

THE WORLD IN 2030 Migrating Diseases





Migrating Diseases

With 2°C of global warming probable and 4°C possible, health systems struggle to address the growing impact of climate change. The increased spread of vector-borne diseases joins poor air quality as a major public health threat.

Additional deaths a year from climate change (2030 to 2050)¹ **250,000** Extra people exposed to disease-carrying mosquitoes by 2100² **1bn** Although smoke from wildfires in Australia, California and Siberia have now joined industrial smog in many major cities to amplify air pollution as an escalating public health issue, recent discussions have suggested that the spread of vector-borne diseases may be a more insidious threat. The implications of this are only just beginning to resonate in some quarters. This will mean new challenges for national health systems and a pressing need for a global, coordinated response.

A child born today may experience a world that is more than four degrees warmer than the preindustrial average. This will impact their health, directly because they will have to live with extreme weather conditions - and indirectly via environmental and ecosystem changes. The distribution of exposure and effect that this will have will not be equal; often people will see greater impact in lowincome settings but over time the impacts will permeate across both geography and demography. Even if the most ambitious climate mitigation initiatives take effect, over the next decade health systems around the world will be placed under increasing pressure as adaption to climate change becomes essential. This will shift the perception of global warming from being a largely environmental concern to also be an imminent public health danger.



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Extending Reach

In 2019 we heard experts in a London workshop anticipate "an extension of the reach and duration of tropical disease alongside the re-emergence of old infections." Certainly, warmer conditions and changes in precipitation are facilitating the expansion of disease-carrying vectors, such as mosquitoes and ticks. With more frequent flooding, they are also increasing the risk of waterborne diseases, such as diarrhoea, in part by causing an increase in fly populations.

As this continues, the reach of a growing number of virus is expanding northwards and is likely to raise the risk of more disease, even pandemics, and so affect public health in all regions. Because of the increasing density of many urban populations, the incidence of major outbreaks in cities is expected to become an escalating focus - with those living in over-crowded areas considered particularly vulnerable.

The IPCC agrees. Even with its most optimistic scenario of 1.5°C of global warming it states that "there is strong evidence that changing weather patterns associated with climate change are shifting the geographic range, seasonality, and intensity of transmission of climate-sensitive infectious diseases."³ Rising mean temperatures, increased migration and inadequate healthcare provision

means that vector-borne diseases such as malaria, yellow fever and dengue are already extending their reach. In the next decade major areas of Europe, China, Russia and North America could also become suitable habitats for disease-carrying mosquitoes. Globally as many as a billion people could be newly exposed to these mosquitoes by the end of the century.⁴ The World Bank estimates that, by 2030, 3.6 billion will be at risk from malaria.⁵ Tick-borne diseases such as Lyme disease are also expanding in range.

While the migration of disease may not be new news for some – the WHO were making predictions 17 years ago – as impact grows, concern about vector borne disease will increasingly be part of the mainstream global healthcare narrative.

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The Emerging Challenge

Some, such as the UK Met Office, judge that under a 4°C scenario of global warming we will see an accelerating migration up to a billion people over the next fifty years.⁶ This is a challenge the like of which the world has never seen. From Jakarta to Manhattan urban planners are considering worst case scenarios: those most at-risk from flooding may even enact plans for relocation. More generally we can expect an escalation with over-crowded, under-resourced megacities acting as "hotbeds of contagion".⁷ International bodies are increasingly concerned by the potential impact of fast-developing pandemics and epidemics – with virus diseases such as Ebola very much top of mind.⁸

