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POLICY INSIGHTS

global POLICY

# Urgent pandemic messaging of WHO, World Bank, and G20 is inconsistent with their evidence base

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**Abstract**

When international agencies make claims of an "existential threat" to humanity and advocate for urgent action from countries, it should be a safe assumption that they are consistent with their own data. However, a review of the data and evidentiary citations underlying the claims of the World Health Organization (WHO), the World Bank, and the Group of Twenty (G20) reveals a troubling picture in which the stated urgency and burden of infectious disease outbreaks, namely those of pandemic threat, is grossly misrepresented. These discrepancies in key documents and subsequent recitations in pandemic preparedness proposals have significant policy and financial implications. Disproportionate pandemic preparedness based on these false premises risks a significant opportunity cost through unnecessary diversion of financial and political resources away from global health priorities of higher burden. As WHO Member States plan to transform the way international health emergencies are managed at the World Health Assembly in May 2024, there is a crucial need to pause, rethink, and ensure future policy reflects evidence of need.

## 1 | THE DEVELOPMENT OF THE PANDEMIC PREPAREDNESS AGENDA

Claims of rapidly increasing pandemic risk are driving fundamental and "urgent" reforms in the governance structures and funding of global public health and the very principles upon which it operates. Centered on amendments to the International Health Regulations (IHR) and a new Pandemic Agreement being developed by the World Health Organization (WHO, 2005a, 2021a), the pandemic preparedness, prevention, and response (PPPR) agenda aims to consolidate coordination within WHO (2005a, 2021a), with greatly increased resource mobilization. The World Bank, G20 Group of Nations (G20), and major public–private partnerships including CEPI and Gavi drive these reforms and parallel initiatives on the understanding of major health and economic return on PPPR investment (WHO, 2005a; CEPI, 2024; Gavi Project Syndicate and Barroso, 2021; WHO, 2021a).

These proposals require a major reworking of global public health spending, accompanied by a shift in emphasis from decentralized and voluntary public health policies (WHO, 1978, 2005b), to a more centrally managed system with compliance mechanisms (WHO, 2005c, 2022a).

The financial requirements proposed for current PPPR proposals by the World Bank, WHO, and G20 include $31.5 billion in total annual funding for PPPR ($26.4 billion in annual PPPR investments by low-and middle-income countries (LMICs) and $4.7 billion required in new ODA funding to shore-up international efforts) (WHO and World Bank, 2022). These estimates assume 25% of existing ODA already covers international PPPR efforts and that LMICs only require $7 billion in additional ODA resulting in a total ODA requirement of $10.5 billion (G20 High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response, 2021; World Bank, 2022a). The World Bank proposes a further $10.3 to $11.5 billion for additional One Health measures, while the G20 estimate also does not include surge financing (World Bank, 2022b). In contrast, the total annual budget of WHO is under $4 billion (WHO, 2024a), and approximately $3.5 billion is spent globally on malaria, a disease that kills 600,000 people a year, many of whom are children under 5 (WHO Global Malaria Programme (GMP), 2022).

To be justified, these unprecedented international public health policies and budgets, as well as the urgency with which they are being negotiated, must identify a risk and burden of proportionate magnitude. In our analysis, we explore the evidence base used to support claims of increased pandemic frequency and severity to help determine how well they are substantiated. The result of our analysis suggests that the evidence supporting these claims is weak, raising concern that a desire to address a perceived threat is driving policy, rather than the actual urgency and extent of threat. Given the scale and costs of PPPR policies, it is important to get the risk/burden balance right since an overemphasis on PPPR policy has the potential to compete with other global health issues of far greater burden. Moreover, an overemphasis on resourcing PPPR will incentivize vertical policies aimed to address specific capacities, but which may not be integrated, aligned, or reflective of national strategic plans and their contextual needs. As a result, inflated PPPR risk assessments could funnel resources to narrow initiatives, which have historically resulted in siloed programs that stymy overall public health outcomes.

## 2 | METHODOLOGY

The article is based on a previous report conducted by the research team analyzing the data and evidentiary material cited within eight key G20 (n = 3), World Bank (n = 2), and WHO (n = 3) policy documents used to support current policy assumptions about pandemic risk (Bell et al., 2024). That analysis included key secondary citations (n = 2) and academic sources (n = 6) directly referenced in the policy documents to support these claims. Additional third-level academic references (n = 15) found within these secondary citations were also considered as part of the overall analysis of the original report and therefore inform this article.

The policy documents were identified through a series of institutional websites and general online searches using combinations of search terms that included "zoonosis," "spillover," "pandemic risk," "emerging infectious disease," "pandemic threat," "epidemics," and "acute health emergencies." Key selection criteria for inclusion were that the policy document or report explicitly gave pandemic risk assessments in support of policy recommendations, was published after COVID-19, and was widely cited in the PPPR policy discourse. As a result, these documents represent the major post-COVID-19 PPPR policy initiatives where pandemic risk is explicitly reassessed, often in the context of the emergence of SARs-CoV-2, and were designed to explicitly provide evidentiary material for wider PPPR initiatives such as the Pandemic Agreement, revision of the International Health Regulations (IHRs), the Pandemic Fund, the International Pathogen Surveillance Network (IPSN), and the Medical Countermeasures Platform (MCP). Our analysis focused on reported mortality and outbreak frequency to determine trends in risk and demonstrated harm.

Each policy document and its supporting evidentiary material were analyzed individually to determine to what degree the evidence supports current PPPR risk assumptions and policy. To make this determination, the evidence was first judged on its own merits in terms of whether it represents a robust risk assessment, whether there is appropriate research coherency, as well as the comprehensiveness of analysis on which its conclusion was based. In case of the latter, this included weighing the evidentiary material against existing counterevidence and public health data as well as reassessing the urgency of pandemic risk assumptions against wider global health contexts and burdens.

### 2.1 | Detecting and recording outbreaks

A disease outbreak may be detected through observation of a cluster of an unusual or characteristic clinical illness, or by detection of a specific pathogen in the presence of non-specific symptoms and signs. Prior to the development of microscopy two centuries ago, microscopic pathogens were mostly undetectable and diseases were characterized by their clinical picture and epidemiological features. Pathogen-specific proteins and most host immune responses have only been detectable within the past century, and detectable at point of care in the past few decades (Bell et al., 2006). Detection of genome through PCR (nucleic acid amplification) tests, critical to detecting and distinguishing between many human pathogens, was developed in the 1980s (Zhu et al., 2020), and is still often absent at point of care. Many of these tests are less accessible in lower-income countries, which tend to be clustered geographically in tropical areas. The ability to transmit results has also been transformed over the past century by road and phone networks, rising literacy, and more recently by digital communications, also with a lag in lower-income countries.

The probability of an outbreak being detected, differentiated, and recorded has therefore increased greatly when compared to the latter decades of the 20th Century. This empirical reality is fundamental to interpretation of all data regarding trajectories of disease outbreaks in human populations.

### 2.2 | Comparing burden of disease

Disease burden itself is complicated to measure, but critical to determining the level of resources to be allocated to PPPR. WHO defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"(WHO, 2005b). There is no hierarchy of importance stated between these aspects of health, which are themselves interconnected. While mental and social well-being is harder to quantify, methods used to estimate relative physical burdens of disease are more straightforward.

The simplest of these are case numbers and death counts. The former provides a rough measure of spread of a pathogen in a community, but not its severity. Mortality alone also provides a poor measure of overall impact, as death of a young child (e.g., malaria) will foreshorten life far more than death of an elderly person (e.g., COVID-19) (CDC, 2020a; Makhoul et al., 2022; Pezzullo et al., 2023).

To address discrepancies in age, measures based on life-years lost are commonly used (WHO, 2011). Disability-adjusted life years (DALYs) combine life-years lost with measures of impact of illness (years of disability or lost healthy life years) on daily life, while quality-adjusted life years (QALYs) combine life-years gained by an intervention and the quality of life (lack of disability) during those years (Weinstein et al., 2009; WHO, 2019a). The vital to determine proportionate resource allocation by enabling comparison of a broader impact of diseases and health interventions metrics encompassing life years lost are absent from burden estimates of outbreaks in the publications of the agencies discussed in this article. While this is partly due to difficulty in calculating historic metrics, it is important to note that this is inconsistent with the development of good public policy.

## 3 | THE WORLD HEALTH ORGANIZATION'S CLAIMS ON PANDEMIC RISK

Despite being at the center of efforts to centralize PPPR, WHO has published relatively little, outlining actual pandemic and epidemic risk. Two key documents were published in 2023 as guidance to Member States. WHO also maintains a list of pathogens considered as a priority for research and development to mitigate future pandemic risks.

