



Public-health researcher Tara Kirk Sell (centre) experienced online and e-mail attacks after talking about COVID-19 in the media.

US HOUSE OF REPRESENTATIVES' COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SCIENTISTS UNDER ATTACK

Dozens of researchers tell *Nature* they have received death threats, or threats of physical or sexual violence, after speaking about COVID-19. **By Bianca Nogrady**

Infectious-diseases physician Krutika Kuppalli had been in her new job for barely a week in September 2020, when someone phoned her at home and threatened to kill her.

Kuppalli, who had just moved from California to the Medical University of South Carolina in Charleston, had been dealing with online abuse for months after she'd given high-profile media interviews on COVID-19, and had recently testified to a US congressional committee on how to hold safe elections during the pandemic. But the phone call was a scary escalation. "It made me very anxious, nervous and upset," says

Kuppalli, who now works at the World Health Organization (WHO) in Geneva, Switzerland.

She called the police, but didn't hear that they took any action. The threatening e-mails, calls and online comments continued. The police officer who visited Kuppalli after a second death-threat call suggested she should get herself a gun.

Kuppalli's experience during the pandemic is not uncommon. A survey by *Nature* of more than 300 scientists who have given media interviews about COVID-19 – many of whom had also commented about the pandemic on social media – has found wide experience of harassment or abuse; 15% said they had received

death threats (see 'Negative impacts').

Some high-profile examples of harassment have been well documented. Anthony Fauci, head of the US National Institute of Allergy and Infectious Diseases, was assigned personal security guards after he and his family received death threats; UK chief medical adviser Chris Whitty was grabbed and shoved in the street; and German virologist Christian Drosten received a parcel with a vial of liquid labelled 'positive' and a note telling him to drink it. In one extraordinary case, Belgian virologist Marc Van Ranst and his family were placed in a safe house when a military sniper went on the run after leaving a note outlining his intentions to target virologists.

These examples are extreme. But in *Nature's* survey, more than two-thirds of researchers reported negative experiences as a result of their media appearances or their social media comments, and 22% had received threats of physical or sexual violence. Some scientists said that their employer had received complaints about them, or that their home address had been revealed online. Six scientists said they were physically attacked (see go.nature.com/3tmffdj for survey data tables).

Coordinated social-media campaigns and threatening e-mails or phone calls to scientists are not new: topics such as climate change, vaccination and the effects of gun violence have drawn similar attacks in the past. But even scientists who had a high profile before COVID-19 told *Nature* that the abuse was a new and unwelcome phenomenon tied to the pandemic. Many wanted the extent of the problem discussed more openly. "I believe national governments, funding agencies and scientific societies have not done enough to publicly defend scientists," one researcher wrote in their survey response.

Some researchers say that they have learnt to cope with the harassment, accepting it as an unpleasant but expected side effect of getting information to the public. And 85% of survey respondents said that their experiences of engaging with the media were always or mostly positive, even if they were harassed afterwards. "I think scientists need training for how to engage with the media and also about what to expect from trolls – it's just a part of digital communication," one wrote.

But *Nature's* survey suggests that even though researchers try to shrug off abuse, it might already have had a chilling effect on scientific communication. Those scientists who reported higher frequencies of trolling or personal attacks were also most likely to say that their experiences had greatly affected their willingness to speak to the media in the future (see 'Chilling effect?').

That is concerning during a global pandemic which has been accompanied by a battery of disinformation and misinformation, says Fiona Fox, chief executive of the UK Science Media Centre (SMC) in London – an organization that collates scientific comment and organizes press briefings for journalists. "It's a great loss if a scientist who was engaging with the media, sharing their expertise, is taken out of a public debate at a time when we've never needed them so badly," she says.