In addition, other government organisations such as the CDC in the US are also highlighting other ways in which contagion can occur.⁹ Take the increased incidence of measles. In part this is due to the arrival of infected travellers, but another factor is the rise of those who decide not to vaccinate their children.¹⁰ Currently almost all US states allow parents to exempt their children from jabs by, for example, declaring a religious objection. But as long as parents' choice is put before public health recommendations, stopping measles from spreading in America will be a laborious, costly task. Globally, although measles and rubella are targeted for elimination in five WHO Regions by 2020, more than 140,000 people still died from measles in 2018 – a rise of 50,000 from 2016.¹¹ The spread of 'new' diseases can also be seen in multiple locations. These may be well understood in the regions where they have been traditionally present but, as they migrate, they are reaching countries and cities with little previous experience of treating them. For example, yellow fever is moving fast from the Amazon into Brazil's major cities; Zika has extended its reach across Latin America; and the incidence of Lyme disease is notably rising in Canada and Northern Europe.¹² However, while these all present significant local challenges, globally, it is malaria and dengue fever which are of particular future concern.

Malaria

Malaria currently kills over 400,000 people every year – mainly children under 5 years old. Since 2000 infections have fallen by more than a third with a 60% reduction in the death rate.¹³ The WHO Global Malaria Programme aims to further reduce malaria incidence and mortality by 90% by 2030, eliminate it in at least 35 countries and prevent its resurgence in all that are malaria free.¹⁴ But public health executives are increasingly concerned that these targets will not be reached.

The growing spread of disease-carrying mosquitoes and the emergence of malaria-resistant strains are coinciding with an overall reduction in anti-malaria spending. Progress in the fight against malaria has stalled in several locations and is set to reverse in others. 2°C of global warming adds around half a billion people to the at-risk population with the World Bank anticipating a 50% higher probability of malaria transmission in many previously unexposed regions by 2050.¹⁵



Dengue Fever

Alongside malaria several experts are also highlighting the rapid spread of dengue fever via infected mosquitoes across ill-prepared regions. Over the last 40 years dengue has expanded from localised areas in SE Asia into India, China, Australia, much of Africa, Latin America, North America and southern Europe. Health systems struggled to cope and there is a major problem around awareness and diagnosis.

Dengue is a disease of urbanisation: it breeds in the water that gathers in the plastic, rubber and metal containers that litter the places where people live. Although dengue cannot be spread directly from person to person, an individual infected and suffering from dengue fever can pass it to other mosquitoes. As such, humans can carry the infection from one area to another during the stage when the virus circulates and reproduces in the blood system. Its' early symptoms resemble flu and so is therefore difficult to diagnose, particularly in areas where it is a 'new' condition. It can cause fatal internal and external bleeding. "With its complex epidemiology, many healthcare practitioners are not trained to identify the disease and so critical days are being lost in potential treatment."¹⁶ Some have even modelled that, on current levels of warming, the fastest spreading mosquito-borne disease in the world could have reached over 200 countries by 2050.¹⁷ In a world of many competing health interests, policy makers are now calling for significantly improved surveillance and better diagnosis.

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Old Diseases

Climate change has also led to fears about the potential risk from viruses, such as smallpox or the bubonic plague, that are currently 'trapped' in Arctic ice.¹⁸ As the ice melts so these and other diseases will potentially be released again. It sounds melodramatic but in 2016, when the permafrost

began to retreat in Siberia, a number of people were infected by the anthrax virus which had been lying dormant in the frozen body of an infected reindeer.¹⁹ This is not only a risk to humans - over 2000 reindeer became infected and died within weeks.

Potential Options

What is becoming increasingly evident is that shifts such as greater urbanisation, increased internal migration, the rise in long-haul tourism and a huge growth in refugee populations globally will all increase the risk of greater animal-to-animal, animalto-human and human-to-human transfer of disease. At a time when international mobility is growing globally but also coming under greater public and political scrutiny, debates about health and security will gradually become integrated with the migration debate. However, diseases don't recognise national borders and the dynamics of the modern world is dependent on the movement of people, animals and foodstuffs. Given this what are the options available to help mitigate the impact of vector-borne disease?



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Beyond Quarantine

While originally focused on specific infections with epidemic potential such as plague, cholera, and yellow fever, guarantine has become the cornerstone of organised, coordinated attempts to deal with globalisation and disease control. For some, and largely island, nations, such as Australia, New Zealand and Singapore, guarantine and screening people at entry is feasible, but for the majority of countries with extensive, porous land borders it isn't practical. There are many borders across Asia, Africa, South America and Europe where people can cross largely undetected. Although some nations such as Thailand have had success in developing health schemes for migrants which allows them to access treatment even if they are not in the country legally, few others have followed suit.

