Journal of Public Health Policy (2024) 45:1–7
https://doi.org/10.1057/s41271-023-00460-3

EDITORIAL

Tipping points, still-points, and missing points in the public health agenda for climate change, food safety and food security

Elena N. Naumova[1]

Accepted: 11 December 2023 / Published online: 26 January 2024

Critical points, change points, influential points, tipping points, points of no return—these concepts are fascinating; and they can be terrifying depending on the context. Some of them dominate the discussion of epochal changes in ecology and evolution, climate change and environmental degradation, genesis and senescence. And for a good reason: understanding a system's behavior at near-critical conditions is both desirable and challenging. Humans are driven by curiosity to know what is beyond the horizon and ask 'Are we there yet' questions. Physicians measure vital signs and check biomarkers to follow disease progression, for better or for worse. Public health professionals implement policies to prevent communities from self-inflicted harm.

Climate change scientists are setting goals of detecting the markers—the critical points—to assess the likelihood and risks of unavoidable, irreversible, or abrupt changes. These changes are reflected in the key documents of the Intergovernmental Panel on Climate Change (IPCC), a United Nations body that conducts scientific assessments on climate change. The IPCC's reports are a collaboration of scientific expertise and political consensus created to provide policymakers with regular scientific assessments on climate change. This UN body presented the IPCC Sixth Assessment Report (AR6) to the public in March of 2023. It recognizes "the interdependence of climate, ecosystems and biodiversity, and human societies; the value of diverse forms of knowledge; and the close linkages between climate change adaptation, mitigation, ecosystem health, human well-being and sustainable development, and reflects the increasing diversity of actors involved in climate action" [1]. The report also emphasizes tipping points—the critical thresholds in the Earth's climate system. It states that "the likelihood and impacts of abrupt and/or irreversible changes in the climate system, including changes triggered when tipping points are reached, increase with further global warming (*high confidence*)" [1].

✉ Elena N. Naumova
elena.naumova@tufts.edu

[1] Friedman School of Nutrition Science and Policy, Tufts University, Boston, USA

Tipping points in climate change

One example of tipping points in climate change is the melting of the Arctic Sea ice and the collapse of the Greenland and West Antarctic ice sheets. As the Arctic Sea ice melts, it reduces the Earth's albedo (reflectivity) and allows more solar radiation to be absorbed by the ocean. This further accelerates ice melt, creating a positive feedback loop. If the Arctic becomes ice-free during the summer months, it could have profound global climate implications. If the Greenland and West Antarctic ice sheets, a massive store of freshwater, were to melt, destabilize and collapse, it could contribute to substantial sea-level rise, affecting coastal regions around the world. Once a certain threshold of ice loss is reached, it may become unstoppable and lead to drastic shifts in climate patterns with far-reaching effects on weather systems.

Other examples of tipping points are the permafrost thaw, the release of methane hydrate, large-scale deforestation, and the dieback of rainforests that can intensify a feedback loop of increased warming, accelerating climate change. The loss of critical carbon sinks could release vast amounts of carbon dioxide into the atmosphere. Widespread coral bleaching could lead to ecosystem collapse with consequences for marine life and fisheries. These tipping points are of great concern because they may result in rapid and severe consequences for the planet's climate, eco-heath, and society.

Because these changes may have appeared somewhere far away, 'not in my backyard' and consequences would come not tomorrow, many may ask 'Why worry'? Yet, the reminders appear frequently; they only require viewing from a high vantage point if one is to recognize these phenomena. The likely ones include an increase in hospitalization due to fully preventable heat strokes or summer food poisoning—as we simultaneously approach two tipping points, one in climate change, the other in public health infrastructure.

Behind the less immediately visible but massive changes in climate and weather patterns on the global scale, there are more tangible changes in our daily routines. The United States Department of Agriculture (USDA) has released the latest version of its Plant Hardiness Zone Map—the first update since 2012 [2]. The color-coded map helps farmers and gardeners determine which plants are most likely to thrive at a given location. The zones are based on average low temperatures to inform whether a certain plant could survive the winter. As winters warm nationwide, zones shift northward, along with the frequency and likelihood of freezing points. How might we take a closer look to see the effects of climate change 'in my backyard'? And how do we learn to connect the dots—so that the next time we hear about the food recall for packaged lettuce, we see it as a backyard example of these global changes?