Tracking harassment

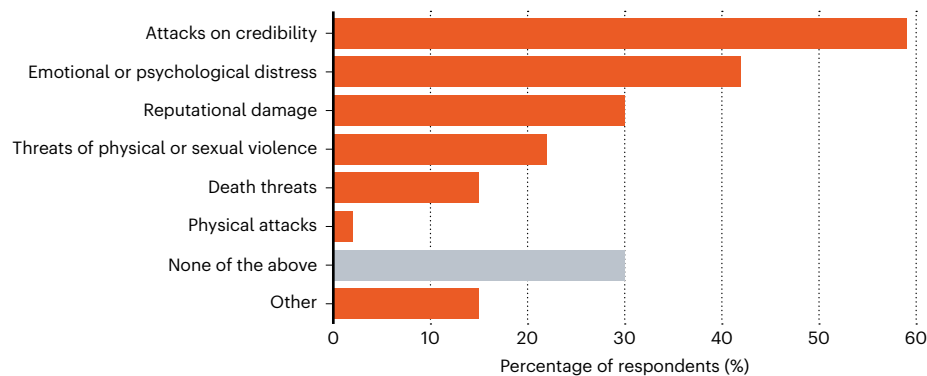
In June, the Australian SMC in Adelaide asked researchers on its COVID-19 media lists about their experiences. The centre had been alerted to online bullying and hate campaigns directed at scientists, and wanted to know whether it was a broader problem, says Lyndal Byford, the centre's director of news and partnerships.

Byford shared the results with *Nature*.

NEGATIVE IMPACTS

In a *Nature* survey of scientists who have commented about COVID-19, 15% of 321 respondents said they had received death threats.

Question: Have you experienced any of the following negative impacts after speaking about COVID-19 to the media, or posting on social media? (You may select multiple options.)



Fifty researchers answered the SMC's informal survey. Nearly one-third reported experiencing emotional or psychological distress after talking about COVID-19; 6 people (12%) reported receiving death threats, and 6 said they had received threats of physical or sexual violence. "I think any organization involved in helping scientists communicate would find that quite disturbing," Byford says.

To get a broader sense of the scale of harassment, *Nature* adapted the Australian SMC's survey, and asked science media centres in the United Kingdom, Canada, Taiwan, New Zealand and Germany to send it to scientists on their COVID-19 media lists. *Nature* also e-mailed researchers in the United States and Brazil who had been prominently quoted in the media.

The results are not a random sample of researchers who have given media interviews on COVID-19, because they represent only the

"The more prominent you are, the more abuse you're going to get."

experiences of the 321 scientists who chose to respond (predominantly in the United Kingdom, Germany and the United States). But the numbers reveal that researchers in many countries are facing abuse related to the pandemic, and the proportions reported were higher than in the Australian survey. More than one-quarter of respondents to the *Nature* survey said they always or usually received comments from trolls or were personally attacked after speaking in the media about COVID-19. And more than 40% reported experiencing emotional or psychological distress after making media or social media comments.

Politicized science

To some extent, this harassment of scientists reflects their rising status as public figures. "The more prominent you are, the more

abuse you're going to get," says historian Heidi Tworek at the University of British Columbia in Vancouver, Canada, who is studying online abuse of health communicators in the pandemic. Most US public-health departments have also received harassment directed at staff and officials, adds Beth Resnick, a public-health researcher at Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland, who has surveyed 580 departments in a study that is not yet published.

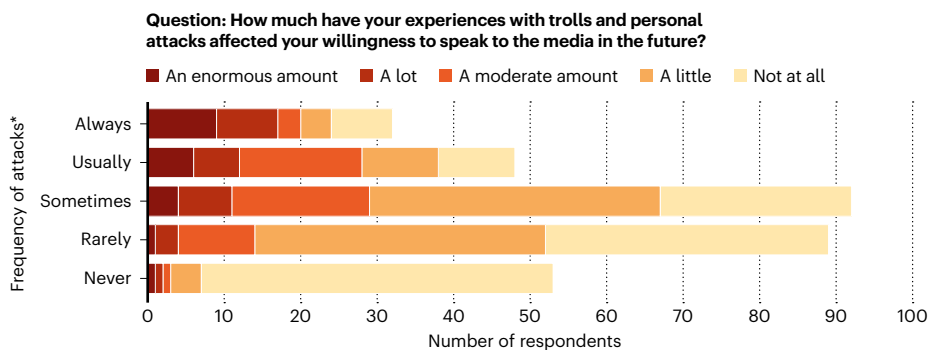
And such attacks might have little to do with the science itself and more to do with who's talking. "If you're a woman, or a person of colour from a marginalized group, that abuse will probably include abuse of your personal characteristics," says Tworek. For instance, Canada's chief public-health officer Theresa Tam is Asian Canadian, and abuse levelled against her included a layer of racism, Tworek says. Kuppalli, a female scientist of colour, says she also experienced this. Abusers told her she "needs to go back where she came from".