If quarantine is less practical, increasingly integrated, multi-partner activities are needed to tackle the future pressures of migration and international disease control. As national borders become less-effective barriers to the spread of infectious diseases, a more collaborative public health response will assume greater international importance. New solutions will expand beyond national perspectives and risks will be addressed with coordinated cross-border responses.



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Improved Surveillance

Medical screening is progressively being supplanted by investments in global infectious disease surveillance and emergency preparedness. Activities which were scaled-up post SARS due to threats such as avian influenza adapting to human hosts or a globally significant pandemic will be extended to monitor for dengue and other fevers that are proliferating. More and better bio-surveillance, improved diagnostics, more sophisticated disease modelling, increased data sharing between national health systems and international agencies and faster responses like those applied with Ebola and Zika are all proposed as part of the solution. In addition, as was argued in one US discussion, at an industry level we will see *"a growth in the demand for new and more effective vaccines."* The development of improved vaccines across at-risk populations is top of the agenda for several key pharmaceutical companies: intergovernmental support for more dengue vaccine research is building.²⁰

Leading in 2030

Taking into account only a subset of the possible health impacts, and assuming continued economic growth and health progress, the current WHO consideration is that climate change will cause approximately 250,000 additional deaths per year between 2030 and 2050 of which infections disease will account for a significant share.²¹

To mitigate the long-term impact of this many are calling for a greater public action, the rapid introduction of decarbonisation technologies, faster adoption of carbon neutral targets and even geoengineering projects to try to reduce net warming. These may be too little, too late.

As political boundaries are increasingly less effective components of control programs, within healthcare systems the more immediate actions on the radar include more cross-border collaboration and improved surveillance, to better modelling and new vaccines. In London it was suggested that across all areas perhaps the biggest need is for "proactive action by government." In Singapore a pan-Asian addition was that "foremost more healthcare policy makers across nations will need to align around focused preventative measures including better understanding and education." This encompasses three pivotal and integrated elements.

- Major, accessible and high-impact communication programmes to increase public awareness of the growing threats;
- 2. Better understanding across policy making of the global interconnections and accelerators of migrating disease; and
- Enhanced education and training of healthcare professionals on the symptoms of new and old diseases to enable faster, lifesaving, diagnosis.



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The World in 2030

This is one of 50 global foresights from Future Agenda's World in 2030 Open Foresight programme, an initiative which gains and shares views on some of the major issues facing society over the next decade. It is based on multiple expert discussions across all continents and covers a wide range of topics. We do not presume to cover every change that will take place over the next decade however we hope to have identified the key areas of significance. Each foresight provides a comprehensive 10-year view drawn from in-depth expert discussions. All foresights are on https:// www.futureagenda.org/the-world-in-2030/

Previous Global Programmes

The World in 2020 was published in 2010 and based on conversations from 50 workshops with experts from 1500 organisations undertaken in 25 countries as part of the first Future Agenda Open Foresight programme. This ground-breaking project has proven to be highly accurate in anticipating future change and the results have been used by multiple companies, universities, NGOs and governments globally. Rising obesity, access not ownership, self-driving cars, drone wars, low cost solar energy, more powerful cities and growing concerns over trust were just some of the 50 foresights generated. For more details: https://www.futureagenda.org/theworld-in-2020/

Five years on, the World in 2025 programme explored 25 topics in 120 workshops hosted by 50 different organisations across 45 locations globally. Engaging the views of over 5000 informed people, the resulting foresights have again proven to be very reliable. Declining air quality, the growing impact of Africa, the changing nature of privacy, the increasing value of data and the consequence of plastics in our oceans are some of the foresights that have already grown in prominence. For more details: https://www.futureagenda.org/the-worldin-2025/

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