What do such changes mean for public health professionals? Should we treat climate change as a public health crisis? Are we already amid a global health emergency? Are we reaching public health tipping points? Let's look at one 'starting point', the climate change summit in Paris on 13 December 2015. There the Parties (state signatories) to the United Nations Framework Convention on Climate Change (UNFCCC) reached an agreement to guide future global climate change policy

and actions. At that point, countries had not yet come together to make policies and investments to limit climate change in a way calculated to mitigate deleterious 'social determinants of health' and address key points of the public health agenda [3].

Tipping points in public health

In ecology and climate change science, tipping points often refer to critical thresholds where a relatively small change can trigger complex nonlinear self-reinforcement. In public health, the concept of tipping points might be framed differently, as we aim primarily to prevent health crises, control diseases, and promote wellness, rather than dealing with long-term, large-scale environmental or climatic changes. Although public health interventions can have significant and positive impacts on populations, the consequences are generally more immediate and directly related to individual or community health. That said, in public health, 'irreversible' changes can also occur in the sense of serious consequences of loss of life due to public health system collapse.

Public health and climate change fields have their specific terminologies and approaches based on their objectives and methodologies. While there may not be direct parallels between the concept of tipping points in ecology or climate change and public health, the core idea is that recognizing critical thresholds—and acting before they are crossed—is essential for preventing detrimental outcomes.

There are indeed examples in public health, as well as in broader social and environmental contexts, that align more closely with the concept of a point of no return. The collapse of a health system due to military conflict and loss of livelihood is a pertinent example. A military conflict could lead to a nuclear war, a catastrophic and potentially irreversible event with profound public health implications and multigenerational imprints in affected regions. Economic factors, such as a severe economic recession or collapse of industries, can lead to increased poverty, food insecurity, and lack of healthcare and have weighty public health consequences with long-lasting impacts. The recent worldwide post-pandemic destabilization and ongoing conflicts in Europe, the Middle East, Asia, and Africa could bring the world closer to the point of no return.

A less dramatic yet prominent example of a tipping point in public health is the aging healthcare workforce, accelerated by population aging, workforce shortages, and maldistribution. In many industrialized nations, a generation reaching retirement age comprises a significant fraction of the public health workforce just as demand for healthcare services increases. The workforce itself, including public health professionals, physicians, and nurses, is also losing an experienced cadre without adequate replacement. The healthcare staff is not evenly distributed across all specialties and geographic areas, exacerbating inequalities. Observers commonly list burnout, exhaustion, and mental health problems as common issues for both the workforce and the general population. For public health professionals, burnout becomes the primary reason to leave the workforce. Training

the public health workforce is expensive and time-consuming. Losing a trained workforce because of the societal inability to adjust to current demands is careless and wasteful.

Missing points

The IPCC Report emphasizes the effect of climate change on increasing food insecurity and food-borne diseases, along with the subsequent inequality in dealing with food insecurity and preventing food-borne diseases.

Although the report recognizes the reduction of food waste and loss as critical, it appears to miss the links between food safety, food security, and the infrastructure ensuring food safety and security.

The link between foodborne illness and climate change is straightforward. The pathogens that cause many foodborne infections are sensitive to ambient temperature: warm wet weather stimulates bacterial growth. With climate change we see a substantial increase in overall air temperature, water temperature and precipitation, the environmental factors that most increase the risk of food contamination. Growing stress on power grids for food storage, transportation, and temperature control, especially during heatwaves and extreme weather events, jeopardizes food safety and could lead to a foodborne illness surge.

Multiple stakeholders address climate change preparedness, *or* food security, *or* food safety, *or* reduction of food waste. These efforts are disconnected and rarely address the needs of marginalized communities. Food insecure households suffer from a disproportionally high toll of climate change impacts.

