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Trump versus HIV

The US president's pledge to halt the HIV epidemic in the United States will require a major shift in policy and rhetoric.

For the past two years, HIV advocacy groups have had little to like about US President Donald Trump's administration. Trump has worked to reduce access to health-care programmes, threatened to cut funding to the President's Plan for Emergency AIDS Relief (PEPFAR), and stigmatized some communities at high risk. So it is little surprise that his 5 February pledge to end the HIV epidemic in the United States by 2030 has been met with some scepticism.

The effort is of course welcome and sorely needed: more than 1 million people in the United States have HIV, and 14% of them don't know they are infected. And it's reassuring to see that the programme is being headed by established leaders in the HIV field, including immunologist Anthony Fauci, director of the US National Institute of Allergy and Infectious Diseases (NIAID), and virologist Robert Redfield, director of the US Centers for Disease Control and Prevention (CDC).

Their approach is sound. It draws inspiration from global strategies to tackle the epidemic, such as the 90-90-90 programme of the Joint United Nations Programme on HIV/AIDS, which aims to reduce HIV infections through evidence-based action. Plans for the US programme include ramping up testing of people at high risk of HIV infection, offering them prophylactic drugs and immediately starting those who test positive on antiretroviral treatments.

It's also encouraging that Fauci has said NIAID will fund studies to look at the best way to reach people at risk. The programme leaders are well aware of lessons from clinical trials in southern Africa showing that people need to feel not only that they have access to affordable HIV drugs, but also that health-care providers won't stigmatize or criminalize them. "Stigma is the enemy of public health," Redfield said in a press briefing on the programme last week.

And that is precisely where the project could run into trouble: Trump's statements and policies have deeply undermined trust, and made health care harder to access, for those in some communities that are at highest risk of contracting HIV, including some people of colour, drug users, men who have sex with men, transgender people and those in poorer communities. Immigration crackdowns have left undocumented immigrants afraid to visit health clinics. The administration has opposed supervised injection sites, where drug users get clean needles to help them avoid contracting HIV and other infections. Last year, the US Department of Health and Human Services proposed a rule that would let health-care providers deny care on the basis of their moral or religious beliefs. Such a rule would mean that gay and transgender people could be turned away by some health clinics. Meanwhile, some US policies abroad undermine public and reproductive health, weakening international efforts to prevent and treat HIV.

Eradicating HIV transmission in the United States is an achievable goal, and an opportunity for the country to lead in public health. That it is even possible shows how far HIV research and prevention have advanced in recent years. But delivering on it will require a major change in attitude and policies towards the people most affected by the disease. ■

Hybrid vigour

Crossing deep learning with physical modelling could shed light on climate and ocean systems.

Barely a day goes by without a promise that artificial intelligence (AI) will revolutionize yet another aspect of life. Research fields ranging from speech recognition to biological imaging are embracing and benefiting from techniques such as deep learning.

But for some fields, integrating AI is not straightforward. The study of Earth — and its climate, oceans and biogeochemistry — is one of them. The amount of geospatial data available on these systems has exploded, with remote sensors above Earth and below the seas generating terabytes of data. But it's a challenge for even the most advanced AI to make sense of systems that are so highly complex and — with weather being a prime example — change rapidly with space and time. Although supremely capable of training on data, AI approaches are less adept at simulating or predicting changes that occur across great distances or time spans — such as novel climates associated with a warming world.

One way to crack this problem, according to the authors of a Perspective on page 195 of this issue, is through a hybrid approach. The latest techniques in deep learning should be accompanied by a hand-in-glove pursuit of conventional physical modelling to help to overcome otherwise intractable problems such as simulating the particle-formation processes that govern cloud convection. The hybrid approach makes the most of well-understood physical principles such as fluid dynamics, incorporating deep learning where physical processes cannot yet be adequately resolved.

So far, the Earth-systems community has, justifiably, not abandoned physics for machine-, deep- or hybrid-learning. For example, ExtremeEarth is a proposal for a massive research project by the European Commission to directly simulate the physical processes underlying phenomena such as the control of cloud dynamics. It might sound simple, but would require an investment on the scale of the commission's Graphene Flagship project, which has a budget of €1 billion (US$1.1 billion). Despite the cost, efforts such as ExtremeEarth have great appeal for their bold initiative to simulate the physics of climate and weather. But for others on a tighter budget, the hybrid learning approach holds promise.

Like other fields before it, geoscience should consider hybrid learning, not least because its potential will be realized only by long-term and intensive scientific inquiry. AI does promise a revolution — but, at least for now, this revolution is likely to come about more rapidly if humans and machines team up. ■