In 2023, the WHO's Strategic and Technical Advisory Group on Infectious Hazards with Pandemic and Epidemic Potential published its report "Future Surveillance for Epidemic and Pandemic Diseases: a 2023 Perspective" (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023a) and the "2nd Edition of its handbook Managing Epidemics: Key Facts About Major Epidemic Diseases" (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023b). We examine them in turn below.

### 3.1 | Future surveillance for epidemic and pandemic diseases

The Future Surveillance report leads with the claim:

> Since the beginning of the 21st century, the world has experienced major epidemics and pandemics every four to five years.
>
> (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023a, p. 27)

while *Managing Epidemics* further claims that:

> Epidemics and pandemics of infectious diseases are occurring more often, and spreading faster and further than ever, in many different regions of the world.
>
> (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023b, p. XV)

To substantiate this claim, report includes a figure illustrating events that WHO considers major epidemics or pandemics (see Figure 1).

As a visual tool, Figure 1 is compelling. Eight epidemics are shown as active in 2022, compared to zero in 2000. Four more have been resolved. However, this impression is misleading. Of the eight, Zika, cholera, Ebola, and Mpox (monkeypox) have long histories of human infection prior to 2000. The three influenza subtypes reflect expected genetic drift, with prior subtypes exacting higher mortality (Kilbourne, 2006; WHO, 2019b). Only MERS and COVID-19, the latter increasingly held to be a laboratory-modified organism rather than a natural outbreak (Chen et al., 2024; DNI, n.d.; Looi, 2023), are new and persisting outbreak pathogens. Of the four remaining short-term outbreaks, only SARS was previously unrecognized. Plague, yellow fever, and cholera had far greater impact previously.

In terms of mortality, those outbreaks in Figure 1 confirmed to be naturally occurring are of relatively low health burden. WHO's estimates of mortality of 164,000 for the 2009 H1N1 influenza epidemic (WHO, 2019b) were compared with seasonal influenza mortality from 291,000 to 645,000 (Iuliano et al., 2018). The West Africa Ebola outbreak killed an estimated 11,325 people, and the Haiti cholera outbreak killed 9792, with 4000 dying in Yemen from the same disease. The

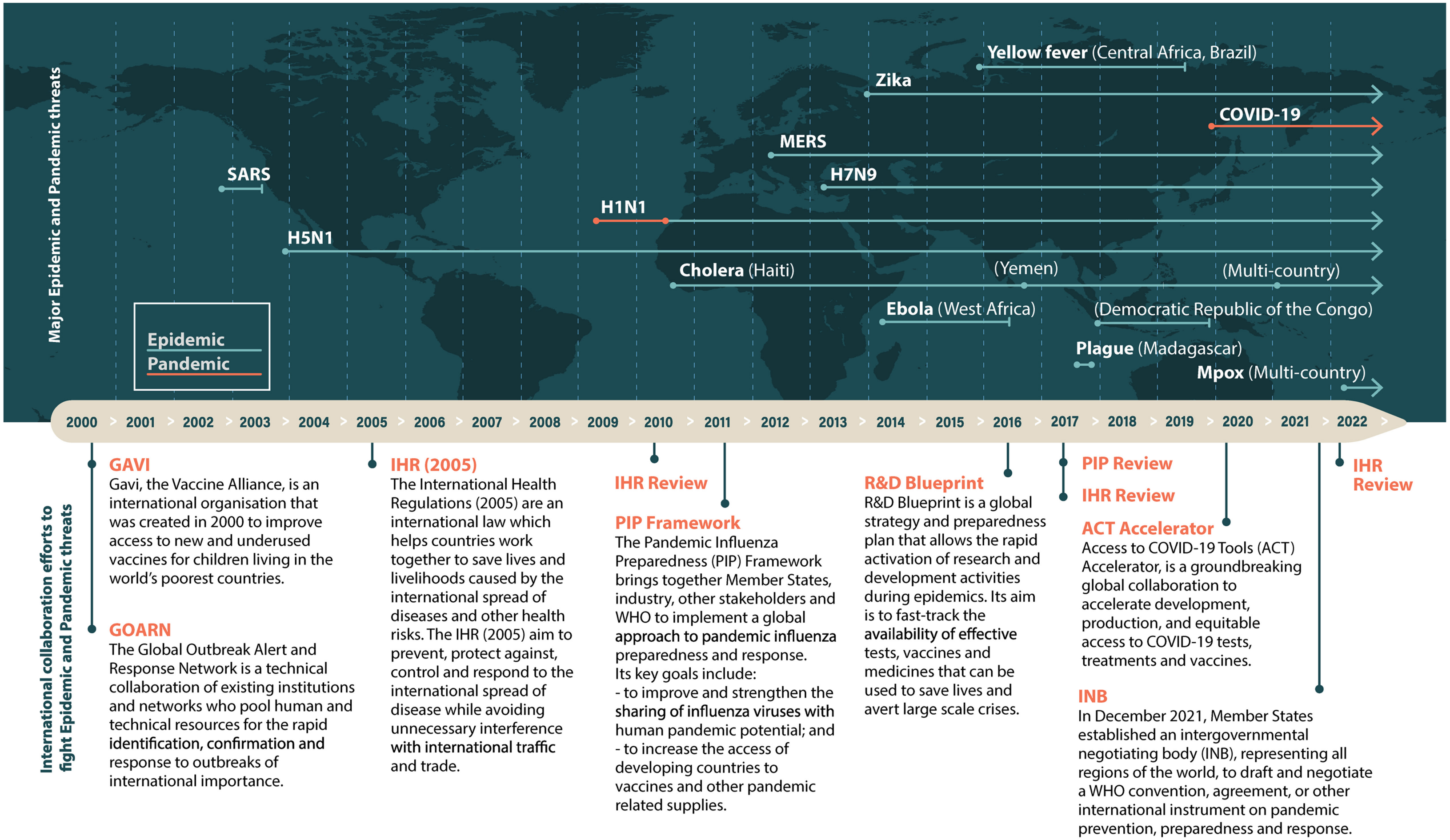



**FIGURE 1** WHO Report; "Future Surveillance for Epidemic and Pandemic Diseases: a 2023 Perspective," showing "Major epidemic and pandemic events in the 21st century".

remaining outbreaks killed less than 3500 people—the number killed by tuberculosis every day (WHO, 2023a). Seven of these diseases killed under 1000. Rather than demonstrating increasing risk, the WHO figure demonstrates mostly low-level recurrence or persistence of diseases that were formerly of far greater burden.

WHO further notes within *Future Surveillance* that "300–400 infectious hazard events of public health concern are now detected annually…" (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023a, p. 27). The 2021 Annual Global Report on Public Health Intelligence Activities is cited (WHO, 2022b), noting an increase in substantiated public health events recorded in the Emergency Management System (EMS) over 20 years prior to COVID-19 (WHO, 2022b). However, the highest value was reached in 2009. The report's authors further acknowledge that the overall increasing trend is "in part, due to an improved use of EMS and increased trainings for WHO Regions, along with systematic engagement with States Parties to improve national surveillance systems" (WHO, 2022b, p. 38). Despite the obvious influence of evolving technology on increased outbreak detection and reporting over recent decades (upward bias), the report concludes without much consideration that these public health events are increasing and that this trend will continue "as climate change, (protracted) humanitarian crises, and disasters become more frequent and gain prominence" (WHO, 2022b, p. 41). Yet, no evidence or citations are provided to back this assumption.

Environmental and social contributors are cited elsewhere in *Future Surveillance* as promoting risk including "population and demographic changes, biodiversity and ecological changes, urbanization, livestock production and expanded and higher-volume transportation networks" (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023a, p. 27). However, there is contestation within the literature regarding the role of these factors and these are common influences on population health and not specific to infectious diseases (Black et al., 2008; Knutie et al., 2017). The literature also demonstrates a complex relationship between these variables and outbreak risk depending on context (Allen et al., 2017; Bell et al., 2024; Jones et al., 2008; Morand & Lajaunie, 2021).

## 3.2 | Emerging epidemics

The 2023 WHO 2nd Edition of the handbook Managing Epidemics: Key Facts About Major Epidemic Diseases makes similar claims (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023b):

> Epidemics and pandemics of infectious diseases are occurring more often, and spreading faster and further than ever, in many different regions of the world. The background factors of this threat are biological, environmental and lifestyle changes, among others.
>
> (p. XV)

> Early years of the 21st century have already been deeply scarred by so many major epidemics.
>
> (p. 3)

and further

> Epidemics in the 21st century are spreading faster and further than ever.
>
> (p. 5)

To substantiate these claims, the handbook lists outbreaks including SARS, H1N1, MERS, Ebola, Zika, COVID-19, and a plague outbreak in Madagascar that killed 209 people in 2017, then refers to the exact same timeline graphic in Figure 1 discussed above.

