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ANALYSIS

ESSAY

Why doctors and their organisations must help tackle climate change: an essay by Eric Chivian

Doctors are ideally placed to provide people with compelling, concrete examples of the medical consequences of climate change, argues **Eric Chivian**. Not only do they have the ability to turn around the potentially destructive changes to the environment caused by human behaviour, but they also have the responsibility to do so

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In 1980, with three other Harvard faculty members, I started an organisation called the International Physicians for the Prevention of Nuclear War, which eventually included some 250 000 physicians from 80 countries. In 1985, we won the Nobel peace prize. The most important contribution of the physicians who joined this federation was to help people grasp what a nuclear war would really be like—so that they knew that these weapons were so catastrophically destructive that they could not be used, and so policy makers and the public would do everything in their power to prevent a nuclear war from occurring.

We did this by translating the abstract, technical science of nuclear weapons explosions, which world class scientists had been warning about for decades, into the concrete, personal terms of human health, in everyday language that people could relate to and understand—namely, what would really happen to us in such a war. We talked about skull fractures instead of the number of joules of force in the explosion, about third degree burns instead of the number of degrees centigrade in the fireball, and about radiation sickness instead of the number of Rems of radiation in the fallout. As a result, I believe we helped make nuclear war more real for people; we made it harder for them to think about such wars in vague, abstract, technical terms and, in the process, we helped change public opinion, and maybe even public policy, about the use of these weapons.

But, in contrast to nuclear weapons explosions, changes to the global environment like climate change and the loss of biological diversity are much harder to grasp. They are orders of magnitude more complicated scientifically, with large numbers of complex variables, and we have no Hiroshima or Nagasaki to serve as concrete examples of what will happen.

Global environmental changes, unlike explosions, can also be hard to see—they often occur slowly or intermittently, sometimes imperceptibly, and they can be obscured by normal fluctuations in things like temperatures or rainfall, which produce often abrupt and large swings all the time. Our human brains are wired to see what is happening right in front of us right now—we are not very good at seeing things that are not obvious, that happen incrementally, or that occur over large areas or in other parts of the world.

The task of grasping changes to the global environment is also made more difficult because scientists, who are trained largely to talk to one another, often speak to policy makers and the public in technical, jargon filled language that most people cannot follow. And this problem is becoming more acute as science becomes increasingly specialised.

In addition, scientists are always talking about $P<0.001$ proofs and will never say with certainty, for example, that with our ever increasing use of fossil fuels we are causing things like hurricanes to become larger, more powerful, and longer lasting, or the Arctic ice sheet and Greenland to melt. They are by training sceptics, always hedging their bets. This, of course, is what science is, and should be about—coming up with the most likely, best explanation for what is being observed until a better one comes along. The deniers, by contrast, are absolutely certain about their conclusions and give simple, direct explanations. So it is no wonder that people are confused about what is true and what is not.

As was true with nuclear war, we must help educate people about what is really happening to the environment in language they can understand, and there is no more compelling way to do this than by talking about human health. It may be even more important than it was with nuclear war for physicians and public health professionals to be involved with global environmental change.

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Value of talking in human health terms

As physicians we can provide people with concrete examples of the medical consequences of climate change and thus help convince them that we have no choice about whether we preserve the global environment: our health and our lives depend on our doing so. One useful example is that of the cone snail *Conus magus* and its potential contribution to human pain relief.

Cone snails are a large group of predatory snails that mostly live in tropical coral reefs. They defend themselves and paralyse their prey for food—worms, small fish, and other molluscs—by firing a poison coated harpoon at them. There are thought to be around 700 cone snail species, and each species is believed to make 100-200 distinct peptide poisons to coat their harpoons, representing an explosion in marine evolution, both in terms of species numbers and in the variety of chemical compounds. There may be as many as 140 000 toxic peptides in all, and they are among the most potent and highly selective membrane receptor binding molecules in nature, acting as both facilitating and inhibiting agents and targeting an enormous variety of sites, including sodium, potassium, and calcium ion channels and acetylcholine, dopamine, serotonin, norepinephrine (noradrenaline), vasopressin, neurotensin, N-methyl-D-aspartate, oxytocin, and vasopressin receptors.

Only about 1% of the 700 species and less than 0.1% of the estimated number of peptides have been studied in any detail, and already several important new compounds have been found. Ziconotide, derived from a cone snail calcium channel blocker, is used to treat severe chronic pain that is not responsive to opiates. What is remarkable about ziconotide is that not only is it 1000 times more potent than morphine, but it does not cause addiction or tolerance. The search for a potent drug for chronic pain to which patients do not become tolerant has been the "holy grail" in medicine, and here is one made by a cone snail.