In the United States (US), consumers spend $1.1 trillion yearly on food [4]. Adding impacts on health care, loss of biodiversity, and deteriorating environment, the food system costs a total of $3.2 trillion per year, more than three times the market value of expenditures. In 2019 alone, 80.6 million tons of available food, valued at $408 billion, remained unsold or uneaten; this largely became food waste and contributed approximately 54 million tons to landfills and combustible municipal solid waste [5]. The US Centers for Disease Control and Prevention (CDC) estimates that annually 48 million—almost 1 in 6 people in the US—get sick from foodborne illness [6] and the only safety measure deployed to prevent foodborne illness is food recalls—when a manufacturer or distributor voluntarily removes food products from commerce due to their expected risk to human health.

In the US, 15 federal agencies engage in some aspect of food safety oversight. Two bear primary responsibility for foodborne illness and recall surveillance: the US Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) and the US Food and Drug Administration (FDA). Fragmented federal food safety oversight has resulted in a lack of standardized reporting and interoperability across regulatory agencies and food safety surveillance systems. These deficiencies impede the precision and generalizability of data-driven approaches to investigate emerging public health threats such as climate change and extreme weather events.

Connecting the dots

Although we recognize the connections between climate change, food security, and food safety, we have no indicators sensitive to detecting the effects of climate change and extreme weather on food safety and security. The reasons for this disconnect are many: *multi-disciplinarity and complexity* challenge, *multi-agency and multi-scale* challenge, and the *pace of change and reaction time* challenge, in other words, the lack of integration of minds, resources, and goals.

The *multi-disciplinarity and complexity* challenge is, in part, due to poor integration of research talents working in closely related areas. For example, research groups developing metrics related to food security, groups focusing on modeling and forecasting climate change, groups working on assessing the effects of climate change on health and wellbeing, and groups responsible for practical solutions to prevent and mitigate the effects of climate change are administratively and programmatically lack crucial connections. Their efforts and goals are not well integrated—but they should be.

The multi-agency and multi-scale challenge is, in part, due to fragmentation of resources, where open data sharing requirements of federally collected information are unequal to and do not translate into broad data usability. For example, to assess the relationship between foodborne disease outbreak (FBDO) and heatwave onsets, given the high likelihood of a power outage, we need to combine food safety data from the CDC with data on extreme weather (EWE) collected by the US National Weather Service and with records collected by US Energy Information Administration. Just focusing on the timing aspect: FBDOs and food recalls are typically updated weekly, but they are released to researchers after a 3–36-month delay. Data on EWEs are commonly available 1–2 days after an event, but the EWEs summaries are too generic and may not provide the needed parameters. Records on major disturbances in electricity power appear monthly and suffer from severe underreporting. To make information actionable, the data-holding agencies must examine data for quality and release it to researchers on time in a usable format. Only when credible data are accessible, proper warnings and forecasts can be developed. Such data are beyond the reach of investigators—but should not be.

The *pace of change and reaction time* challenge is due, in part, to the requirements for fast decisions at critical times that must be balanced with envisioned short-term and long-term consequences and supported by metrics intended to measure the success of policy or interventions. Limited efforts to engage multidisciplinary groups in identifying and achieving consensus on metrics reduce our ability to assess the impacts of climate change on health, nutrition quality, food safety, and food security. The most affected communities very often have limited information to judge and the least voice to appeal. Thus, guiding policies and programs are inadequately tailored to enable the prevention and mediation of the long-lasting social impacts of climate change-related insults.

Closing points on continuous improvements

Building an integrated strategy for climate change preparedness and mitigation and food safety and security could start by further improving health surveillance. Leveraging national data repositories and supporting predictive modeling are critical to inform real-time food safety and food security responses to climate change. *Imagine if we could leverage surveillance to inform food safety emergency preparedness and response to reduce health risks related to climate change.* These efforts will help to accelerate the adoption of emerging solutions by:

- developing education strategies and programs tailored to helping communities prevent food-related diseases and food waste,
- promoting local growers and directing more and better food to food deserts,
- minimizing risk of food contamination and establishing better warning before extreme weather events for the public and key stakeholders,
- accelerate our capabilities for data gathering, measuring, and predicting the effects of extreme weather events on the food and health systems, and
- empowering young voters and marginalized communities, and to truly hear their voices.