Increased outbreak frequency is evidenced through a table of "acute public health events" (see Figure 2a), derived from the WHO R&D Blueprint disease priority list (WHO, 2016). The Blueprint is a global preparedness plan to allow the rapid activation of R&D activities during epidemics and dedicates specific dashboard portals for priority diseases. Although the diseases in Managing Epidemics correspond to those listed within the Blueprint, the Blueprint itself does not provide further data. The 63 "acute public health events" that were reported for Zika virus in 2016 may refer to multiple reports of the same outbreak(s) in South America that year, separated geographically or temporally. However, WHO notes in Figure 2a that time- and space-linked reports were merged and counted as one event leaving this large contributor to overall numbers unexplained.

Other "public health events" listed in Figure 2a seem arbitrary. Malaria killed roughly 600,000 in each of these years but is recorded as a few outbreaks per year (WHO, 2023b). Other diseases including measles, yellow fever, and dengue are endemic or cause frequent outbreaks across the tropics, but their inclusion promotes a visual impression of increasing risk (see Figure 2b). The event numbers in Figure 2b do not match those in Figure 2a, although the non-specific source "acute public health events reported to WHO" is cited as the sole basis. The reader is to take on trust that this represents a real increase in risk, although the vague methodology underlying these charts is poorly supportive. WHO notes elsewhere that overall burdens of malaria, measles, meningitis, and polio have declined over recent decades (WHO, 2021b, 2023b, 2023c, 2024b), while cholera is acknowledged to be predominantly driven by poverty and poor sanitation.

**(a)** Acute public health events* for selected infectious diseases (2011–2021)

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avian/Animal influenza | 5 | 2 | 1 | 3 | | 5 | 5 | 3 | 2 | 5 | 16 | 47 |
| Chikungunya | 1 | 3 | 4 | 24 | | 5 | 3 | 3 | 2 | | 1 | 46 |
| Cholera | 24 | 24 | 11 | 1 | 19 | 16 | 14 | 23 | 19 | 4 | 12 | 167 |
| Crimean-Congo haemorrhagic fever | 1 | | 3 | | 4 | 2 | 8 | 4 | 8 | 3 | 3 | 36 |
| Dengue | 8 | 10 | 7 | 6 | 7 | 5 | 12 | 13 | 16 | 4 | 10 | 98 |
| Ebola virus disease | 1 | 3 | | 3 | | | | 2 | 2 | | 1 | 12 |
| Lassa fever | 2 | 1 | 2 | 1 | 2 | 2 | 7 | 3 | 6 | 1 | 4 | 31 |
| Malaria | 2 | 2 | | | 3 | 3 | 11 | 4 | 8 | 3 | 7 | 43 |
| Marburg virus disease | | | | 1 | | | 2 | | | | 1 | 4 |
| Measles | 19 | | 7 | 11 | 13 | 7 | 15 | 25 | 15 | 3 | 5 | 120 |
| Meningococcal disease/Meningitis | 11 | 11 | 3 | 4 | 4 | 8 | 10 | 7 | 2 | 2 | 2 | 64 |
| MERS | | 3 | 5 | 9 | 2 | 1 | 1 | 5 | 4 | 1 | 2 | 33 |
| Nipah virus | 1 | | 1 | | | | | 1 | 2 | 1 | 1 | 7 |
| Poliomyelitis | 10 | 1 | 4 | 3 | 2 | 2 | 3 | 13 | 16 | 6 | 16 | 76 |
| Rift Valley fever | 2 | | | | 2 | 3 | 3 | 3 | 3 | 1 | 2 | 19 |
| Yellow fever | 2 | 3 | 3 | | 1 | 5 | 1 | 5 | 2 | 6 | 3 | 31 |
| Zika | | | | 2 | 15 | 63 | 5 | 3 | 1 | | 2 | 91 |

* A public health event is an outbreak of a disease reported to WHO. One event may consist of one or several case reports or clusters. Time and space linked reports are merged and counted as one event.

**Heatmap for selected infectious diseases:**
– Top 10 most commonly reported infectious diseases selected in the 11-year time period.
– Priority diseases in WHO R&D blueprint

**Note:**
Events of acute watery diarrhoea have **not** been included as cholera

**(b)** Number of acute public health events* of infectious disease typology by year (2011–2021)

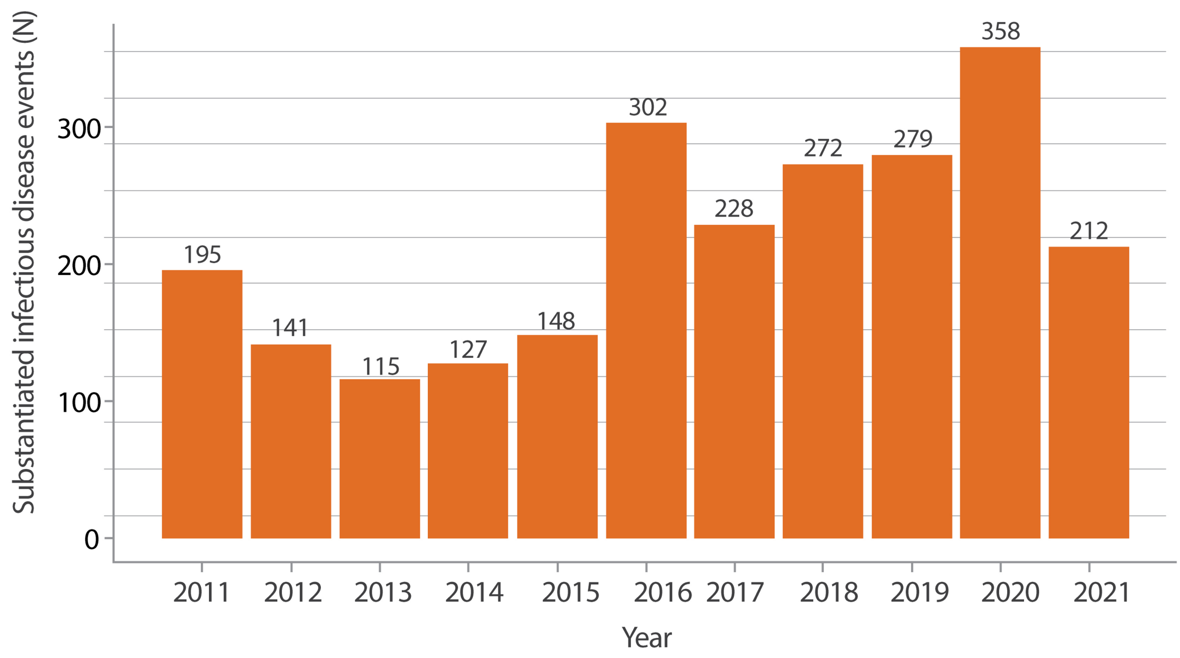



**FIGURE 2** Acute public health events from WHO handbook "Managing Epidemics: Key Facts About Major Epidemic Diseases, Second Edition." (a) Acute public health events for selected diseases, and (b) infectious disease public health events by year.

To explain WHO's claimed increase in outbreak frequency and scope, the handbook outlines two key drivers: (1) the "fast and intense mobility of people", and (2) increased land use and agricultural changes, namely "deforestation, urban sprawl and human encroachment into previously untouched habitats". These latter changes "intensify our interactions with wildlife and the pathogens they harbor. Changing and intensified food production, from live poultry and animal markets to deforestation for expanded large-scale agriculture, also leads to increased contact between people and wildlife" (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023b, p. 13). Again, as with the 2023 WHO Future Surveillance report, no evidence is cited to support these claims, and the reality is complex (Allen et al., 2017; Bell et al., 2024; Jones et al., 2008; Morand & Lajaunie, 2021).

### 3.2.1 | WHO priority disease list

The WHO priority disease list constitutes a third major WHO source for claims of pandemic risk (WHO, 2024c). Prioritizing diseases for research and development in emergency contexts, it lists non-influenza diseases considered to be potential major epidemic or pandemic threats; currently, COVID-19, Crimean–Congo hemorrhagic fever, Ebola virus disease and Marburg virus disease, Lassa fever, Middle East respiratory syndrome coronavirus (MERS-CoV) and severe acute respiratory syndrome (SARS), Nipah and henipaviral diseases, Rift Valley fever, Zika, and "Disease X" (see below for Disease X definition).

