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UNHEALTHIER BY DEGREES

More than 300 delegates from healthcare, the military, climate science, industry, business, and politics met at a *BMJ* conference last week to consider the risk climate change poses to human health. **Henry Nicholls** reports

Just over two decades ago, the Intergovernmental Panel on Climate Change (IPCC) published its first report. It was a groundbreaking document, notable for its impressive size. "It was about twice as thick as the average New York telephone book," recalls Tony McMichael, professor of population health at the Australian National University in Canberra. But it had at least one serious omission. "In it, one found just a few paragraphs on the issues of human health," he says.

This is puzzling in the extreme. Somehow the real impact that climate change will have on humans—for many of us within our lifetimes—has passed us by. This has got to change, says Professor McMichael, who had a key role in beefing up this section in subsequent IPCC reports. "This is not just an issue of collateral damage." The consequences of climate change for human health and survival are absolutely fundamental, he says.

Professor McMichael was talking last week at a special event in London, hosted by the *BMJ*, to consider the health and security perspectives of climate change.

Rapid industrialisation, torching of fossil fuels, and extraordinary population growth might have placed natural systems under untold stress, delegates heard. But it's climate change that is the real game changer. With global warming, we will have to confront collapsing food production, water shortages, famine, and mass migration. Violence and conflict are almost inevitable.

Health

Global warming is likely to have a deep and mostly negative effect on human health. Increasing temperature can have a direct effect, as was shown by the heatwave that engulfed Europe in 2003. In France, which was worst affected, this event is thought to have caused around 14 000 deaths, mostly among older people. Other freak climatic events, such as floods, droughts, and storms, are all going to put further stress on health systems.

Climate sensitive infectious diseases are already proving a problem. For example, increasing temperatures seem to be allowing *Oncomelania hupensis*—the intermediate host of the *Schistosoma japonicum* parasite—to spread northward across China. In one model, researchers estimate that by 2050, the range of *O hupensis* is likely to have spread a further 750 000 km^2, putting many millions more people at risk of infection.[1]

Since mosquitoes are acutely sensitive to temperature, mosquito borne diseases could also spread. Considerable debate remains about how global warming will affect vectors of malaria, but things look a little clearer for the dengue bearing *Aedes aegypti*. According to one projection, more than half the global population will be at risk of dengue by 2085—compared with around a third in a world without climate change.[2]

Beyond these direct consequences for health, of course, "there are potentially greater climate related threats to food yields and nutrition, to freshwater supplies, and to community morale, mental health, and stability," says Professor McMichael. "More ominously, climate related food shortages, hunger, epidemic outbreaks, and associated social unrest endanger health, safety, and survival via conflict and displacement."

Conflict

There is plenty of evidence to suggest we should be taking such predictions seriously, the confer-

Tony McMichael: "Climate related food shortages, hunger, epidemic outbreaks, and associated social unrest endanger health"

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MARK THOMAS

DMITRY CHISTOPRUDOV/AP/PA

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CDC

Signs of things to come: the conference heard that with global warming we will have to confront more disasters such as droughts, cyclones, and the spread of mosquito borne diseases, which will all exact a terrible toll on human life

ence heard. In 2007, for example, researchers combed through historical records to reveal a strong connection between cycles of temperature and outbreaks of war. During cooler periods, notably in the "little ice age" between AD1400 and AD1900, there seems to have been a drop in agricultural production and an almost simultaneous increase in war and famine.[3] A subsequent study of climate and conflict in Europe over the past 1000 years came up with similar findings.[4]

The most recent analysis of dozens of conflicts between 1950 and 2004 indicates that global warming may not make matters any better. It reveals that an outbreak of civil unrest is twice as likely to occur during a warm, environmentally stressful El Niño year than it is during a milder and less disruptive La Niña.[5]

"What we are doing is eating into a system that is quite vital from a planetary perspective," says Alejandro Litovsky, director of the London based Earth Security Initiative. Climate change is like a powerful steroid being injected into a system that is completely dysfunctional, and will result in "the global scramble for farmland," he says. "The strategic map of the world is going to change in completely unexpected ways."

Solutions

Tackling a problem of this scale is going to take some doing. In the future, it may become unacceptable to drive cars in the way we do. "It is completely mad to be in a city in which there are single occupants of gas-guzzling cars," says Jon Snow, journalist and presenter of *Channel 4 News*. "All private cars should be banned in central London," he says. "That should not be a remotely controversial statement." Perhaps also, in years to come, it will no longer be possible to fly with the freedom that we currently enjoy.

While the realisation of such visions, if there were ever the political will to achieve them, might be some way off, individuals must do everything possible to reduce their reliance on fossil fuels, urges Hugh Montgomery, director of the UCL Institute for Human Health and Performance. "It's the socially and morally responsible thing for any citizen."

Beyond individuals taking more action, professional bodies like the British Medical Association also need to raise their game, says Montgomery. "The BMA has taken strong stands on a lot of public health issues, like alcohol, like cigarettes, and it should not remain silent on this one." As respected and influential figures in society, doctors also have a special responsibility to spread the word about the seriousness of climate change, he says. "We need to communicate it to our patients."