Globally and nationally, we should develop, test, and implement health security initiatives in collaboration with safety regulatory agencies to leverage historical data, understand the socioeconomic and environmental drivers of health, and promote strategic planning and preparedness for future climate challenges. To reduce health risks related to climate change, we must identify and measure relevant outcomes and driving factors and consolidate and share the information. Then it becomes possible to design better policies and to test and implement them. *Imagine if we could expand the utility of the global and national surveillance systems* and examine the relationships between health outcomes (like heat strokes and FBDO), climate-related factors (like heatwaves, droughts, and floods), social indicators (like food insecurity and access to health care), and infrastructure (like power outages and vaccination coverage)—to inform health emergency preparedness and response while maintaining transparency and assessing the effectiveness of implemented public health policies.

At the *Journal of Public Health Policy* (*JPHP*), we welcome new ***viewpoints*** and solutions for ongoing and upcoming challenges. We invite authors to challenge the ***still-point***, a state of mind where one has stopped moving into the future and is resting in the present. Humanity had invented and discovered many 'points', here is a brief overview:

- In chemistry, the ***boiling point,*** the ***freezing point***, and the ***melting point*** are the temperatures (under standard atmospheric pressure) at which a substance changes from a liquid to a gas, a liquid to a solid, and a solid to a liquid, respectively. The ***flash point*** is the lowest temperature at which a substance's vapor can ignite when exposed to an open flame or spark. In various fields, the ***saturation point*** represents the maximum level or concentration of a substance that can be dissolved or absorbed by another substance at a given temperature and pressure.

- In art, design, and decision-making, the ***focal point*** refers to the central or main point of attention or interest, and the ***vanishing point*** is the point in a perspective drawing where parallel lines appear to converge and disappear into the distance.
- In negotiation or problem-solving, a ***sticking point*** refers to an issue or obstacle that is preventing progress or agreement.
- In aviation, a ***landing point***, is the designated area on a landing strip where an aircraft is intended to touch down.
- In psychology or personal life, the ***breaking point*** is the moment when a person can no longer cope with stress, pressure, or a challenging situation. The ***crisis point*** is a point in time or a situation that represents a critical and potentially dangerous moment, requiring immediate attention or resolution.
- In narratives or historical events, a ***turning point*** marks a critical moment or event that significantly alters the course of a story or history.
- In the context of statistics and data analysis, ***change points*** and ***inflection points*** each refer to a specific time at which there is a noticeable shift in the underlying characteristics or behavior.

And my favorite, the ***vantage point***—is a specific location or position from which someone can observe a situation, event, or scene, typically offering an advantageous perspective. It provides a clear view of what is happening, allowing for a broader understanding of the situation.

From a ***public health point of view***, we must do a great deal to prevent the ***point of no return***.

Elena N. Naumova, Editor-in-Chief.

Data availability Not applicable.

References

1. IPCC. Summary for policymakers. In: Core Writing Team, H. Lee and J. Romero, editors. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: IPCC; 2023. pp. 1–34. https://doi.org/10.59327/IPCC/AR6-9789291691647.001.
2. 2023 USDA Plant Hardiness Zone Map. https://planthardiness.ars.usda.gov/. Accessed 29 Nov 2023.
3. Robbins A. How to understand the results of the climate change summit: Conference of Parties21 (COP21) Paris 2015. J Public Health Policy. 2016;37:129–32. https://doi.org/10.1057/jphp.2015.47.
4. The Rockefeller Foundation. True cost of food: measuring what matters to transform the U.S. food system. The Rockefeller Foundation. https://www.rockefellerfoundation.org/report/true-cost-of-food-measuring-what-matters-to-transform-the-u-s-food-system/. Accessed 29 Nov 2023.
5. ReFED, Inc. Roadmap to 2030: reducing U.S. food waste by 50% and the ReFED insights engine at-a-glance. Long Island City: ReFED, Inc.; 2021. p. 19.
6. CDC. Foodborne illnesses and germs. Centers for Disease Control and Prevention; 2020. https://www.cdc.gov/foodsafety/foodborne-germs.html. Accessed 29 Nov 2023.