Both the Australian SMC and *Nature's* survey, however, found no clear difference between the proportions of violent threats received by men and women. "We were surprised," Byford says. "We really felt women would be bearing more of a brunt in terms of the abuse that they got."

Some aspects of COVID-19 science have become so politicized that it is hard to mention them without attracting a storm of abuse. Epidemiologist Gideon Meyerowitz-Katz at the University of Wollongong in Australia, who has gained a following on Twitter for his detailed dissection of research papers, says that two major triggers are vaccines and the anti-parasite drug ivermectin – controversially promoted as a potential COVID-19 treatment without evidence it was effective. "Any time you write about vaccines – anyone in the vaccine world can tell you the same story – you get vague death threats, or even sometimes more specific death threats and endless hatred," he says. But he's found the passionate defence of ivermectin surprising. "I think I've received more death

CHILLING EFFECT?

In *Nature's* survey, scientists who reported the highest frequency of trolling or personal attacks* were also most likely to say that their experiences had greatly affected their readiness to give future media interviews.



threats due to ivermectin, in fact, than anything I've done before," he says. "It's anonymous people e-mailing me from weird accounts saying 'I hope you die' or 'if you were near me I would shoot you!'"

Andrew Hill, a pharmacologist at the University of Liverpool's Institute of Translational Medicine, received vitriolic abuse after he and his colleagues published a meta-analysis in July. It suggested ivermectin showed a benefit, but Hill and his co-authors then decided to retract and revise the analysis when one of the largest studies they included was withdrawn because of ethical concerns about its data (*A. Hill et al. Open Forum Inf. Dis.* 8, ofab394; 2021). After that, Hill was besieged with images of hanged people and coffins, with attackers saying he would be subject to 'Nuremberg trials', and that he and his children would 'burn in hell'. He has since closed his Twitter account.

In Brazil, microbiologist-turned-science-communicator Natalia Pasternak also noticed online attacks against her increasing when she spoke about the unproven COVID-19 treatments being promoted by the Brazilian government, which include ivermectin, the antimalarial drug hydroxychloroquine and the antibiotic azithromycin. In 2018, Pasternak founded the *Instituto Questão de Ciência* – the Question of Science Institute – with the aim of promoting the use of scientific evidence in policymaking and discourse. When COVID-19 happened, Brazil "became the first country in the world to actually promote pseudoscience as a public policy, because we promote the use of unproven medications for COVID-19", Pasternak says.

She appeared on major television stations and produced her own YouTube show, called the *Plague Diary*. Commenters criticized her voice and appearance, or argued that she wasn't a real scientist. But, Pasternak says, the attacks rarely challenged what she was saying.

Some attackers have also tried to use the law to silence their targets. A group of supporters of Brazilian president Jair Bolsonaro tried to sue Pasternak for defaming him when she likened Bolsonaro to a plague on her YouTube show; the lawsuit was dismissed. And

Van Ranst has been sued for defamation by a Dutch protester who opposes vaccination and public-health measures such as lockdowns in Belgium and the Netherlands.

Another topic that attracts high volumes of abuse is the question of SARS-CoV-2's origins. Both the Australian and UK SMCs say they have struggled to find scientists who are willing to comment publicly on the issue for fear of getting attacked. Fox says the UK SMC has approached more than 20 scientists to participate in a briefing on this question, but all declined.