Other sectors of society have an even greater contribution to make to carbon reduction, notably the military. "We are the great gas-guzzlers of the world," admits rear admiral Neil Morisetti, head of Climate and Energy Security at the UK's Ministry of Defence. The consumption of fossil fuels by the armed forces is truly staggering: a typical aircraft carrier might make just 12 inches to the gallon and burn 20 tonnes of fuel an hour launching and recovering jets. This dependence on non-renewable energy also poses considerable risks to any operation. So if the world's armed forces were able to reduce their consumption of fossil fuels, there would be plenty of benefits alongside a reduction in carbon emissions. "We have an opportunity to be more effective, to reduce risks, to reduce costs," says Morisetti. "It's a no-brainer."

Health benefits

Such changes, if they could be achieved on a global scale, would not only reduce carbon emissions but also benefit public health. Less reliance on cars would help stem the rising rates of obesity and cardiovascular disease.

Reduced consumption of fossil fuels would also result in a reduction in air pollutants like

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particulates, nitrogen oxides, and sulphur dioxide. In Europe, around 500 000 people a year die as a direct consequence of such pollution, says Anne Stauffer, policy manager for the Brussels-based Health and Environment Alliance (HEAL). Once you factor in the cost to society of ill health, hospital admissions, medical consultations, and medication, there are huge health savings to be made from cutting fossil fuel consumption, she says. Indeed, a recent report by HEAL in collaboration with Health Care Without Harm Europe indicates that if the EU were to move from a commitment to reduce carbon emissions from 20% to 30% by 2020, the improvement to air quality would save the European economy up to €30.5bn (£26.5bn, $42.3bn) every year.

It would also help if we were to completely rethink what we eat. "One half of all the cereals grown on the planet are fed to animals," says Timothy Lang. Not only is this an incredibly inefficient use of land, a meat-rich diet also has knock-on consequences for health, particularly by raising the incidence of cardiovascular disease. "We have to shift from seeing totally different food systems as being inevitable to making them normal," says Lang.

Contraction and convergence

Unpalatable as this might sound, a complete overhaul of food production and consumption is still not enough. Perhaps the boldest scheme for reducing global carbon emissions—and one on the kind of scale that's needed—comes in the shape of so called contraction and convergence.[6] Under this proposal, there would be a period of convergence, with the world's nations working towards a predetermined per capita carbon budget. At this point, it would be possible to begin a period of contraction, with carbon consumption being scaled back en masse. "Contraction and convergence is not only the right way to solve the problem. It is the only way," says Aubrey Meyer, director of the Global Commons Institute and the architect of this scheme.

In 2003, the secretariat of the United Nations Framework Convention on Climate Change acknowledged that its objective to stabilise the rising greenhouse gas concentration in the atmosphere "inevitably requires 'contraction and convergence'." Yet there is still no agreement on the details of how to take this plan forward. With the UNFCCC up for discussion at next month's Conference of the Parties in Durban, South Africa, Meyer is clear about what's needed. "There absolutely has to be a negotiation about the rate at which we converge on equal entitlements," he says.

The consequences of putting this off hardly bear thinking about. During past mass extinctions—notably in the Permian era—increasing temperature triggered the massive release of carbon stored in the soil, permafrost, and forests. If we reach this tipping point and we experience so called "runaway climate change," it's game over. "Attempting to model that is like attempting to model your funeral after the event," says Meyer. "It's ludicrous."

In this brutal light, *Homo sapiens* starts to look like just another run-of-the-mill species, for which survival and reproduction are merely sorry steps towards ultimate extinction. "I fear that the human species itself is not as highly evolved as we might wish it to be," says Adrian Lister, professor of paleontology at the Natural History Museum in London.

Faced with this unsettling thought, it would be tempting to throw up our hands and retrench into our current, unsustainable ways. But this is hard to do with a conscience. As befits a product of natural selection, we humans are understandably fond of reproduction and there are few things that motivate us as much as our children do. But uniquely among evolved organisms, we are also able to predict what kind of a world we will leave them, and it doesn't look good. "We are on a track at the moment that could give us a temperature rise of 4 or 5°C by 2060," says Hugh Montgomery. "My younger son will be in his early 50s at that point, and that's not a world he will survive in."

Doing nothing is not an option.

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FROM BMJ.COM **Julian Sheather**

Apocalypse tomorrow

There are four horsemen of the apocalypse: conquest, war, famine (or pestilence), and death, and climate change will unleash all of them.

I was at the *BMJ* conference last week that explored some of the health and security impacts of climate change, and these grim riders were everywhere to be seen.

Put simply, climate change will alter the distribution of human necessities like food and fresh water. Green places will become barren, rivers will run dry. The need to secure access to these basic goods will drive people to war.

Add to this the death toll from severe weather events—droughts, hurricanes, floods—and changing distributions of infectious disease vectors, and you can feel the hot breath of the horses on your neck.

The word apocalypse comes from the Greek for "lifting the veil," the revealing of secrets or truths that were previously hidden. But one of the extraordinary things about climate change is that the truths are already out in the open. We are besieged by them. And this brings us to the inevitable question: if the climate change predictions are reliable—and it is likely that they are—and the results of the continuing rise in carbon production are as catastrophic as they are predicted to be, why do we continue as if nothing in the world has changed?

Scientists are close to unanimous about the problem. The solution: a global economy based on green energy sources, is both well established and technologically feasible. So why is it that even those who are fully signed up to the problem behave almost without exception as if nothing is happening? We drive, we fly, we consume, we gorge on unnecessary calories, we clamour for economic growth. How is it that, to judge by our behaviour rather than our pious words, even the best educated among us refuse to accept the truth?

Julian Sheather is ethics manager, BMA. The views he expresses in his blog posts are entirely his own.

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