WHO have developed a joint process to bridge their assessment tools through the IHR/PVS National Bridging Workshops (NBWs), targeting the operational One Health approaches at national level (Belot et al. 2021). The process enables countries to identify actions that support collaboration while advancing evaluation goals identified through the IHR and PVS Pathway. By integrating sector-specific and collaborative goals, the NBWs help countries to create a joint road map for enhanced compliance to international standards and strengthened prevention, preparedness, and response (World Bank 2018). This should contribute to the National Action Planning for Health Security (NAPHS) that is a country owned,

multi-year, planning process contributing to accelerate the implementation of PPR core capacities, and is based on a One Health for all-hazards, whole-of-government approach. Other national plans, such as National Biodiversity Strategies and Action Plans (NBSAPs), which will be updated following the adoption of the post-2020 global biodiversity framework, and Nationally Determined Contributions (NDCs) under the Paris Agreement should also be considered and integrated where relevant.

Key actions are listed in the table below (Table 5) to correct the prevailing panic and neglect cycle and mainstream a One Health lens into national development frameworks. For country governments, it will be critical to mainstream One Health into their development framework, to provide coordination, ensure public expenditure management and support technical capacity. Strategic commitment is needed from IFIs, along with knowledge creation, global coordination, and provision of financial support to countries. There is a role also for the technical partners of the Quadripartite in relation to methodologies and standards.



TABLE 5: Governments, financial institutions and technical partners' needed actions for One Health-based prevention investments

Country governments	Mainstreaming One Health into the development framework	<ul style="list-style-type: none"> • Carry out a systematic risk assessment for spillovers to identify national hotspots and establish risk profiles. • Incorporate a One Health lens (based on the risk map) into national development and PPR strategies and investment frameworks. • Realign relevant policies, specifically climate change, forest management, biodiversity conservation, land use planning, urban planning, and agriculture policies (especially livestock policies), to mainstream One Health considerations.
	In-country coordination	<ul style="list-style-type: none"> • Set up national and regional One Health coordination mechanisms that work across sectors, adopting a programmatic approach, with private sector and other partners, to holistically support PPR at regional, country, and local levels. • Increase engagement with non-health fields and the private sector to encourage their ownership of the One Health agenda (environment, agriculture, livestock, climate change, etc.). • Encourage or possibly mandate Environmental, Social, and Corporate Governance (ESG) standards that include One Health in corporate regulations.
	Public expenditure management	<ul style="list-style-type: none"> • Develop a country-specific One Health expenditure tracking guideline. • Improve the visibility of One Health-related expenditure in the national budget system (Financial Management Information Systems) through practices such as budget tagging for One Health and unbundling One Health expenditures in larger health and non-health programs.
	One Health technical capacity	<ul style="list-style-type: none"> • Strengthen technical capacity to increase compliance with IHR (2005) and WOH standards for pandemic prevention and preparedness. • Strengthen technical capacity in other relevant sectors. • Strengthen the monitoring and evaluation function of One Health-related programs so that they consistently generate high quality administrative data.

IFIs	Strategy	<ul style="list-style-type: none"> • Multilateral Development Banks to include or strengthen policy commitments related to One Health in their concessional funding replenishment cycles (e.g., IDA20 policy commitment to support countries to mainstream One Health). • Mainstream PPR more systematically in standard country analytics (such as the World Bank's SCDs or the IMF's Article IV consultations). • Incorporate One Health in country engagement activities, identifying relevant One Health entry points for projects and operations across relevant sectors. • Routinely assess and report on trade-offs and co-benefits of investments related to pandemic prevention in project preparation and evaluation.
	Knowledge creation	<ul style="list-style-type: none"> • Carry out analytical work on One Health such as regional/country case studies and diagnostics, methodology development for pandemic risk assessments, and public expenditure reviews focused on One Health. • Develop monitoring and evaluation methodology for One Health related programs to measure its outputs and outcomes.
	Global coordination	<ul style="list-style-type: none"> • Raise awareness of benefits of One Health to stimulate country demand for investment and trust fund resources from donor countries. • Support the implementation of the Quadripartite One Health Joint Plan of Action (2022-2026) by aligning financing toward identified priority areas. • Promote a commonly accepted budget reporting system to allow for consistent reporting on One Health expenditures across countries.
	Country support/ financing	<ul style="list-style-type: none"> • Support countries in increasing their capacity to achieve compliance with a One Health minimum standard (IHR (2005) and WOHAI Code and Manual). • Mobilize financing mechanisms, such as IDA, IBRD, as well as the recently approved FIF for PPR and ensure sufficient coverage for One Health-based prevention investments in its funding allocations.
Quadripartite	Methodologies and standards	<ul style="list-style-type: none"> • Strengthen methodology and further integrate mechanisms for JEE, PVS pathway, NBW, STAR, NAPHS and One Health national planning process for pandemic PPR. • Develop a One Health crosswalk for relevant standards and expand standards to cover drivers of pandemic risk. • Monitor progress under the OH Joint Plan of Action with regard to pandemic prevention.