Other cone snail toxins are at various stages of preclinical and clinical trials—for treatment resistant epilepsy, for protecting nerve cells after head injuries or strokes, for protecting heart cells during myocardial infarction. Some believe that cone snails may lead to more important human medicines than any other group of organisms. But they live in tropical coral reefs that are threatened worldwide by ocean warming and acidification, and so they will be lost when the corals are gone. That is just one of countless examples of what our massive release of carbon dioxide into the atmosphere really means for humanity.

Medical model—evidence and proof

The medical model provides another valuable lesson. Looking at the roles of evidence and "proof" in medicine, and how they differ from those in science, allows for an understanding of the precautionary principle, not as an abstract scientific idea but as something many practising physicians must deal with every day.

For example, if a child aged less than 1 month comes to hospital with a fever of more than 38°C, he or she is immediately given two broad spectrum antibiotics after blood, urine, and cerebrospinal fluid are drawn for bacterial cultures, providing there are no contraindications. The physician doesn't wait until the cultures come back two days later before starting treatment. You can't afford to wait, for in that time a bacterial infection could spread rapidly through the infant's body and kill it. More than 90% of fevers in infants are, in fact, caused by viruses, not bacteria, and only a small fraction of those that are caused by bacteria go on to cause serious problems or death. But the risk of not giving antibiotics to all infants with high fever—that a child will die—is so grave that no paediatrician is willing to take it.

This is the model we need to use for making decisions about reducing greenhouse gas emissions and other assaults on the global environment. The risks of inaction and delay are so enormous, so potentially catastrophic for the planet, not just for now, but for hundreds and thousands of years—and in the case of the melting of ice around the world, and the acidification of the oceans, perhaps for tens of thousands of years—to come, that to wait to act until we have absolute proof of what will happen is to take a risk with the physical, chemical, and biological systems of the planet, to do a global experiment with our own health and lives, that no member of parliament or Congress, no prime minister or president, no one should ever be willing to take. That is the lesson of medicine.

Why those of us in the medical community who have warned about the threat of global warming were not more effective over these past two decades or so is a long and complicated story, and for me it has been the greatest and most painful disappointment of my life. We should not have any illusions about why we have so far failed to do much about the relentless build up of greenhouse gases. We were, and we are, up against the richest, most powerful, most rapacious adversaries on the planet, who since the industrial revolution began have controlled what powers almost everything we all do, whose products are the engine for the economies of all industrialised countries and the fuel for the rapid growth of developing countries.

There has also been a widespread, well funded, sophisticated and highly effective campaign, much as there was in the early days by the tobacco industry, to cast doubt on the science of global environmental change and to discredit the scientists This campaign, as has been widely reported by the media, has been funded by tens of millions of dollars from some corporations and individuals, such as Exxon Mobil and David and Charles Koch in the US, whose $80bn fortune largely derives from the production and distribution of fossil fuels. All stand to profit by our lack of understanding and our continued and escalating use of these fuels.

This disinformation or "junk science" has been disseminated by some politicians (almost one third of the US Congress—127 members of the US House of Representatives and 30 members of the Senate—do not believe in human caused climate change); by right wing think tanks in the US, such as the Heartland Institute and the Competitive Enterprise Institute; by media outlets such as Rupert Murdoch's Fox News and the editorial pages of the *Wall Street Journal,* and by talk show hosts such as Rush Limbaugh. The media are responsible for disinformation in another way. They love public fights because they increase viewing figures, so they put deniers such as Lord Monkton head to head in a debate about climate change with respected scientists, as if they each represented equally valid, equally substantiated, equally widely held views. So it is not surprising that many people believe there is a substantial debate going on in the scientific community about whether human activity is harming the global environment, which there is not, and that many people don't know what or who to believe.

We are all incredibly lucky to be alive at this moment in history. The changes to the environment we are dealing with are caused by our own behaviour and we have the ability and the responsibility to turn them around—especially those of us in the richest, most powerful nations on the planet. It is up to us. Who will do it if we do not?

Eric Chivian is founder and former director of the Center for Health and the Global Environment at Harvard Medical School. He is currently director of the Program for Preserving the Natural World. He was lead editor and author of Critical Condition: Human Health and the Environment (MIT Press, 1993) and of Sustaining Life: How Human Health Depends on Biodiversity (Oxford University Press, 2008), which Donald Kennedy, former editor in chief of Science magazine, called “the best work ever on what biodiversity means to human health.”

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