

FOSSIL-FUEL POLLUTION AND CLIMATE CHANGE

Communicating Statistics on the Health Effects of Climate Change

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Health care professionals act as science communicators when they translate complex statistics to inform their patients about medical issues and motivate behavior change to

improve health. Traditionally, the focus of such discussions has ranged from medication side effects to rationales for cancer screening. But communications involving statistics can be challenging, as the Covid-19 pandemic has shown. Although solving communication problems alone won't always lead to behavior change — especially among skeptics — evidence shows that people are more likely to understand and be motivated by statistics if communicators present them thoughtfully and strategically.^{1,2}

We believe that some foundational behavioral-science principles can enable health professionals to use statistics in ways that inform and promote action rather than confuse or dissuade.

Though these lessons are broadly applicable, they are especially relevant to the current need to swiftly and effectively communicate the health and equity implications of climate change to patients and the public in order to protect health and motivate individual and collective action.

Providing numerical data is important: studies reveal that providing statistics can help earn people's trust and motivate them to engage in healthier behavior; many people also find numerical data useful.¹ Moreover, hearing a message from a trusted source, such as a health care professional, tends to make it more persuasive than it might otherwise be; recipients are more likely to follow related recommendations from

these sources.² Thus, clinicians have a powerful megaphone — and a profound responsibility — to effectively communicate health-related statistics. But the way they do so is important, especially given that about a third of Americans are functionally innumerate, lacking the basic math skills needed to make effective health decisions on the basis of the statistics they typically encounter.¹ Even highly educated people may be innumerate, although numeracy and education are correlated. Fortunately, some well-established principles can guide discussions with patients and the public at large.^{1,2}

The strategic process starts with choosing a communication goal — essentially, what the audience needs to understand. Attainment of that goal should — but often doesn't — drive the rest of the process. For example, in July 2021, the lay media reported that 4115 fully vaccinated

people in the United States had had breakthrough infections that resulted in hospitalization or death. Although health professionals understand that breakthrough infections are inevitable — even as the vaccines achieve their goal of preventing severe disease and death — this high number confused the public and undoubtedly contributed to anxiety and distrust. If the communication goal was to educate the public about the extent of the vaccine's protection, especially against hospitalization and death, it would have been better to express the hospitalization data, for example, as the number of hospitalizations per 100,000 people and compare the rates for vaccinated and unvaccinated groups. Then both data sets could have been displayed over the same time span, clarifying visually how vaccination reduced hospitalizations (see figure).

This example highlights the rapidly rising stakes of today's complex, interconnected health challenges. The medical and public health communities have to communicate, swiftly and decisively, what is known and how that knowledge might evolve. Being transparent about uncertainty may also serve the identified communication goal and help avert the undermining of trust when something unexpected occurs.¹

The harms of climate change are happening here and now, affecting health directly and indirectly, disrupting health care delivery, and creating and exacerbating inequities. Thus, one goal of communication with patients and the public should be to increase understanding of the connections between climate change and health, making them more real and relevant to the audience.

A further goal might be to promote understanding of actions people can take to protect their health and address the root causes of the problem.

An effective communication strategy for achieving these goals will have multiple components.^{1,2} Four key tactics are providing a meaningful context, reducing the cognitive burden for the listener or reader, adding stories when appropriate, and furnishing feasible solutions. These principles can be applied, for example, to the dissemination of information from a recent landmark climate-change study by Vicedo-Cabrera et al., which estimated that more than one third (37%) of heat-related deaths during warm months were directly attributable to human-induced climate change.³