Pandemic prevention is a global public good.

Moving forward

More than two years after the outbreak of the most devastating zoonotic disease in a century, now is the time to act and take a One Health approach in development and pandemic prevention financing. If not now, when?

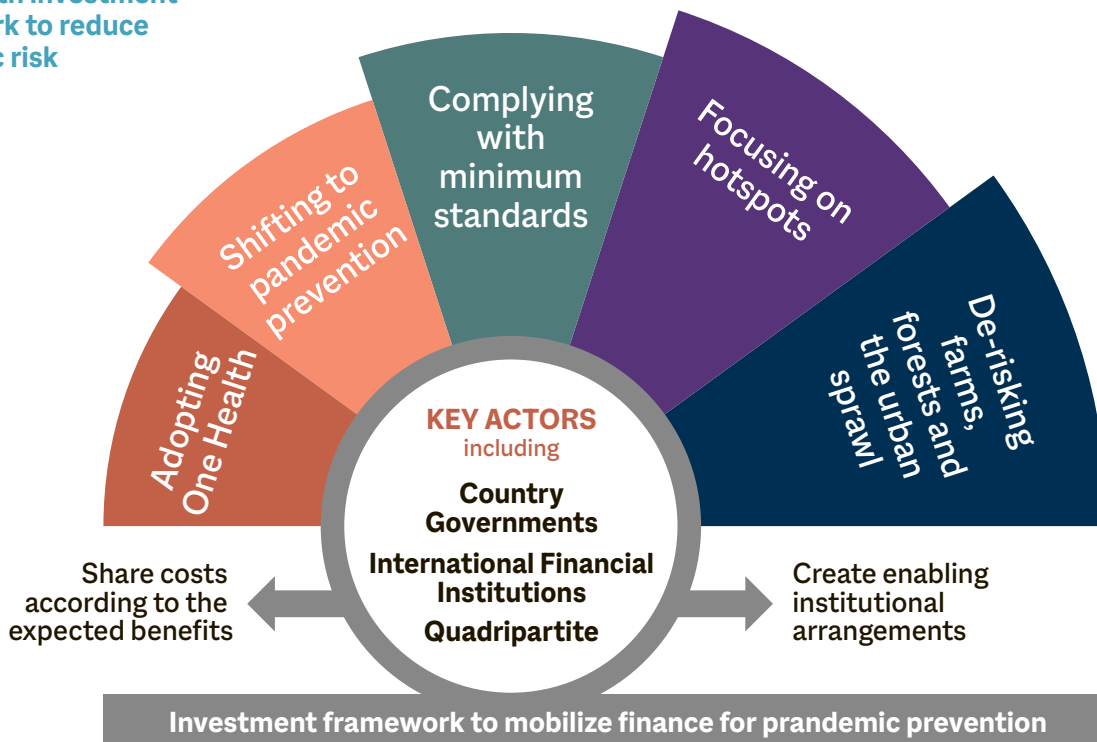
While the world has understandably been focused primarily on responding to the immediate threat and damages caused by COVID-19, some have begun to look at the longer-term challenges and the failures of the current system that allowed such a destructive zoonotic pandemic to emerge and spread throughout the world. The response to COVID-19 shows that the international community does not have a well-structured and coordinated system for managing the risks of zoonotic diseases, that institutional ambiguities and the narrow mandates of technical agencies continue to preclude the practical implementation of One Health at the needed scale, and that current levels

of investments for prevention are, simply, inadequate.

Experience has shown that once time passes, memories will erode, new crises and challenges will emerge, pandemic prevention will again be forgotten by the highest-level decision makers, and the world will again fall into a state of chronic underinvestment in prevention, which had been the case before COVID-19 shook the world in early 2020.

This report presents a One Health investment framework to deliver the objectives of pandemic risk reduction within the broader PPR agenda. This framework, the proposed practices and approaches to investing in prevention, and the principles that guide them, was informed by the results of this analytical work and by experience gained by the World Bank, its client countries, and technical partners in addressing recent public health crises.

