With the year 2020 having been dominated by the Covid-19 pandemic, one might expect there to be a voluminous research record on new or re-emerging viruses that can infect humans. There is not. There were just 7 471 publications on this topic in 2019, 35% of which were produced by scientists in the USA alone (Figure 2.1). Global output on this broad topic progressed by just 2% per year between 2011 and 2019, slower than global scientific publications overall: 3.8% per year.

Growth was much faster in individual countries which had to marshal science to cope with other viral outbreaks over this period (Figure 2.1). The 2014–2015 Ebola outbreak in Liberia and neighbouring Guinea and Sierra Leone stamped its mark on these countries' scientific output, as did repeated Ebola outbreaks in the Democratic Republic of Congo. For instance, Liberia's publications on new or re-emerging viruses that can infect humans quadrupled from 33 (2012–2015) to 133 (2016–2019), an intensity 144 times the global average (see chapter 18). Liberia, Sierra Leone and Guinea all had the strongest specialization in the world on emerging viruses over the 2011–2019 period. Much of this output involved international collaboration, which accounted for 70% of scientific publications in low-income countries.

USA, Brazil and France have the highest specialization

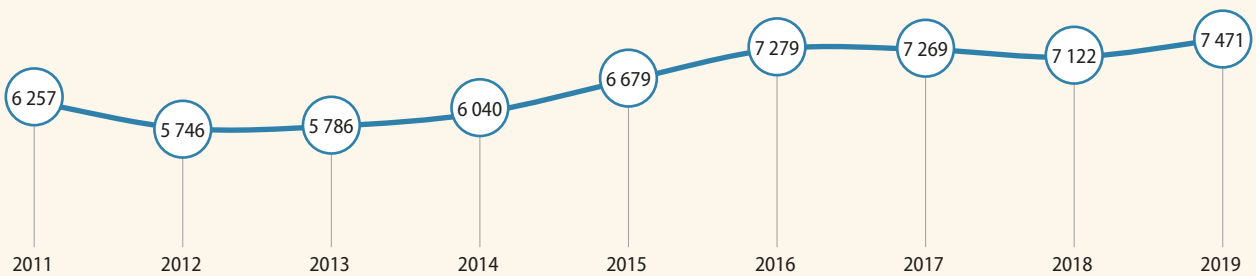
Among the top 10 countries for the volume of output on new or re-emerging viruses that can infect humans, the strongest specialization was found in the USA, Brazil and France. In January 2021, the French government announced the launch of the world's first research institution specializing in this field (see essay, p. 9).

Those countries which showed the fastest growth rates were Brazil and India (Figure 2.1). Brazilian output on viral research surged from 643 (2012–2015) to 1 605 (2016–2019) publications, 1.4 times the global average intensity. It was able to draw on its existing specialization in tropical communicable diseases (four times the global average intensity) in tackling the Zika outbreak in Brazil between 2015 and 2018, which also affected Colombia and the USA, among other countries.

The strong growth in research on this topic in low- and middle-income countries shows the value of

Figure 2.1: **Scientific publications on new or re-emerging viruses that can infect humans**

Global trend in volume of publications on new or re-emerging viruses that can infect humans, 2011–2019



Top 10 countries for volume of scientific publications on new or re-emerging viruses that can infect humans, 2011–2019

	Volume 2011–2019	Growth rate 2012–2019	Specialization index 2011–2019	World share (%) 2011–2019
USA	20 965	1.24	1.46	35.1
China	7 776	1.23	0.59	13.0
UK	4 807	1.28	1.08	8.1
France	3 813	1.24	1.30	6.4
Germany	3 796	1.24	0.88	6.4
Japan	3 635	0.92	1.05	6.1
Canada	2 614	1.15	1.06	4.4
Australia	2 454	1.13	1.22	4.1
Brazil	2 381	2.50	1.37	4.0
India	2 210	1.35	0.66	3.7

international scientific collaboration in tackling pandemics (Figure 2.5). This high level of scientific collaboration augurs well for the fight against Covid-19.

Prevention is better than a cure

The current focus in tackling new or re-emerging viruses tends to be reactive, rather than proactive. A workshop report published in October 2020 by the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES), which is co-sponsored by UNESCO and three other United Nations agencies,* observes that the majority (70%) of emerging diseases such as Ebola and Zika and almost all known pandemics (e.g. influenza, HIV/AIDS and Covid-19), are zoonoses, meaning that they are caused by microbes of animal origin. These microbes 'spill over' when humans, wildlife and livestock come into contact with one another, such as through agricultural expansion, deforestation or wildlife trade.