This list, intended to signify naturally occurring threats, raises several concerns as a basis for supporting PPPR-specific funding. COVID-19 is increasingly considered to be the result of human manipulation rather than natural emergence (Chen et al., 2024; DNI, n.d.; Looi, 2023), and irrespectively, is rarely severe beyond the unwell elderly (CDC, 2020b; Makhoul et al., 2022; Pezzullo et al., 2023). Lassa fever is confined to West Africa and kills around 5000 people per year (CDC, 2022). Ebola is mostly isolated to outbreaks in West and Central Africa, with the largest outbreak in West Africa in 2014, killing under 12,000 people (WHO, 2017). None of the remaining diseases have killed more than 1000 people in recorded history (ECDC, 2021; Epstein et al., 2006; Paixao et al., 2022; WHO, 2015, 2018, 2023d). Of those of confirmed natural origin, this list, therefore, reflects diseases either highly geographically confined or widespread but of relatively low mortality. "Disease-X" is intended as a hypothetical highly transmissible and virulent disease (placeholder for the known unknown). It seems sensible to consider such an event, but clearly, this must remain within the context of actual risk if resource allocation is to remain proportionate. Prominence given to Disease X in the media suggests that this context is not well understood (Brown et al., 2024; Loria, 2018). Moreover, the prominence given to a single infectious disease in isolation threatens to ignore the fact that most diseases are syndemic and closely associated with social determinants, requiring more holistic approaches to public health (Swinburn et al., 2019).

In sum, the WHO's documents promote a misinterpretation of their own evidence sources associated with the trajectory of acute infectious disease outbreaks and their burden. While the WHO priority disease list relies heavily on a hypothetical disease to promote naturally arising risk (Disease X), promotion of transparency and clear analysis of data is fundamental to WHO's mandate. This raises an important policy issue, since the way in which WHO currently characterizes outbreaks runs the risk of inappropriately prioritizing them over other persisting endemic infectious diseases as well as non-communicable diseases, both of which impart far higher burdens.

## 4 | THE G20 HIGH-LEVEL INDEPENDENT PANEL REPORT

The High-Level Independent Panel (HLIP) of the G20 published a commissioned report "A Global Deal for our Pandemic Age," in June 2021. Its findings, promoting a need for urgent action on PPPR, were primarily based on inputs from Metabiota Inc. (a private company specializing in outbreak reporting and analysis) and McKinsey & Company, and an additional list of outbreaks from unspecified sources (G20 *High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response*, 2021). The HLIP report guided the G20 Leaders Declaration in Bali in 2022 and was repeated in Delhi in 2023, which supported the development of the WHO Pandemic Agreement and proposed IHR amendments.

The HLIP report concludes that pandemics and disease outbreaks are increasing in frequency and impact, with a high likelihood of recurrence of a major pandemic within one to two decades:

> without greatly strengthened proactive strategies, global health threats will emerge more often, spread more rapidly, take more lives, disrupt more livelihoods, and impact the world more greatly than before.
>
> …countering the existential threat of deadly and costly pandemics must be the human security issue of our times. There is every likelihood that the next pandemic will come within a decade…
>
> (G20 High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response, 2021, p. 5)

Based on the predicted pandemic burden and risk, the report suggests $15 billion annually in additional international spending, plus an additional 1% of GDP of LMICs being put aside ($18 billion per year), with a return on investment from 300 to 700 times this expenditure.

Support for the assertion of "the reality of a world at risk of more frequent pandemics" is laid out on page 20 of the HLIP's report:

a. "The last two decades have seen major global outbreaks of infectious diseases every 4–5 years, including SARS, H1N1, MERS and COVID-19." (*See Annex D*).
b. "There has been an acceleration of zoonotic spillovers over the last three decades." (*See Annex E*).
c. "Scientists attribute the increased frequency of infectious disease outbreaks to population growth and increased human encroachment on the natural environment…" (G20 *High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response*, 2021, p. 20)

Annexes D and E are the main evidence contributions. The report of McKinsey and Company (2021) does not introduce new disease data or sufficient evidence. Yet, it does speculate on an increased possibility of an outbreak with 25% mortality, which will disproportionately harm children as a basis for investment, but such an outbreak has not occurred at broad scale since bubonic plague in the 14th century, apart from smallpox and measles outbreaks in immunologically isolated populations of the Americas and Oceania in the 16th to 19th centuries.

## 4.1 | Annex D data in the HLIP report

Annex D of the HLIP report lists "Major Infectious Disease Outbreaks in the Past Two Decades" (see Figure 3a). No reference or attribution is provided for the list, no associated mortality or other impact data is provided, nor is the geographic location of any outbreak given.

Based on the largest outbreaks identifiable in the literature for each disease commencing in the year listed, we analyzed the impact of these outbreaks (see Figure 3b). Sources for our assumptions are listed in Table 1. It appears that the authors of the report made errors in Annex D, as some years listed were not the largest outbreaks recorded for the specific disease within the past two decades. For instance, the enterovirus 71 outbreak presumably refers to the outbreak in Taiwan of that year, while recorded mortality for this disease was far higher in Mainland China in 2008–2012 (Nayak et al., 2022). While the major West African Ebola outbreak is listed, a further outbreak in 2017 may be an error, as only three recorded deaths could be located in reports of that year (CDC, 2019). The intent may have been to refer to 2018, when two larger outbreaks occurred in the Democratic Republic of Congo (CDC, 2019; WHO, 2020). We have included these two outbreaks in Figure 3b. COVID-19 was included in the HLIP table (Table 1), but we discuss its higher attributed mortality elsewhere, given its origins (natural spill-over vs. laboratory mediated) remain controversial (Chen et al., 2024; DNI, n.d.; Looi, 2023).

As Figure 3b demonstrates, only the H1N1 ("Swine Flu") outbreak killed over 20,000 people in the 20 years prior to COVID-19. The 164,000 recorded deaths are well below that expected from seasonal influenza (Iuliano et al., 2018; WHO, 2019b). After H1N1 influenza, mortality is dominated by the 11,325 deaths of the West African Ebola outbreak, largely confined to three countries. Ebola historically occurs in quite geographically confined areas due to its reliance on close contact for transmission and readily distinguishable illness.

The third largest outbreak listed by the G20 HLIP report was the Haiti cholera outbreak in 2010, thought to have originated from poor sanitation in a UN compound (Lantagne et al., 2013). Cholera once caused major outbreaks (peaking between 1852 and 1859) and was the subject of the first international agreements on pandemics (McCarthy, 2002). Improved water and sewage sanitation has reduced its impact greatly to a point where the Haiti outbreak was unusual.

While other outbreaks are overlooked in Annex D of the HLIP report, it contains most major events (see note on enterovirus 71) and is the only evidence quoted for the Report's claim of major outbreaks every 4–5 years. This claim requires outbreaks with mortality equivalent to 1 day of tuberculosis (approximately 3500 deaths/day) to be considered "major outbreaks" (see Figure 3a,b) (WHO, 2023a). The widely endemic diseases tuberculosis and malaria, responsible for approximately 1,380,000 (WHO, 2023a) and 620,000 (WHO Global Malaria Programme (GMP), 2022) deaths annually, respectively, each dwarf the combined total of all outbreaks listed in the HLIP report table; under 200,000 and under 25,000 excluding influenza, over 20 years.

## 4.2 | Data provided from Metabiota Inc.

The second major source of evidence quoted in the HLIP report as supporting assertions of high and increasing pandemic risk is data provided by Metabiota Inc., a company then based in San Francisco, California, USA (Metabiota, 2024), specializing in data analysis including health-related data (now a division of Ginkgo Bioworks (USA)). Metabiota's data, included in Annex E of the report, are the basis of the assertion of "an acceleration of zoonotic spillovers over the last three decades." Annex E (see Figure 4) claims for non-influenza:

> There has been a clear exponential increase of such epidemics, which increased in frequency by a factor of about 3 every 20 years.
>
> (p. 73)

and for influenza, that there has been a dramatic change (worsening) of the threat:

(a) Major Infectious Disease Outbreaks in the Past Two Decades

| YEAR | OUTBREAK |
|---|---|
| 2019 | SARS-CoV-2 |
| 2018 | Lassa |
| 2017 | Zika |
| 2017 | Ebola |
| 2014 | Chikungunya |
| 2014 | Ebola |
| 2012 | MERS |
| 2010 | Cholera |
| 2009 | H1N1 Influenza |
| 2004 | H5N1 Influenza |
| 2003 | SARS-CoV-1 |
| 2001 | Enterovirus 71 |
| 2001 | Nipah |

(b)

| Outbreak | Mortality |
|---|---|
| 2019 SARS-CoV-2 | … |
| 2018 Lassa | 114 |
| 2017 Zika | 362 |
| 2017 Ebola | 3 |
| 2014 Chikungunya | 0 |
| 2014 Ebola | 11,325 |
| 2012 MERS | 858 |
| 2010 Cholera | 9,792 |
| 2009 H1N1 Influenza | 163,000 |
| 2004 H5N1 Influenza | 32 |
| 2003 SARS-CoV-1 | 774 |
| 2001 Enterovirus 71 | 26 |
| 2001 Nipah | 54 |
| **TOTAL** | **189,661** |
| **TOTAL Excl influenza** | **25,629** |

**FIGURE 3** (a) Annex D from the HLIP Report "A Global Deal for our Pandemic Age," and (b) REPPARE assumptions for outbreaks listed and associated mortality. (See Annex I for sources of mortality estimates).

