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Viewpoint

Denialism: what is it and how should scientists respond?

Black is white and white is black

HIV does not cause AIDS. The world was created in 4004 BCE. Smoking does not cause cancer. And if climate change is happening, it is nothing to do with man-made CO_2 emissions. Few, if any, of the readers of this journal will believe any of these statements. Yet each can be found easily in the mass media.

The consequences of policies based on views such as these can be fatal. Thabo Mbeki's denial that that HIV caused AIDS prevented thousands of HIV positive mothers in South Africa receiving anti-retrovirals so that they, unnecessarily, transmitted the disease to their children.[1] His health minister, Manto Tshabalala-Msimang, famously rejected evidence of the efficacy of these drugs, instead advocating treatment with garlic, beetroot and African potato. It was ironic that their departure from office coincided with the award of the Nobel Prize to Luc Montagnier and Françoise Barré-Sinoussi for their discovery that HIV is indeed the case of AIDS. The rejection of scientific evidence is also apparent in the popularity of creationism, with an estimated 45% of Americans in 2004 believing that God created man in his present form within the past 10 000 years.[2] While successive judgements of the US Supreme Court have rejected the teaching of creationism as science, many American schools are cautious about discussing evolution. In the United Kingdom, some faith-based schools teach evolution and creationism as equally valid 'faith positions'. It remains unclear how they explain the emergence of antibiotic resistance.

Elsewhere, the hand of powerful corporate interests can be seen. It took many decades for the conclusions of authoritative reports by the US Surgeon General[3] and the British Royal College of Physicians[4] on the harmful effects of smoking to be accepted, while even now, despite clear evidence of rapid reductions in myocardial infarctions where bans have been implemented, there are some who deny that second-hand smoke is dangerous. In large part this was due to the efforts of the tobacco industry to deflect attention to other putative causes of smoking-related diseases, from stress to keeping pet birds. The reports of the Intergovernmental Panel on Climate Change have suffered similar attacks from commentators with links to major oil companies.

All of these examples have one feature in common. There is an overwhelming consensus on the evidence among scientists yet there are also vocal commentators who reject this consensus, convincing many of the public, and often the media too, that the consensus is not based on 'sound science' or denying that there is a consensus by exhibiting individual dissenting voices as the ultimate authorities on the topic in question. Their goal is to convince that there are sufficient grounds to reject the case for taking action to tackle threats to health. This phenomenon has led some to draw a historical parallel with the holocaust, another area where the evidence is overwhelming but where a few commentators have continued to sow doubt. All are seen as part of a larger phenomenon of *denialism*.

Defining and recognizing denialism

The Hoofnagle brothers, a lawyer and a physiologist from the United States, who have done much to develop the concept of denialism, have defined it as the employment of rhetorical arguments to give the appearance of legitimate debate where there is none,[5] an approach that has the ultimate goal of rejecting a proposition on which a scientific consensus exists.[6] In this viewpoint, we argue that public health scientists should be aware of the features of denialism and be able to recognize and confront it.

Denialism is a process that employs some or all of five characteristic elements in a concerted way. The first is the identification of conspiracies. When the overwhelming body of scientific opinion believes that something is true, it is argued that this is not because those scientists have independently studied the evidence and reached the same conclusion. It is because they have engaged in a complex and secretive conspiracy. The peer review process is seen as a tool by which the conspirators suppress dissent, rather than as a means of weeding out papers and grant applications unsupported by evidence or lacking logical thought. The view of General Jack D Ripper that fluoridation was a Soviet plot to poison American drinking water in Dr Strangelove, Kubrick's black comedy about the Cold War is no less bizarre than those expressed in many of the websites that oppose this measure.

In some cases, denialism exploits genuine concerns, such as the rejection of evidence on the nature of AIDS by African-Americans who perceive them as a manifestation of racist agendas.[7] While conspiracy theories cannot simply be dismissed because conspiracies do occur,[8] it beggars belief that they can encompass entire scientific communities.

There is also a variant of conspiracy theory, *inversionism*, in which some of one's own characteristics and motivations are attributed to others. For example, tobacco companies describe academic research into the health effects of smoking as the product of an 'anti-smoking industry', described as 'a vertically integrated, highly concentrated, oligopolistic cartel, combined with some public monopolies' whose aim is to 'manufacture alleged evidence, suggestive inferences linking smoking to various diseases and publicity and dissemination and advertising of these so-called findings to the widest possible public'.[9]

The second is the use of fake experts. These are individuals who purport to be experts in a particular area but whose views are entirely inconsistent with established knowledge. They have been used extensively by the tobacco industry since 1974, when a senior executive with R J Reynolds devised a system to score scientists working on tobacco in relation to the extent to which they were supportive of the industry's position. The industry embraced this concept enthusiastically in the 1980s when a senior executive from Philip Morris developed a strategy to recruit such scientists (referring to them as 'Whitecoats') to help counteract the growing evidence on the harmful effects of second-hand smoke. This activity was largely undertaken through front organizations whose links with the tobacco industry were concealed, but under the direction of law firms acting on behalf of the

