COMMENTARY

Disproportionate contributions to air quality-related deaths: The latest case against red meat

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On COVID and Agricultural Air Pollution

The COVID epidemic, which has been holding us under its thumb for over a year now, has so far claimed about 600,000 US lives (1). By any human measure, and compared to most historical mass casualty events, this is a staggering, epic toll. Yet suppose you found out that it only takes the US food system about 30 y to kill as many people by air pollution alone, above and beyond the deaths by the more familiar ways by which this food system kills Americans? (For the uninitiated, metabolic and dietary diseases, fortified novel pathogens, chemotoxicity, or pollution of drinking water, ponds, lakes, and coastal ocean are some of the more direct of these ways.)

Hard to comprehend and harder still to stomach though this statistic is, it is exactly what a stunning paper by Domingo et al. (2) in PNAS delivers, based on a novel quantification of diet-related air pollution deaths in the United States. It is a tour de force of amazing insights derived from nothing more than run-of-the-mill analysis of carefully curated data by solid, traditional tools containing nothing objectionable and minimal, well-reasoned conjecture. It puts Mark Twain's famous assessment of science as delivering (3) "such wholesale returns of conjecture out of such a trifling investment of fact" on its head, delivering wholesale returns of facts, important facts, out of trifling investment in methodology.

Let's make the COVID comparison a tad more formal. If we invoke the time elapsed since the 1918 flu pandemic to crudely estimate the return time of COVID-like pandemics to be on the order of a century, and assume a total US death toll on the order of a million, such pandemics claim roughly 3 lives $(10^5$ person $\times$ y$)^{-1}$. Meanwhile, the US food system claims (2) about 5.5 lives $(10^5$ person $\times$ y$)^{-1}$ by, again, air pollution alone. Or, compare this death rate to that of Alzheimer's disease (4), unquestionably among the most dreaded, devastating diagnoses one can face; it is roughly one-fifth. If you live in the Midwest or the Central Valley of California, your exposure to and risk from food production-related air pollution is manyfold higher (2). The only thing more astonishing than this mostly elective death toll itself is its ability to remain mostly concealed up until now.

Some Pertinent Historical Background

This important paper adds yet another disturbing leg to a stool whose legs keep proliferating, the one addressing the mostly optional ills wrought by our dietary choices and the agricultural system that caters to them, enables them, and ultimately promotes and perpetuates them.

In the modern era, the stool assembly began, decades back, with such visionary follow-up studies as the Framingham Heart Study, the Nurses' Health Study, or the Health Professionals Follow-up Study. Interpreting the steadily trickling results of these studies over decades, such pioneers as Meir Stampfer (5) or Walter Willett (6) at Harvard have been patiently documenting the ill health effects of some dietary choices, sadly among the most ubiquitous ones at that, and the ease with which one can unshoulder these effects with alternative choices. Today, these efforts have amassed a nearly bulletproof body of nutritional knowledge that, while being steadily revised and rethought, vividly documents just how powerfully diet shapes health and how suboptimal the mean American diet is.

Taking these results as mostly foundational givens, the next key leg of the stool was crafted by the trailblazing work of Marion Nestle at New York University along the often-uneasy suture lines between life and social sciences. Nestle (7, 8) painstakingly amassed what will eventually become a factually unimpeachable, historically important demonstration of the political and economic forces that promote and profit from our most damaging dietary choices. Likely most disturbing is Nestle's unveiling of a policy establishment (chiefly the US Department of Agriculture) that prioritizes agricultural corporations, food processing conglomerates, and the lobbying firms both employ with abandon, thereby redirecting the US food system away from protecting public health and in some important instances toward undermining it.

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These two merged tributaries were relatively recently joined by an upstart third, highlighting the environmental dimensions of food and food choices. This is my stomping grounds, and a field to which some of the authors (9–11) of the paper by Domingo et al. (2) have already made key contributions.

The novelty and brilliance of the current paper (2) is its bold synthesis. It builds conceptually on the established foundation of life cycle assessments, accounting-like environmental analyses, which have already documented in unambiguous detail the air pollution costs of food in individual farms. While not directly used here, this knowledge must have spawned the initial curiosity. Once underway, though, Domingo et al. wisely shunned farm-level results and instead combined official national agricultural emission data (after some requisite and sound massaging) with mortality statistics to derive a clear, general message, one that applies not to this farm or that, but to the whole nation. And clear and general their message is; you have to admit, it rarely gets much clearer than "air pollution from the US food system claims ≈18,000 lives annually."

The most important, enduring, and actionable part of the Domingo et al. results is the partitioning of total emissions of various mortality agents into the food categories that primarily cause these emissions. And here, the major surprise, at least to me, is just how unsurprising the bottom line turns out to be, how nicely it conforms with, yet adds to, the existing narrative, in which livestock, principally ruminants, overwhelmingly dominate total damage. [If you are a skilled watcher of Black Swans (12), "conforming with the existing narrative" understandably alarms you greatly. However, you need not be; you are in genuine expert hands here, not those of financial forecasters.]

So animal-based foods, especially beef, not only cause the most water pollution, claim the most high-quality cropland, emit the most greenhouse gas emissions, and cause the most cardiovascular and encephalovascular diseases per gram protein, kilocalorie, or gram, as is now firmly established. Animal-based foods—we now know courtesy of Domingo et al. (2)—also directly cause the most air pollution mortality. Their table S1 is one for the ages, a "must-frame" for any livestock enthusiast. Let me highlight just two tidbits. First, a gram of beef protein causes as many air pollution deaths as roughly 200 g of protein from broccoli, lentils, or buckwheat. Second, a beef kilocalorie causes as many air pollution deaths as 500 to 1,100 kcal from carrots, cauliflower, or celery.

Joining existing literature on the grossly disproportionate nutritional and environmental costs of livestock, most notably beef, the powerful results of Domingo et al. (2) question, yet again, our stubborn failure to drastically reduce our consumption of animal-based foods, most urgently beef.

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4 US Department of Health and Human Services, Center for Disease Control and Prevention, Leading causes of death. https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm. Accessed 18 April 2021.

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