FIGURE 6.
One Health investment framework to reduce pandemic risk

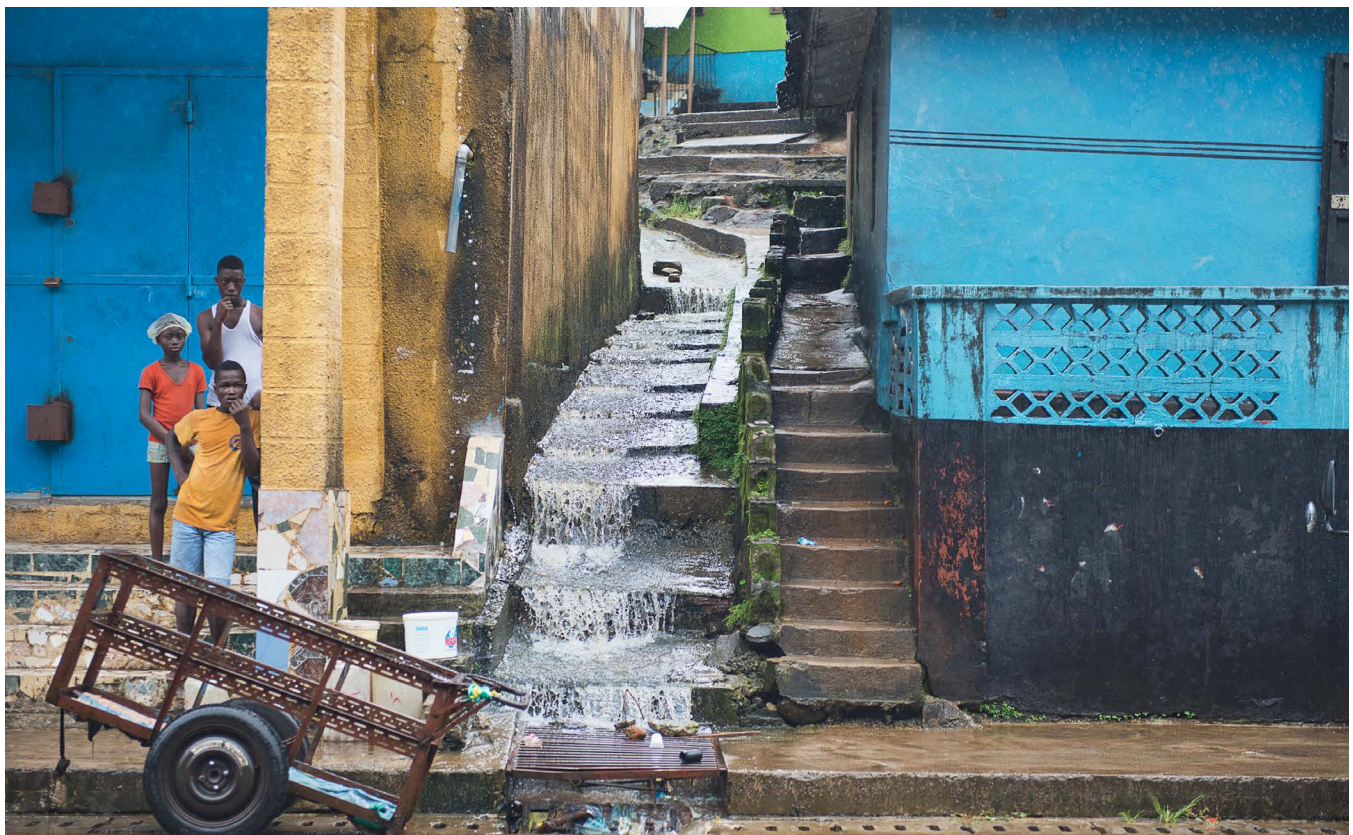


In this framework (Figure 6), investments are guided by five core principles to be applied while mobilizing finance for a fair share of the burden and creating enabling institutional environments for countries to make progress and to serve as building blocks for an effective global One Health implementation support architecture and pandemic risk prevention. The framework encompasses critical areas of intervention and emphasizes their integration and funding into finance mechanisms that will be sustainable over time, and at scale. In laying foundations for global health security, the framework must be implemented at the country level, strongly aligned with countries' prioritized national plans.

As a new IDA cycle starts, with a policy commitment to support countries in One Health programs, the World Bank has positioned itself to implement this framework. The establishment of the new FIF for PPR provides a renewed opportunity to mainstream One Health in development finance, with proper attention to

prevention. This instrument, along with ongoing efforts to strengthen the global health governance, holds promises to bring additionality in financial resources for prevention, incentivize countries to invest more, and defragment the pandemic PPR landscape.

While the international architecture for pandemic prevention is operationalized with identified roles for countries, IFIs, and the Quadripartite, the crux of the next steps must be a country-led process. This will include agencies working together to support countries to identify, prepare, and invest in projects to reduce spillover and co-finance prevention interventions. Eventually, the implementation will require a broader set of actors in the civil society. As part of this process, an immediate required task is to prepare country-level diagnostics and assess risks, vulnerabilities, needs, and financing gaps for countries to reach minimum standards and comply with their obligations as good neighbors.





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