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tobacco industry.[10] In some countries, such as Germany, the industry created complex and influential networks, allowing it to delay the implementation of tobacco control policies for many years.[11] In 1998, the American Petroleum Institute developed a Global Climate Science Communications Plan, involving the recruitment of 'scientists who share the industry's views of climate science [who can] help convince journalists, politicians and the public that the risk of global warming is too uncertain to justify controls on greenhouse gases'.[12] However, this is not limited to the private sector; the administration of President George W Bush was characterized by the promotion of those whose views were based on their religious beliefs or corporate affiliations,[13] such as the advisor on reproductive health to the Food and Drug Administration who saw prayer and bible reading as the answer to premenstrual syndrome.[14] A related phenomenon is the marginalization of real experts, in some cases through an alliance between industry and government, as when ExxonMobil successfully opposed the reappointment by the US government of the chair of the Intergovernmental Panel on Climate Change.[15,16] These events led a group of prominent American scientists to state that 'stacking these public committees out of fear that they may offer advice that conflicts with administration policies devalues the entire federal advisory committee structure'.[17]

The use of fake experts is often complemented by denigration of established experts and researchers, with accusations and innuendo that seek to discredit their work and cast doubt on their motivations. Stanton Glantz, professor of medicine at the University of California, San Francisco and who has made a great contribution to exposing tobacco industry tactics, is a frequent target for tobacco denialists. He is described on the Forces website as 'infamous for being the boldest of liars in ''tobacco control'' that most ethically challenged gang of con artists', adding that 'he cynically implies his research into smoking is science, banking on the sad fact that politicians, let alone the media, have no idea that epidemiology is not real science and that his studies define the term junk science'.[18]

The third characteristic is selectivity, drawing on isolated papers that challenge the dominant consensus or highlighting the flaws in the weakest papers among those that support it as a means of discrediting the entire field. An example of the former is the much-cited Lancet paper describing intestinal abnormalities in 12 children with autism, which merely suggested a possible link with immunization against measles, mumps and rubella.[19] This has been used extensively by campaigners against immunization, even though 10 of the paper's 13 authors subsequently retracted the suggestion of an association.[20] Fortunately, the work of the Cochrane Collaboration in promoting systematic reviews has made selective citation easier to detect.

Another is a paper published by the *British Medical Journal* in 2003,[21] later shown to suffer from major flaws, including a failure to report competing interests,[22] that concluded that exposure to tobacco smoke does not increase the risk of lung cancer and heart disease. This paper has been cited extensively by those who deny that passive smoking has any health effects, with the company Japan Tobacco International still quoting it as justification for rejecting 'the claim that ETS is a cause of lung cancer, heart disease and chronic pulmonary diseases in non-smokers' as late as the end of 2008.[23]

Denialists are usually not deterred by the extreme isolation of their theories, but rather see it as the indication of their intellectual courage against the dominant orthodoxy and the accompanying political correctness, often comparing themselves to Galileo.

The fourth is the creation of impossible expectations of what research can deliver. For example, those denying the reality of climate change point to the absence of accurate temperature records from before the invention of the thermometer. Others use the intrinsic uncertainty of mathematical models to reject them entirely as a means of understanding a phenomenon. In the early 1990s, Philip Morris tried to promote a new standard, entitled Good Epidemiological Practice (GEP) for the conduct of epidemiological studies. Under the GEP guidelines, odds ratios of 2 or less would not be considered strong enough evidence of causation, invalidating in one sweep a large body of research on the health effects of many exposures.[24] Although Philip Morris eventually scaled back its GEP programme, as no epidemiological body would agree to such a standard, British American Tobacco still uses this criterion to refute the risk associated with passive smoking.[25]

The fifth is the use of misrepresentation and logical fallacies. For example, pro-smoking groups have often used the fact that Hitler supported some anti-smoking campaigns to represent those advocating tobacco control as Nazis (even coining the term nico-nazis),[26] even though other senior Nazis were smokers, blocking attempts to disseminate anti-smoking propaganda and ensuring that troops has sufficient supplies of cigarettes.[27] Logical fallacies include the use of *red herrings*, or deliberate attempts to change the argument and *straw men*, where the opposing argument is misrepresented to make it easier to refute. For example, the US Environmental Protection Agency (EPA) determined in 1992 that environmental tobacco smoke (ETS) is carcinogenic, a finding confirmed by many other authoritative national and international public health institutions. The EPA assessment was described by two commentators as an 'attempt to institutionalize a particular irrational view of the world as the only legitimate perspective, and to replace rationality with dogma as the legitimate basis of public policy', which they labelled as nothing less than a 'threat to the very core of democratic values and democratic public policy'.[28] Other fallacies used by denialists are *false analogy*, exemplified by the argument against evolution that, as the universe and a watch are both extremely complex, the universe must have been created by the equivalent of a watchmaker and the *excluded middle* fallacy (either passive smoking causes a wide range of specified diseases or causes none at all, so doubt about an association with one disease, such as breast cancer, is regarded as sufficient to reject an association with any disease).

Responding to denialism

Denialists are driven by a range of motivations. For some it is greed, lured by the corporate largesse of the oil and tobacco industries. For others it is ideology or faith, causing them to reject anything incompatible with their fundamental beliefs. Finally there is eccentricity and idiosyncrasy, sometimes encouraged by the celebrity status conferred on the maverick by the media.

Whatever the motivation, it is important to recognize denialism when confronted with it. The normal academic response to an opposing argument is to engage with it, testing the strengths and weaknesses of the differing views, in the expectations that the truth will emerge through a process of debate. However, this requires that both parties obey certain ground rules, such as a willingness to look at the evidence as a whole, to reject deliberate distortions and to accept principles of logic. A meaningful discourse is impossible when one party rejects these rules. Yet it would be wrong to prevent the denialists

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having a voice. Instead, we argue, it is necessary to shift the debate from the subject under consideration, instead exposing to public scrutiny the tactics they employ and identifying them publicly for what they are. An understanding of the five tactics listed above provides a useful framework for doing so.

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