> There have been around 10 influenza spillover events each year in recent years, compared to hardly any 25 years ago.
>
> (p. 73)

The charts in Figure 4 indicate one or less non-influenza events annually prior to 1960 increasing to 20 by 2018, and one or less influenza spillover events annually prior to 1995 rising to 10 by 2020. The chart on influenza

**TABLE 1** Outbreaks listed in Annex D of the G20 High-Level Independent Panel's 2021 Report, with probable mortality added and sources from which these are derived. 2018 and 2018–20 Ebola outbreaks are added to address a probable oversight in the HLIP report.

| Outbreak (HLIP annex D) | Mortality | Notes | Source for mortality estimate |
|---|---|---|---|
| 2019 SARS-CoV-2 | … | Discussed separately elsewhere in this report. | |
| 2018 Lassa | 114 | Nigeria | https://www.who.int/emergencies/disease-outbreak-news/item/20-april-2018-lassa-fever-nigeria-en |
| 2017 Zika | 362 | Assumed to be 2016–2017 outbreak. | https://www.nejm.org/doi/pdf/10.1056/NEJMoa2101195 |
| 2017 Ebola | 3 | DRC | https://www.cdc.gov/vhf/ebola/outbreaks/drc/2017-may.html |
| (2018 Ebola) | 33 | DRC (Bikoro) | https://www.cdc.gov/vhf/ebola/outbreaks/drc/2018-may.html |
| (2018–2020) | 2287 | DRC (n Kivu, Ituri, S Kivu). | https://www.who.int/emergencies/disease-outbreak-news/item/2020-DON284 |
| 2014 Chikungunya | 0 | Location of 2014 outbreak is unclear. Mortality is low but may occur among the elderly. | |
| 2014 Ebola | 11,325 | West Africa outbreak. | https://www.who.int/emergencies/situations/ebola-outbreak-2014-2016-West-Africa |
| 2012 MERS | 858 | Global | https://www.who.int/health-topics/middle-east-respiratory-syndrome-coronavirus-mers#tab=tab_1 |
| 2010 Cholera | 9792 | Haiti (2010–2019) | https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON415 |
| 2009 H1N1 Influenza | 164,000 | Median of WHO estimates 123,000–203,000. | https://apps.who.int/iris/bitstream/handle/10665/329438/9789241516839-eng.pdf?ua=1 |
| 2004 H5N1 Influenza | 32 | Southeast Asia | https://www.ncbi.nlm.nih.gov/books/NBK22148/ |
| 2003 SARS-CoV-1 | 774 | Global | https://www.who.int/publications/m/item/summary-of-probable-sars-cases-with-onset-of-illness-from-1-november-2002-to-31-july-2003 |
| 2001 Enterovirus 71 | 26 | Taiwan | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9188855/ |
| 2001 Nipah | 45 | Bangladesh | https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON490 |

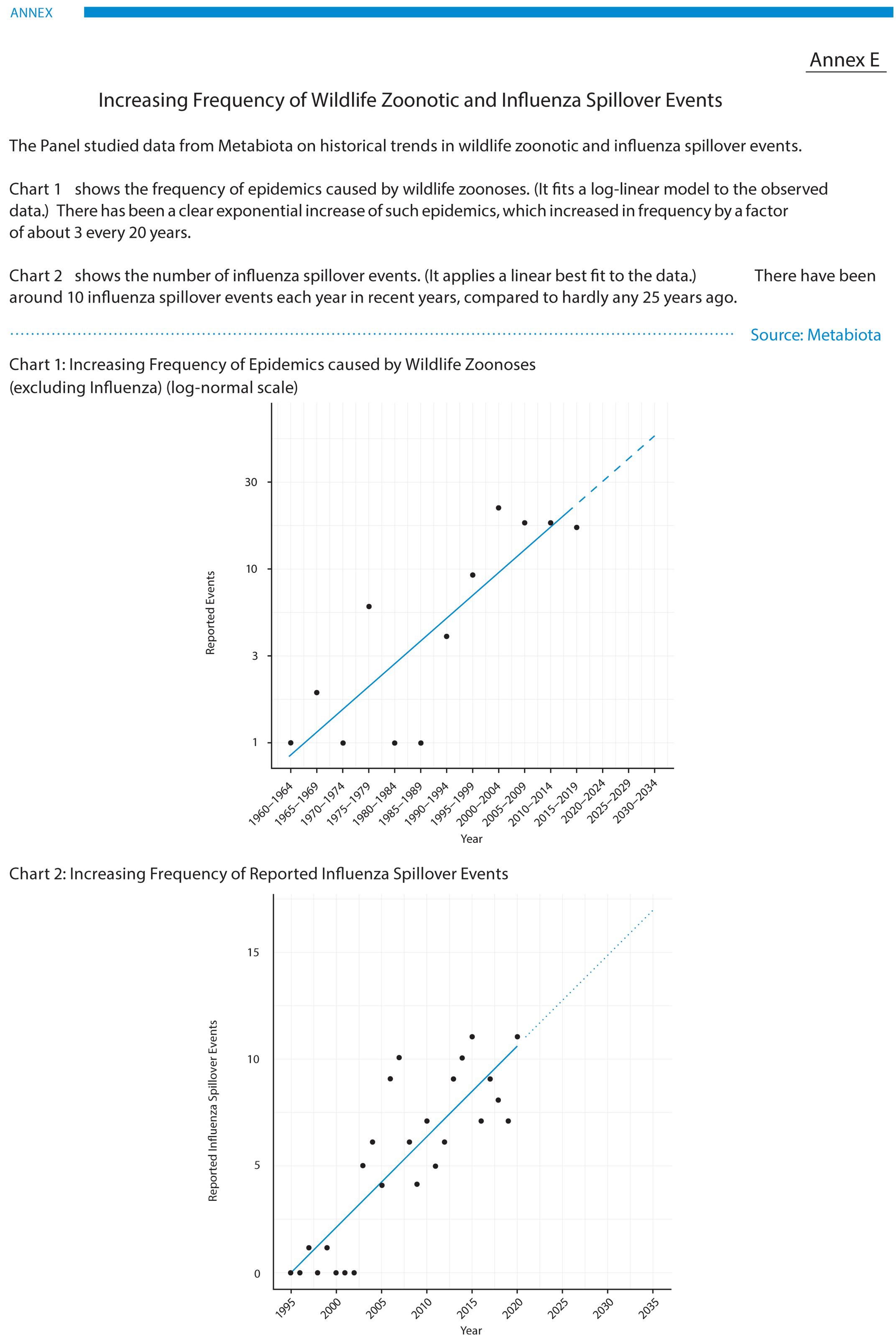
"spillover" events is difficult to interpret. Influenza deaths have been trending down in the United States (where data are relatively good) over the past few decades (Dattani et al., 2024; Doshi, 2008). Mortality from highly pathogenic avian influenza (HPAI) types H5 and H7 has greatly declined over the past century (Dattani et al., 2024). WHO notes that mortality from H5N1 ("Bird Flu"), a variant widely considered of concern, has declined markedly over the past two decades (WHO, 2024d). Metabiota's claim of an increase from 1 to 10 spill-over events per year from 1995 to 2000 seems unlikely to refer to a real change in seasonal influenza. It is possible that the increase refers to advances in detection of variants or changes in seasonal outbreak reporting.

While the HLIP report does not provide Metabiota's sources for the charts in Annex E, Ginkgo Bioworks also confirmed that the same dataset forms the basis of Meadows et al., 2023, published in the British Medical Journal (Meadows et al., 2023). Meadows et al. analyzed the Metabiota database of 3150 outbreaks, including all outbreaks recorded by WHO since 1963, as well as "historically significant" prior outbreaks (see Figure 5).

Meadows et al. (2023) concentrate on outbreaks of zoonotic origin from 1963 to 2019 that are not vector-borne, and of not more than 5 years of duration (to exclude endemic diseases), with at least 50 deaths recorded for that pathogen cumulative overall outbreaks from that pathogen. They excluded influenza as specifically targeted surveillance programs increased detection.