Virologist Danielle Anderson, now at the Peter Doherty Institute for Infection and Immunity at the University of Melbourne in Australia, received intense, coordinated online and e-mail abuse after writing a fact-checking critique in early 2020 of an article suggesting that SARS-CoV-2 might have leaked from China's Wuhan Institute of Virology (WIV). At the time, she was based at the Duke-National University of Singapore Medical School in Singapore, but had collaborated with the WIV since the epidemic of severe acute respiratory syndrome (SARS) in 2002–04. "Eat a bat and die, bitch," one e-mail read.

"I just don't read the comments and I don't engage."

Another researcher with a long-standing WIV collaboration, Peter Daszak, president of EcoHealth Alliance in New York City, has also received abuse. Daszak, who travelled to Wuhan in January as part of a WHO-coordinated inquiry into the origins of SARS-CoV-2, says he's had a letter containing white powder sent to his home, had his address posted online and regularly receives death threats.

Harassment has cut both ways when it comes to SARS-CoV-2's origins. Alina Chan, a postdoctoral researcher at the Broad Institute of MIT and Harvard in Cambridge, Massachusetts, has received abuse for her work on the

idea that the pandemic might have resulted from exposure to a virus at a laboratory or research site (sometimes also called the 'lab leak' hypothesis). Ultimately, she says, abusive attacks are counterproductive to the people making them. "They make the people on their own side appear unreasonable and dangerous," she says. "Second, they make it difficult to hold people accountable because now everyone is distracted by having to address the excessively abusive attacks."

Coping strategies

For researchers who receive online abuse, individual coping strategies include trying to ignore it; filtering and blocking e-mails and social-media trolls; or, for abuse on specific social-media platforms, deleting their accounts. But it's not easy.

"It is very harrowing if every day, you open up your e-mails, your Twitter, you get the death threats, you get abuse every single day, undermining your work," says Hill. It also takes time to go through messages and filter out abusers, he says. That led to his decision to delete his Twitter account.

Kuppalli has kept her social-media presence, but is more careful about how she uses it. Her rule is now not to respond to comments or posts when she is upset or angry or, in some cases, not to reply at all. "I just don't read the comments and I don't engage."

Trish Greenhalgh, a health researcher and doctor at the University of Oxford, UK, said on Twitter in March that she had received "malicious abuse" from another academic and was blocking her abuser's followers to make it harder for them to target her. She had previously tweeted that if anyone abused her PhD students, she would try to identify the abuser and report them to their employer.

But researchers shouldn't try to cope on their own, says Tworek: there is much that institutions can do to assist scientists who are receiving abuse. Support staff can help a scientist to filter and block their e-mails and report abuse on social media, as well as remove researchers' contact details from institutional websites and report incidents to police. "Unfortunately, it's frequently a problem that people aren't believed," Tworek says – even when online threats escalate to offline ones.

In *Nature's* survey, 44% of scientists who said they'd been trolled or experienced personal attacks said they never told their employer. Of those who did, however, almost 80% found their employer 'very' or 'somewhat' supportive. When Kuppalli informed her university, for instance, she was given a car parking space much closer to her office, and the university's IT department worked to block some of the regular abusive e-mailers.

Public-health researcher Tara Kirk Sell at the Johns Hopkins Center for Health Security in Baltimore has experienced online and e-mail

SOURCE: NATURE ANALYSIS

attacks, particularly after appearing on a US conservative television network to talk about COVID-19. One e-mail suggested that Sell and her colleagues should be executed.

Sell, who'd experienced abuse as a former professional athlete, reported the e-mail to administrators, who handed it to campus security officers. They investigated, identified the sender, contacted them and warned them to stop. Sell didn't hear from them again. "I think that a lot of people don't realize that they should report their harassment to their institution," she says.

One Australian epidemiologist – who asked to remain anonymous because she didn't want more abuse – told *Nature* that she had to push her university for help after she received "vile, sexualising" e-mails in the wake of her media interviews on COVID-19. At first, her institution suggested it was her responsibility to deal with it. They only took action after she likened the online abuse to someone standing up in her lecture theatre and shouting the same words, which included a derogatory reference to her sexual anatomy. "You would march that person off the campus," she said. Eventually, her university removed her contact details from its website and put her in touch with a campus security officer.

