Technology: the nexus of climate change and COVID-19?

We are in the midst of dual crises: COVID-19 and climate change. Both have led to a substantial loss of life, disproportionately affected vulnerable and disadvantaged individuals, and pushed some healthcare systems to the maximum. The 2020 report of The Lancet Countdown on health and climate change emphasises the need for responses to these crises to be aligned, in order to tackle them successfully. What role can technology play in helping us win these battles?

From satellite-based surveillance systems to climate models, technology has proven essential for quantifying how the environment is changing, and these innovative approaches have provided a foundation from which the effects of climate change on health can be understood and mitigated. For example, advances in sensor technology and computational modelling allow air quality to be monitored in near real time. Data can be leveraged on an individual basis through wearables (such as the personal AirSpeck), or on a large scale (such as by the London Air Quality Network), to monitor and predict levels of air pollution and act as an early warning system for those most vulnerable to high levels of pollution. Monitoring pollution is pivotal because modelling studies from the USA and other regions have shown that historically higher exposure to the air-borne pollutant PM$_{2.5}$ is positively associated with higher COVID-19 mortality rates (although the association could be confounded by individual-level risk factors such as ethnicity).

Aside from air quality, studying the influence of meteorology on the virus could help predict seasonal variation in its transmission. “Since SARS-CoV-2 has emerged only recently as a human pathogen, there is still uncertainty as to whether its transmission will vary seasonally in different parts of the world” says Associate Professor Rachel Lowe from the London School of Hygiene and Tropical Medicine. “If modelling studies reveal sufficient evidence that seasonality in COVID-19 transmission is linked to meteorological variables like temperature and humidity, weather forecasts could be used to provide early warnings of increased risk and support response strategies.”

To further mitigate the health effects of climate change, technology can help healthcare systems reduce their carbon footprint. NHS Digital set out its Sustainability Development Management Plan in 2017, aiming to become more energy efficient. The 2019–2020 update report reveals that NHS Digital is making good progress, which is potentially aided by COVID-19 necessitating reduction in travel and the use of remote offerings such as the algorithm-based triage system NHS Pathways.

Nick Watts, NHS Chief Sustainability Officer, says, “In 2020 the NHS published the Delivering a ‘Net Zero’ National Health Service report detailing the ambition to become the first Net Zero health system. The report recognises digital transformation is key to delivering low carbon models of care. Developed in close coordination with NHS Digital, the arrival of the strategy will require refreshed ambition and focus as the system moves more squarely into delivery.”

The Net Zero plan highlights the potential of artificial intelligence (AI), big data, and machine learning for developing diagnostic tools and more efficient systems. But whilst people do not often consider the environmental impact of technological innovation, AI does in fact have a big carbon footprint, and data storage and resource-intensive machine learning algorithms can generate substantial carbon emissions. These costs have ignited a movement called green AI, calling for more environmentally friendly approaches such as lower-energy hardware and encouraging researchers to use tools for tracking and calculating machine-learning energy consumption and carbon emissions and report these results in publications for full transparency. It is vital that those working in this space adopt lower carbon approaches as the number of data-driven methods and the range of digital services available continues to increase.

Clearly, technology could have a role to play in the battles against climate change and COVID-19, arming us with real-time information on environmental conditions, and revealing associations between these conditions and disease susceptibility. Technology also showcases how health-care systems can be adapted to support sustainability. However, these potential gains might be overshadowed by poor practice, unless the research community adopts more carbon-friendly and transparent approaches. Technology presents an arsenal of tools to fight these dual crises, but sustainability needs to be at the heart of each method.