The outcome, and therefore the basis for the HLIP report data, is 75 outbreak events with 17,232 deaths in 24 countries, caused by filoviruses (Ebola and Marburg), SARS Coronavirus 1, Nipah virus, and Machupo virus. Machupo virus causes localized outbreaks in Bolivia linked to an endemic species of mouse, while Nipah has been confined to Southeast Asia. Most of these individual outbreaks involved less than 50 deaths (Meadows et al., 2023).

The chart of frequency of events in Figure 5 and those in Figure 4 from the HLIP report demonstrate an obvious increase in reported event frequency. Applying models to this data reveals an exponential increase. This could be explained by a rapid increase in actual events. However, several obvious confounders exist. These include increased surveillance efforts, especially economic growth


ANNEX

Annex E

Increasing Frequency of Wildlife Zoonotic and Influenza Spillover Events

The Panel studied data from Metabiota on historical trends in wildlife zoonotic and influenza spillover events.

Chart 1 shows the frequency of epidemics caused by wildlife zoonoses. (It fits a log-linear model to the observed data.) There has been a clear exponential increase of such epidemics, which increased in frequency by a factor of about 3 every 20 years.

Chart 2 shows the number of influenza spillover events. (It applies a linear best fit to the data.) There have been around 10 influenza spillover events each year in recent years, compared to hardly any 25 years ago.

Source: Metabiota

Chart 1: Increasing Frequency of Epidemics caused by Wildlife Zoonoses (excluding Influenza) (log-normal scale)



Chart 2: Increasing Frequency of Reported Influenza Spillover Events



**FIGURE 4** Annex E from the HLIP report, intended to demonstrate an exponential increase in the frequency of epidemics (outbreaks) derived from zoonotic spillover.

(more labs and roads), rising donor interest in outbreaks, rising total donor funding, and rising emphasis on publication of data. In addition, confounders associated with the expansion of diagnostic capacity must be considered, including the development of PCR in 1983 and the gradual expansion of its use, the development of improved and

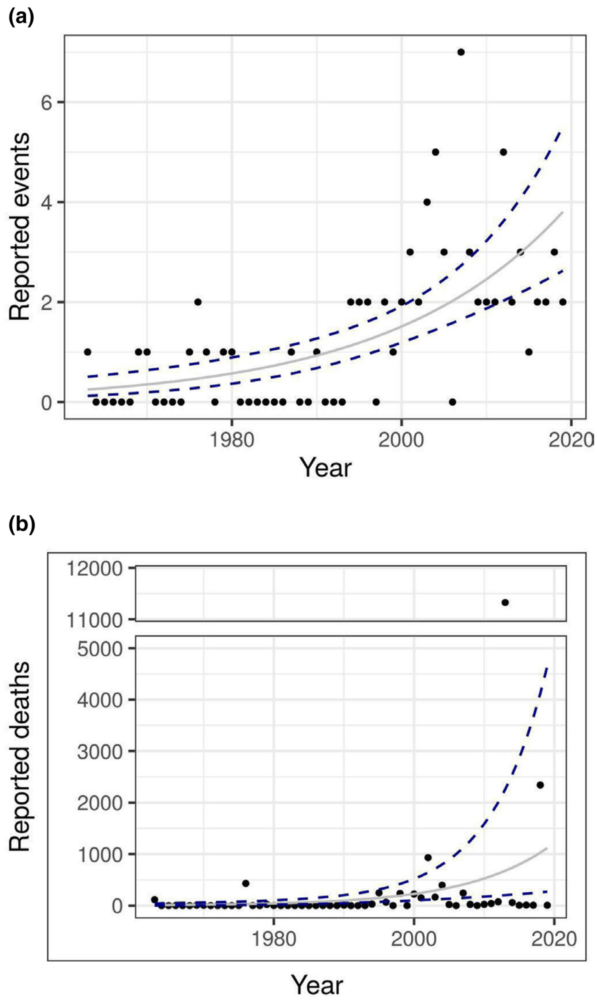



**FIGURE 5** Reported non-influenza zoonotic spillover events and corresponding mortality, 1960 to 2020, from Figure 2 of Meadows et al., 2023. The annual number of reported outbreaks (a) and deaths (b) caused by Filoviruses, SARS Coronavirus 1, Machupo virus, and Nipah virus from 1960-2019 (points). The grey line shows the fit temporal trend; the navy blue dashed lines show ±95% CI. Note the break in the y-axis in panel b which was added to increase visibility of the trend.

lower-cost antigen tests, and the expansion of access to lower-cost serology tests, as well as multiple other reasons for increased detection, reporting, and recording.

The curves produced by Metabiota indicate that very few outbreaks occurred before the 1970s. This seems to lend weight to the influence of the confounders listed above, particularly technological advancement in detection, rather than demonstration of a true exponential increase. Meadows et al. recognize this in the limitations section of their paper, noting that reporting frequency did not adjust for the development of new surveillance and diagnostic technologies. As outlined earlier, PCR testing was only developed in the 1980s and has become more accessible over the last 30 years, first in higher-income and then to a still limited extent in lower-income countries (Zhu et al., 2020). Antigen and point-of-care serology tests have only become widely available in the past couple of decades for some common pathogens, and genetic sequencing very recently (Bell et al., 2006). Improvements in road transport, clinic access, and digital information sharing have also transformed the ability to transmit and recall such information since 1960. Most small and localized outbreaks reported by Meadows et al. (2023) for the past decade would have been missed 60 years ago, as the rise in HIV/AIDS was missed for at least 40 years prior to identification through emerging technologies in the 1980s (Sharp & Hahn, 2011).

Analysis of the mortality trends for these diseases, included in Meadows et al., but not in the HLIP report, raises similar concerns. Meadows et al. (2023) indicate that the data represent an exponential increase of 8.7% annually, and that: “If these annual rates of increase continue, we would expect the analysed pathogens to cause four times the number of spillover events and 12 times the number of deaths in 2050 than in 2020.” (p. 3).

Two mortality points from Meadows et al (see Figure 5b) drive the upswing of the curve between 2010 and 2019. These correlate with the West African Ebola outbreak of 2014 and the Democratic Republic of Congo (DRC) Ebola outbreaks of 2017 (which we have assumed are the 2018 and 2018–2020 DRC outbreaks). The 2014 outbreak was unusual due to a relatively slow response by authorities and is by far the largest such recorded outbreak in history (Moon et al., 2015; Siedner & Kraemer, 2014).

As a thought experiment, Figure 6b shows the Metabiota mortality data from the 75 outbreaks since 1963 with Ebola virus outbreaks removed. A relative increase in mortality is seen from 1997 to 2003 period (SARS1, Marburg, and Nipah virus outbreaks, all below 1000 deaths), and little since. The exponential increase in mortality in Figure 5b (and see Figure 6a) was thus an artifact of two unusually bad Ebola virus outbreaks, and zoonotic spillover burden is shown to decline in terms of mortality. This finding is not isolated but reflected in widely cited analyses by Smith et al. (2014) while general reductions in outbreak frequency are seen in the larger GIDEON database by Morand and Walther (2023) and Stephens et al. (2021), and have been noted earlier by Jones et al. (2008) in a broader compilation of outbreaks extending beyond zoonotic spillovers.

Spillover of pathogens from animals to humans occurs and causes outbreaks of disease. What is less reliable from the Metabiota data used as a basis for conclusions of the G20 HLIP report is that there is an increased frequency of zoonosis and/or that the increase in reporting cannot be fully or partly explained by advancements in detection technologies. Confirming the former would require further research that could control for this latter variable, but a recent reduction in events in the GIDEON database strongly suggests that the HLIP report's conclusions of an exponential increase, based on very limited data, are incorrect.