In response to an increase in attacks on scientists and public-health officials, the Royal Society of Canada set up a working group on 'protecting public advice' in May. It is set to release a policy briefing before the end of the year. "Our fundamental concern is what do we do to make sure that expertise can still reach the public and it's not silenced by this kind of activity," says working-group chair Julia Wright, an English-literature scholar at Dalhousie University in Halifax, Canada, and president of the Academy of the Arts and Humanities at the Royal Society of Canada.

Wright says some universities have formal policies on how to handle attacks on staff, which range from ensuring that person has access to support from counselling and security services, to making public statements of support of their academics and of academic freedom. Those statements are often very helpful, Wright says, but they can also give oxygen to a harassment campaign that might otherwise have died down. "This is something that I think we're all still trying to figure out strategies for dealing with."

Social media

Much abuse happens on social media – raising the perpetual question of what responsibility social-media companies bear for what's said on their platforms. Among the scientists who responded to *Nature's* survey, 63% used Twitter to comment on aspects of COVID-19, and around one-third of those said they were 'always' or 'usually' attacked on the platform.

Kuppalli reported abusive content to



Virologist Danielle Anderson received abuse after critiquing an article on SARS-CoV-2's origins.

Twitter, but was told that it did not violate the platform's terms. Hill sent examples to Twitter of the abusive tweets he was receiving, featuring pictures of hanged corpses, and got the same response. A Twitter spokesperson said the company has clear rules about addressing threats of violence, abuse and harassment, and added that Twitter has introduced features to reduce abuse, including technology to detect abusive language, as well as settings that allow users to control who responds to their tweets and to hide some replies.

Wright, along with other researchers, says that social-media firms need to do more to combat abuse and misinformation that is spread through their networks. But the platforms are so big that the only way to deal with it is through automated algorithms, Wright says, which are easy to evade. And she worries about putting social-media companies in the position of censors.

Consequences of harassment

A positive aspect of the pandemic is the extraordinary amount of effort researchers have put into public communication about science during the crisis, says Fox. She recommends that researchers in the public eye be careful about stepping outside their own areas of expertise, and try to avoid making comments that might be perceived as political. But engaging with the media inevitably comes with the possibility of unwanted abuse that's almost impossible to stop, she adds.

Some scientists say they've learnt to temper their comments about COVID-19. Robert Booy, an infectious-diseases paediatrician at the University of Sydney says that he learnt lessons from hasty comments he made in one rushed telephone interview conducted at the side of the road. "I said, 'you can have a vaccine, or you can go to heaven early,'" he recalls. "I should not

have been rushed, I should not have been glib and I should have been on home ground and calm," he says.

Whereas some scientists have put up with abuse, others have excluded themselves from commenting even on relatively uncontroversial topics. *Nature's* survey found instances of scientists staying quiet: a few anonymous respondents wrote that they were hesitant to speak about some topics because they saw abuse being meted out to others. Anderson says her experience has changed how she communicates science, and she now declines most media interviews.

Tworek is concerned that seeing attacks and abuse levelled at senior scientists could discourage up-and-coming researchers. This applies especially to women, people of colour and individuals from minority groups. "It could be that you see anybody being abused, and you don't want to be subject to that yourself, but it may be particularly if you see somebody who is like you," she says.

Kuppalli appreciates the double-edged effect of her work being thrust into the limelight; she's been harassed, but has also had the opportunity to ensure science in the public arena is as accurate and as evidence-based as it can be. She's also aware that, as a woman of colour in a high-profile position, she has unusual privilege and responsibility. "That's also why I take it so seriously, because there's all these stories and articles and things written about how women are not getting opportunities," she says. "Every time I get that opportunity, I feel very grateful."

Bianca Nogrady is a freelance science journalist in Sydney, Australia.

Additional reporting and survey work by Richard Van Noorden.