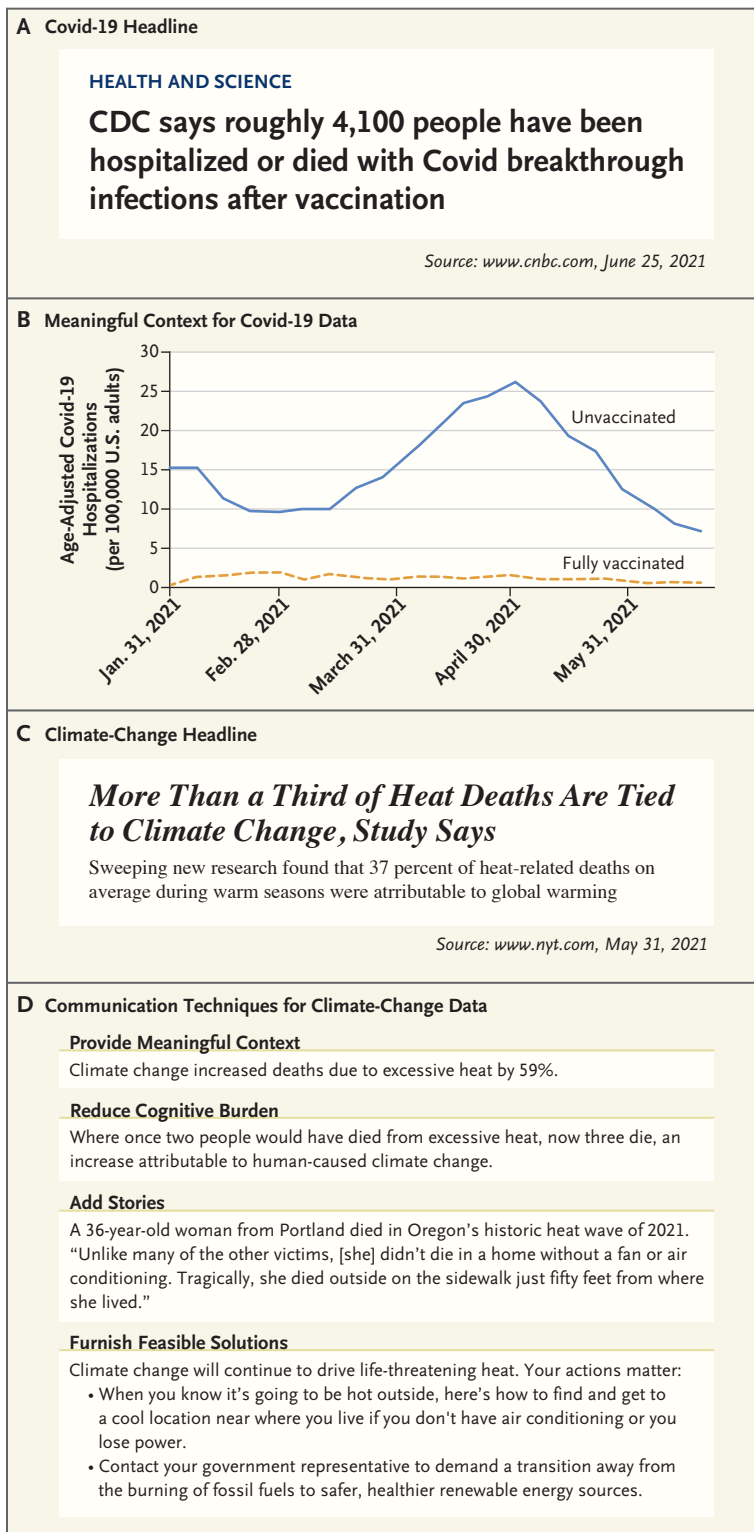
Statistics presented without context, however, can be abstract and meaningless; comparisons are one way to make data more intuitively comprehensible. One approach to providing meaningful context for the findings of Vicedo-Cabrera et al., for instance, would also take advantage of the power of negative framing^{1,4}: instead of citing the static 37% estimate, one could emphasize the growing mortality — an estimated 59% increase in heat-induced deaths attributable to climate change. Providing the estimated percentage increase in deaths in the reader's or listener's own city or state would probably be even more effective in helping people recognize how salient the threat is. It is therefore important to generate and communicate hyper-local data whenever possible.

People can also be tripped up by overly complex information, hence the second key tactic for effective communication — reducing the cognitive burden.

Communicators can't expect their audience to do the math. For example, since many people have difficulty comprehending percentages,¹ physicians might want to translate the 59% increase in deaths into small, easy-to-grasp numbers in statements such as "Where once two people would have died from excessive heat, now three people die, an increase attributable to human-caused climate change." Studies show that presenting such frequencies helps people imagine and respond emotionally to concrete situations.¹

Keeping frames consistent is also important. For example, health professionals should present either mortality or survival statistics and not alternate between them in the same message. And it is often less confusing and overwhelming for people if communicators don't provide all the available information at once.^{1,2}

Third, although communicating statistics thoughtfully may make messages more effective, transferring knowledge and raising awareness may be insufficient to motivate behavior change.^{2,4} People find it particularly easy to ignore health information that is unfamiliar and far from their own experiences. Stories (for example, those about people affected by extreme heat) can help bridge the gap in making critical connections between climate change and health. Many health professionals are practiced at pairing statistics with human narratives to educate patients, promote understanding of the relevance of a topic to their lives, and alter their emotions, beliefs, and behaviors. Individual anecdotes, however, don't clarify how common an experience may be, so they need to be paired with data on statistical likelihood.