The IPBES report estimates that there are another 1.7 million currently 'undiscovered' viruses in mammals and birds, up to half of which could have the ability to infect people. It predicts that future pandemics will emerge more often, spread more rapidly, do more damage to the global economy and kill more people than Covid-19, unless there is a transformative change in the global approach to dealing with infectious diseases.

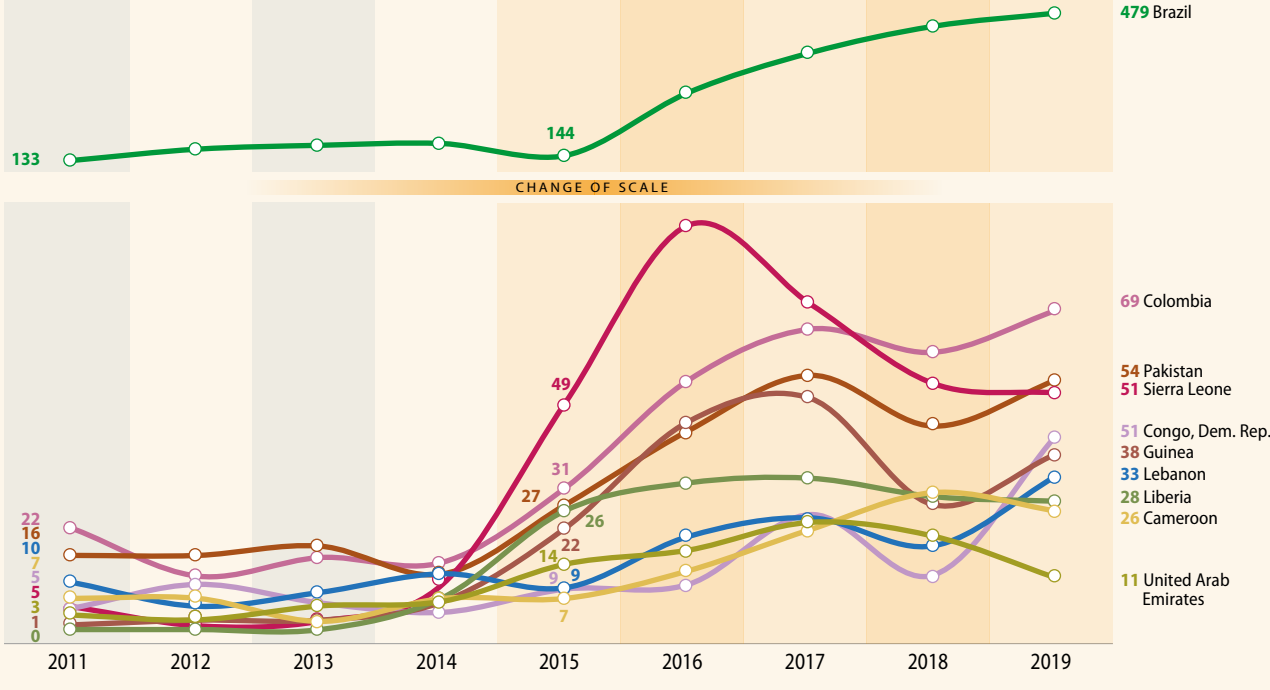
For Dr Peter Daszak, President of the EcoHealth Alliance and IPBES workshop chair, 'we still rely on attempts to contain and control diseases after they emerge, through vaccines and therapeutics. We can escape the era of pandemics but this requires a much greater focus on prevention, in addition to reaction.'

As the report recalls, the risk of a pandemic can be significantly lowered by reducing the human activities that drive the loss of biodiversity, such as agricultural expansion and intensification, the unsustainable exploitation of biodiversity-rich regions and unsustainable production and consumption patterns.

Source: compiled by Susan Schneegans and Tiffany Straza; IPBES (2020) Workshop Report on Biodiversity and Pandemics, October, see: https://ipbes.net/sites/default/files/2020-12/IPBES%20Workshop%20on%20Biodiversity%20and%20Pandemics%20Report_0.pdf

*United Nations Development Programme, United Nations Environment Programme and United Nations' Food and Agricultural Organization

Top 10 countries for growth in scientific publishing on new or re-emerging viruses, 2011–2019
For countries with at least 100 publications



Note: These data exclude HIV, the subject of a separate research topic, and SARS-CoV-2 (Covid-19) which was unknown in 2019. The growth rate is calculated as the number of publications from 2016–2019 divided by the number of publications from 2012–2015. The degree of specialization is calculated by assessing the number of publications produced by a given country over the 2011–2019 period as a proportion of that country's total scientific output. This level of specialization is then compared with the global average to give the specialization index. For details, see Annex 4.

Source: Scopus (Elsevier), including Arts, Humanities and Social Sciences; data treatment by Science-Metrix