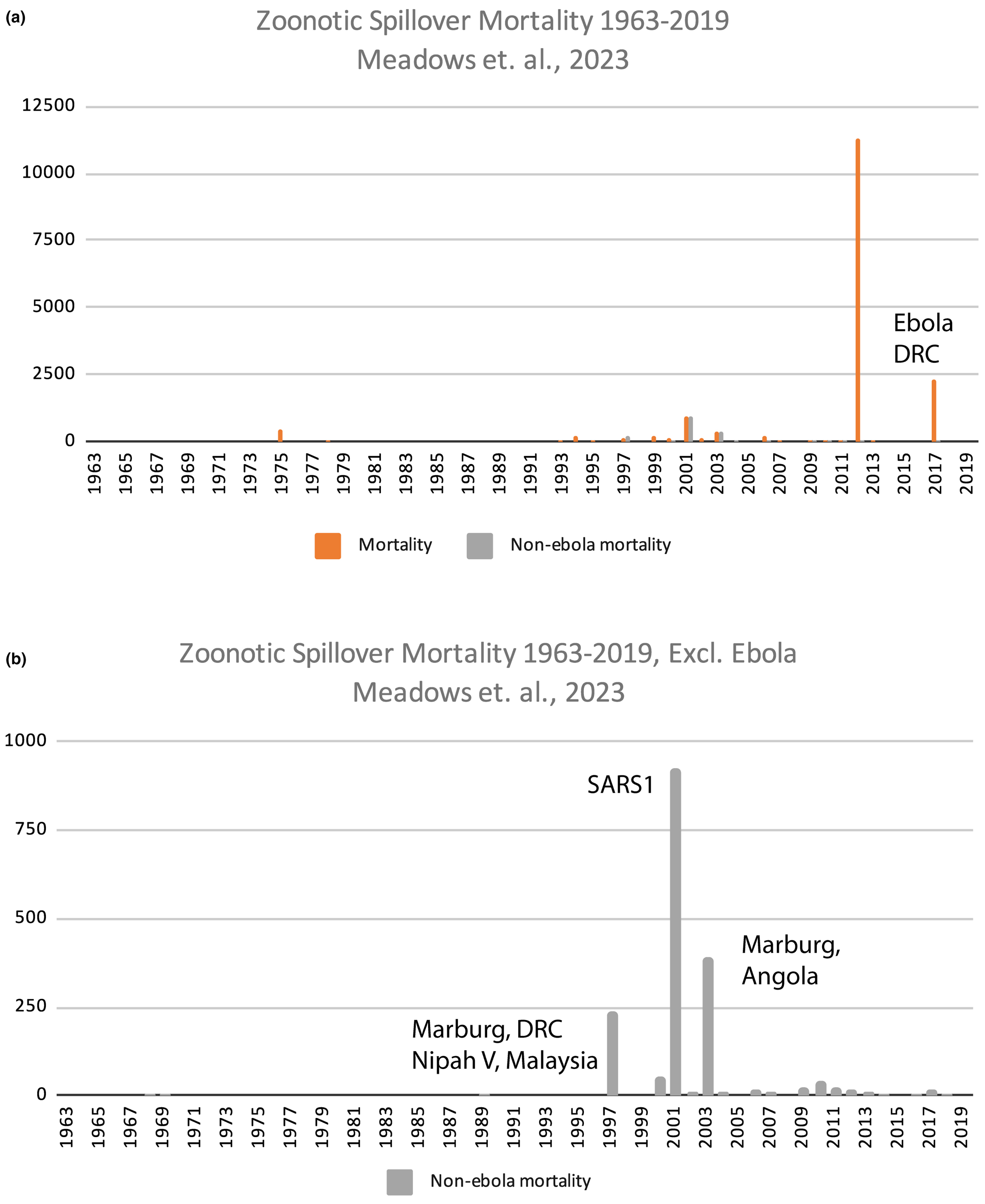



**FIGURE 6** Meadows et al. (2023) data recharted, (a) including Ebola outbreaks and (b) excluding Ebola outbreaks (note change in Y-axis intervals).

As with the low mortality of most "major outbreaks" in Annex D of the HLIP report, the reanalysis of Meadows et al. also illustrates the very low overall burden of mortality resulting from such events. In terms of annualized mortality over the 1963 to 2019 period, the 75 outbreaks of Meadows et al. produce an average of just 302 deaths per year in total, 34 if Ebola is excluded, and 17 if SARS1 is also excluded. As noted above, tuberculosis alone kills 3500 people daily (WHO, 2023a).

## 4.3 | The HLIP report and COVID-19

COVID-19 has, of course, intervened, continuing through the publication of the HLIP report, with mortality occurring predominantly in the elderly and those with significant co-morbidities in higher-mortality high-income countries (CDC, 2020b; Makhoul et al., 2022). Excess mortality rose over baseline, but separating COVID-19 mortality from mortality resulting from the "lockdown" measures reduced disease screening and management in high-income countries, and diverting resources from poverty-related diseases in low-income countries makes actual burden estimates difficult.

However, if COVID-19 is assumed as a natural event, then it should obviously be included when determining risk. There are meaningful debates about the accuracy of how deaths were recorded and attributed to COVID-19 (DNI, n.d.; Looi, 2023). However, assuming WHO is correct in its estimates, there have been just over 7 million deaths attributed to (or associated with) the SARS-CoV-2 virus over 4 years, with most in the first 2 years (WHO, 2024e). With an average mortality of 1.7 million per year over 4 years, COVID-19 is not greatly different from tuberculosis (1.3 million) but is concentrated in a considerably older age group (WHO, 2023a). Tuberculosis, however, continues before and will continue after COVID-19, whereas the COVID-19 outbreak has rapidly waned (WHO, 2024e). As the first event in 100 years of this magnitude, it appears to be an outlier rather than evidence of a trend (WHO, 2019b).

The evidence presented for the G20 in the HLIP report provides poor support for claims of high and increasing outbreak burden. The basis of the G20 recommendation that "without greatly strengthened proactive strategies, global health threats will emerge more often, spread more rapidly, take more lives, disrupt more livelihoods, and impact the world more greatly than before" is not supported. It is inevitable that reporting of outbreaks has been influenced by changes in both the capacity and incentive to report.

## 4.4 | The World Bank report: "putting pandemics behind us"

The World Bank Report "Putting Pandemics Behind Us" (World Bank, 2022b) (updated 2023) and its accompanying technical report "Increasing investments in One Health to reduce risks of emerging infectious diseases at the source" (World Bank, 2022c) proposed a further \$10.3 billion to \$11.5 billion to be spent on One Health interventions to mitigate the threat of outbreaks and pandemics of zoonotic origin, intended to be additional to the \$31.1 billion for PPPR proposed by WHO and World Bank. The report discusses evidence for pandemic risk, reasons for emergence, and financial implications.

The report states in the first paragraph of the introduction that:

> The burden of infectious diseases continues to grow, and humanity faces more outbreaks, some with the potential to become pandemics.
>
> (World Bank, 2022b, p. 4)

The report further notes that:

> Every year, zoonoses cause more than a billion human infections and a million deaths.
>
> (World Bank, 2022b, p. 3)

The claim of a million deaths is not detailed, but the introduction later mentions HIV/AIDS and COVID-19 as zoonotic outbreaks, which would explain this conclusion. HIV/AIDS arose over decades prior to being recognized in a very different environment from today (Sharp & Hahn, 2011). This changing environment in terms of ability to detect and report is not dealt with. Both reports go on to reference specific papers that rely on the Global Infectious Disease and Epidemiology Network (GIDEON) dataset of outbreaks (Gideon, 2024) to justify the narrative of increasing outbreak risk while concentrating on a claimed exponentially increasing risk of zoonotic outbreaks as a basis for further investment.

The Technical Report bases its claim of this increasing frequency on research by Morand (2020), stating: "The pace of EIDs [Emerging Infectious Diseases] 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" (World Bank, 2022b, p. 17). Morand (2020) presents a more nuanced picture, showing that reported outbreak frequency increases from 1960 to several hundred per year, peaking around 2009, then decreases after 2010. An analysis by Morand and Walther (2023) of the GIDEON dataset, in a paper cited for other reasons in the World Bank report, shows outbreak frequency further declining and *disease frequency* in 2018 returning to 1960 levels (Morand & Walther, 2023).

The World Bank continues:

> …and the yearly probability of an occurrence of large outbreaks could increase up to threefold in the coming decades.
>
> (Marani et al., 2021)

Marani et al. (2021) note that a three times increase in outbreak frequency is a modeling result. It does not allow for increased detection and identification due to developing technological capacity.