Applying Behavioral-Science Principles to Communication about Covid-19 and about Climate Change and Health.

Panel A shows a headline about Covid-19 data, and Panel B shows how these data could be conveyed with a meaningful context. Panel C shows a headline that refers to Vicedo-Cabrera et al.,³ and Panel D describes communication techniques that could be combined to convey these data. Data in Panel B are from the Centers for Disease Control and Prevention; the story quoted in Panel D is from KGW8 News (August 12, 2021).

should include concrete calls to action. For example, health professionals can provide patients the information they need to protect their health during heat waves (e.g., how to identify cool locations during a power outage) or to help address climate change's root causes (e.g., contact your government representative to demand a transition away from the burning of fossil fuels to safer, healthier renewable energy sources). If people fail to perceive the efficacy of specific actions or lack confidence that they can take them, they lose hope for the future and are less likely to act.

The use of these and other evidence-based tactics is especially vital as the climate crisis accelerates and action stalls.^{1,2} Dedicated research is needed to test these techniques in the context of climate change, given the additional factors influencing people's perceptions, including misinformation campaigns and political polarization. But helping the public understand the issues is essential to protecting health today and galvanizing broad and immediate action toward an equitable transition away from fossil fuels.

Disclosure forms provided by the authors are available at NEJM.org.

Finally, perceived efficacy is key to encouraging behavior change⁵; people need to know about possible solutions and effective actions that they believe they can take. Communications

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Medical Device User Fee Reauthorization — Back to Basics or Looking Ahead?

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On March 22, 2022, the Food and Drug Administration (FDA) announced an agreement with representatives from the medical device industry on the proposed terms of a reauthorization of the Medical Device User Fee Amendments (MDUFA),¹ which permit the FDA to collect user fees from manufacturers to facilitate premarketing review and device oversight. This agreement represents the culmination of contentious, largely closed-door negotiations that extended beyond the statutory deadline of January 15, 2022. After soliciting public feedback, the FDA delivered a final proposal to Congress, which must reauthorize MDUFA by September 30, 2022. User fees have become vital to FDA operations; in fiscal year (FY) 2021, MDUFA user fees (\$269 million) accounted for 40% of the agency's device-regulation budget, with the remainder coming from congressional appropriations.

Congress first granted the FDA authority to collect user fees from device companies in 2002 under the Medical Device User Fee and Modernization Act (MDUFMA; see table). This legislation — modeled after a pre-

scription-drug program enacted in 1992 (PDUFA) — established a 5-year covenant between the industry and the FDA: medical device manufacturers agreed to pay a fee for each application in exchange for the FDA committing to meet goals for product-review times.² In 2007, Congress reauthorized the program (MDUFA II) and began permitting the FDA to collect annual registration fees from manufacturers to help ensure adequate funding levels when application volumes fluctuate downward; registration fees accounted for 70% of user fees in FY 2021. Subsequent reauthorizations in 2012 (MDUFA III) and 2017 (MDUFA IV) substantially increased total user-fee funding and directed the FDA to undertake initiatives supporting premarketing review, such as auditing agency review processes and developing expertise in digital health technologies.

The industry and the FDA began MDUFA V negotiations with different views on the program's future. Although the FDA has largely met or exceeded review-time goals (see the Supplementary Appendix, available at NEJM.org), review times increased amid

a surge in applications during the Covid-19 pandemic. Citing these setbacks, industry representatives advocated for a “back to basics” approach directing the FDA to focus MDUFA V fees and unused MDUFA IV funds on activities that would expedite premarketing review, such as hiring and training of review staff.

In contrast, the FDA proposed a forward-thinking approach: expanding the program's funding and scope to support complementary activities, such as strengthening postmarketing-surveillance capabilities and creating a program to solicit input from external stakeholders (e.g., patients, physicians, and payers) during product development. The latter initiative, known as the Total Product Life Cycle Advisory Program (TAP), proved particularly controversial. The FDA proposed that such input could help it proactively address potential barriers to successful commercialization, but the industry countered that involving additional stakeholders would increase review duration and complexity.

To help mitigate industry concerns, the MDUFA V proposal introduces performance-based