Two studies are cited in Marani et al. (2021) as supporting this finding; Jones et al. (2008) and Daszak et al. (2001). These studies do not cover the past two

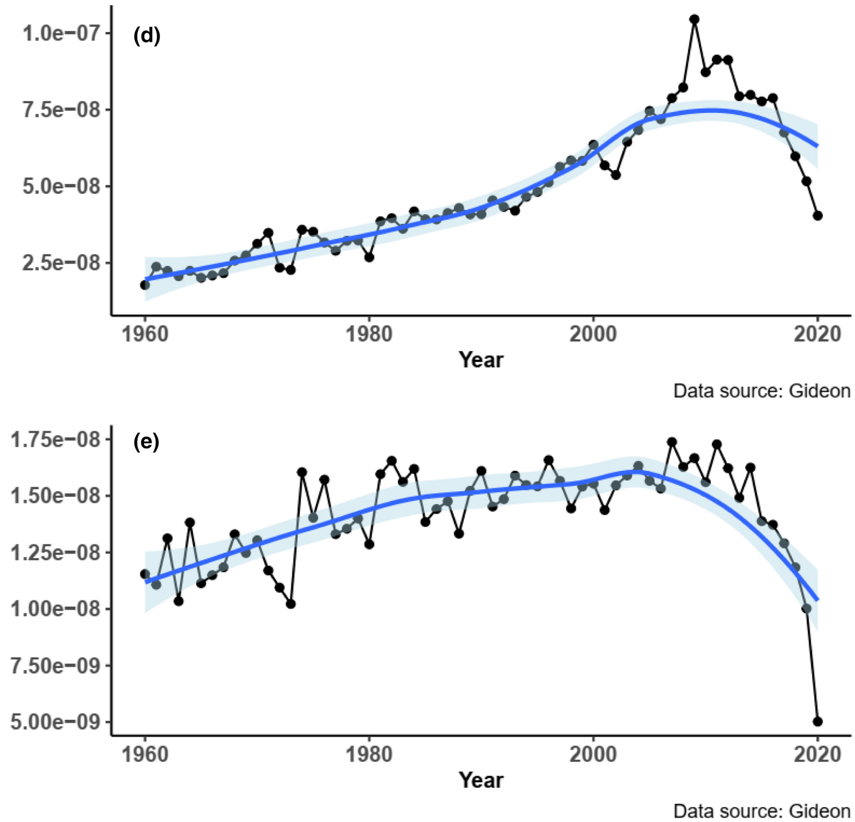



**FIGURE 7** (d) Annual total outbreak number per capita. (e) Annual total disease number per capita. GIDEON database analyzed in Morand and Walther, 2020 (version 2023). https://www.biorxiv.org/content/10.1101/2020.04.20.049866v2.

decades when the GIDEON dataset records reducing outbreak frequency, and so do not lend direct support for this assumption. The actual conclusions of Marani et al. (2021), while still not allowing for the advent of antibiotics, detection, and reporting changes, predict that a Spanish flu-like event would recur once every 292 to 877 years, while a COVID-19-like event would recur every 129 years. The lower value for the Spanish Flu-like illness assumes a threefold increase continuing since 2000 (contrary to GIDEON data).

The accompanying Technical Report (World Bank, 2022) makes similar claims and bases these predominantly on references using the same GIDEON dataset:

> Since 1980, the number of outbreaks per year has been steadily increasing (Figure 1a). Between 1980 and 2012, the number of outbreaks increased at an average of 6.7 percent per year.
>
> (World Bank, 2022: 5)

The figure concerned is taken from Smith et al. (2014), which does indeed show an increase in recorded outbreaks from 1960 to 2010, then reducing to 2014 at the end of the analysis period. Analyses of the same data extending to later dates, Morand and Walther (2023) and Stephens et al. (2021), are cited in the report for other reasons. Yet, both show a reduction in outbreak frequency, for all outbreaks and for outbreaks killing over 10 people, continuing to reduce rapidly to 2020 (see Figure 7) and 2017, respectively. The implications for PPPR evidence-based policy making is that the World Bank clearly could have made use of this later analysis, which would have led to a modification of their policy recommendations.

The World Bank's main and technical reports, therefore, provide very poor evidence of rapidly increasing outbreak risk from naturally occurring, zoonotic spillover outbreaks. Studies quoted within the paper appear to contradict the World Bank's findings, rather indicating that risk has probably reduced in the last one to two decades, and that risk of a COVID-19-like event may be less than once per century. At a minimum, these findings call into question their argument for "urgent" and large increases in annual spending to reduce pandemic risk and suggest that further analysis of risk and burden is required, while also being weighed against competing health priorities.

## 5 | WHERE TO GO FROM HERE?

The basis of the urgency for PPPR promoted by WHO, the World Bank, and the G20 is summed in a statement within WHO's *Managing Epidemics* report:

> Epidemics and pandemics of infectious diseases are occurring more often, and spreading faster and further than ever, in many different regions of the world.
>
> (WHO Epidemic and Pandemic Preparedness and Prevention (EPP), 2023b, p. XV)

Analyses of the databases and citations on which this statement relies indicate that the evidence supporting it is extremely weak. In this context, the publications and claims of these agencies are disappointing in terms of scholarship and balance. They raise concern that a desire to address a perceived threat is driving messaging, rather than the actual urgency and extent of threat. Although well intentioned, this is unlikely to address public health needs or those of the populations they serve. Disease outbreaks do harm people and shorten lives and must be addressed. The role of WHO, and other health agencies, is to ensure this is undertaken based on well-compiled evidence and scholarly analysis.

There is a clear increase in reported outbreaks from the 1960s up to the decade 2000 to 2010, which is temporally associated with the development and expanding use of modern diagnostic technologies, and the communications infrastructure necessary to transmit and record their results. This period has also seen a marked increase in the global population and an increase in interest and funding in infectious disease.

Analyses of the GIDEON database and other papers cited by WHO and partner agencies indicate a reduction in the frequency of natural outbreaks arising from zoonoses—the mode of emergence forming the main area of concern in the reports examined here—over the past one to two decades. This is at odds with claims by the WHO, G20, and World Bank of an increasing, and indeed accelerating, risk. A wide range of factors can influence the frequency of outbreaks, including poverty and economic health, human travel, and environmental and climatic changes. Yet, these interactions are complex, and institutions such as the World Bank have a history of handling predictions with inappropriate simplicity (Allen et al., 2017; Jones et al., 2008; Morand, 2020; Morand & Lajaunie, 2021).

Pandemics occur and will continue to do so. Over the past century, they have produced relatively low health burdens compared to endemic infectious and non-communicable diseases. Since the Spanish flu and devastating outbreaks of smallpox and measles over a century ago, modern antibiotics have been developed and overall living standards and sanitation have improved (Shaw-Taylor, 2020). Due to travel and the passage of time, large populations immunologically naive to viruses common elsewhere no longer exist. This should strongly mitigate against the recurrence of such outbreaks.

Nonetheless, the current narratives promoted by the WHO, World Bank, and G20 suggest that there is an "existential threat" to humanity that justifies the deployment of disproportionally high resources and political capital to PPPR. According to their own estimates, this investment requires $31.1 billion a year in new funds, $10.5 of which is in the form of new ODA with $26.4 required from already stretched LMIC budgets (this excludes $10.3 to $11.5 billion a year estimated by the World Bank for One Health as discussed above). In terms of ODA, this represents a major opportunity cost when measured against what is spent on known endemic diseases of higher burden such as malaria and tuberculosis. For example, in 2021, malaria received $3.5 billion of a target of US$7.3 billion with a trend of decreasing ODA investment from 2019 (WHO, 2022c), while global funding for tuberculosis was $921 million in 2020, constituting 3.2% of overall ODA for health (WHO, 2022d). In relative terms, the recommended $10.5 billion for pandemic preparedness would consume over a third of the entire 2020 ODA amount spent on global health and population programs, which came to just over US$29 billion (WHO, 2022d).

Investments in the range of $10.5 billion in ODA also threaten to exacerbate current trends of "donor fatigue" and misaligned global financing (Brown, Tacheva, et al., 2023; Brown, Rhodes, et al., 2023). This trend in shifting priorities toward PPPR is already present in global health financing. Although COVID-19-era ODA budgets saw an increase since 2019 in overall dispersals for health, 63.9% of that increase was for the COVID-19 response with another $1 billion disbursed for infectious disease control. Contemporaneously, ODA for basic healthcare fell from $3.4 billion in 2019 to $2.3 billion in 2020, a drop of 34.5%, while nutrition declined by 10.1%. Although ODA for basic health rose again in 2022, it has not recovered to 2019 funding levels, while ODA for COVID-19 and infectious disease control saw additional increases of $1 billion and $500 million, respectively, in 2022 (OECD, 2023). Lastly, there is evidence indicating that national budgets are reallocating existing resources to PPPR, resulting in increased vulnerabilities for universal health coverage (UHC) and threatening to reverse positive health outcomes in other programs (Brown, Tacheva, et al., 2023; Brown, Rhodes, et al., 2023). This intimates that large PPPR investments will compete with already existing health commitments such as UHC, while targeting needed resources to pathogen-specific vertical interventions creating siloed health system effects.

Given these concerns, there is a clear need to commission better analysis of the scale and urgency of pandemic risk to determine an appropriate level of PPPR investment and response. Such analysis must sufficiently account for recent advancements in diagnostic capacity, information sharing, and improving disease control mechanisms. Inappropriate resource diversion risks disproportionately harming populations with other high disease burdens, increasing inequity and poor health outcomes. It is therefore prudent to slow the current PPPR process and provide sufficient time for reflection.

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## CONFLICT OF INTEREST STATEMENT

Funding support for this research has been provided by Brownstone Institute, USA. The authors declare no known conflicts of interest.

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