

OPINION EDITORIAL

Climate Change and the Role of the Frontline Physician

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INTRODUCTION

With the growing awareness of its significance and multisectoral implications, it is necessary to understand climate change as a direct and pressing health issue [1]. Climate change has resulted in an average increase in global temperature, more extreme weather events, a rise in sea levels, and is also intimately associated with worsening air quality and a change in disease distribution [1]. Although low- and middle-income countries have relatively lower greenhouse gas emissions per capita than their high-income counterparts, it is expected that they will experience the brunt of these effects in the years to come [1]. In fact, adverse climate-related health outcomes are likely to be a reality for a significant portion of the global population. This Opinion Editorial will assert that frontline primary care providers and emergency medicine physicians are thus uniquely positioned to have a role in addressing adverse health outcomes expected to occur from climate change.

THE IMPACT OF CLIMATE CHANGE ON HEALTH

Perhaps the most easily identifiable health effects of climate change are the primary effects, also referred to as direct effects [2,3]. These include heat-related illnesses, like heat exhaustion and heat stroke, as well as injuries and mortality due to storms and floods [2,3]. However, readily observed primary effects fail to capture the full picture, as illustrated by the death count from Hurricane Maria in 2017. While the official death count from the hurricane's landfall was 64, an estimate that accounted for the aftereffects of the storm placed

the death toll at 4,645 [4].

Secondary or indirect effects have a non-linear relationship with health, yet comprise the bulk of the climate-health relationship. This can make them more difficult to quantify, predict, and study. Secondary effects refer to shocks within social and economic systems and to infrastructure. Food supplies are a prime example of this, as they are particularly vulnerable to changes in climate. In 2010, Russian wildfires destroyed one third of wheat supplies, increasing prices and halting international export [3]. Food shortages and resultant price fluctuations likely played a key role in the resultant increase in population wide malnutrition and food insecurity, with well-known negative health consequences [2,3,5]. Rising temperatures can also lead to water shortages, as seen in Cape Town in 2018 [2,6]; the water stress there caused dehydration, reduced the frequency and efficiency of hygiene practices, and increased vector-borne disease transmission [7]. The downstream effects of floods can also lead to the contamination of groundwater supply and increase diarrheal illness, as seen in a norovirus outbreak following Hurricane Katrina [3,6]. A final example of secondary impacts to health include the compromise to healthcare access which can occur when hospitals are damaged by fires, requiring patient relocation [8,9], and limiting the distribution of necessary medications [4].

Moreover, when the climate changes, geographical patterns of disease can quickly shift as well. Warmer weather has extended the range of tick-borne diseases northward: the at-risk areas for

Lyme disease in Canada and tick-borne encephalitis in Sweden have expanded with tick habitats [2,3,6]. Similarly, malaria, dengue, and cholera are of growing concern in areas where mosquitoes are now able to proliferate [2,6]. Additionally, with changes in the landscape of livable spaces, increasing urbanization pressures are also leading to an increase in the encroachment of human populations onto wildlife territories. For example, a 2018 study described an increased burden of animal-related injuries, including bites and stings, which was thought to be attributable to this overlap between human development and available habitat for wild animals [12].

Tertiary effects of climate change on health largely relate to the socioeconomic fallout from the primary and secondary effects. Although extremely significant, these effects are poorly documented because of difficulties with quantification. For example, the economic impact of job loss in Canadian communities that rely on forestry, fishing, and farming will contribute to malnutrition and housing insecurity [2]. Conflict over clean water and living space, as well as trauma from significant disasters, will likely only exacerbate these challenges [2,3].

Of particular concern is that disadvantaged and vulnerable populations will feel these effects most acutely: the very young and very elderly, people with unstable housing or living in substandard housing conditions, and the chronically ill [3,13]. Difficulty accessing transportation and affording food, inappropriate home temperature regulation in the summer and winter months, and increased social isolation will exacerbate climate-health interactions in these populations [5].

WHAT CAN PHYSICIANS DO?

Once the various health impacts of climate change are understood, healthcare providers must take steps to mitigate them. Family and emergency medicine physicians in particular are well-poised to assess climate-health impacts and therefore engage in patient education on this matter, while advocating for needed change.

I. Patient Education

By educating their patients and promoting behavioural change, family physicians can simultaneously help patients adapt to climate change and mitigate environmental damage. In particular, by encouraging active transportation such as walking, running, or biking, physicians can reduce carbon emissions while improving the cardiovascular health of their patients [3]. Encouraging patients to replace meat with foods further down the food chain, such as plant-based alternatives is another strategy to reduce the environmental impact of animal agriculture as well as rates of cardiovascular disease, obesity, and diabetes [3].

II. System-Wide Action

There are many ways to effect change at a systems level as a frontline physician. In particular, physicians can identify wasteful practices in their workplace and either employ more sustainable alternatives themselves or advocate action from hospital administrators and management. Eliminating or reducing waste in the healthcare sector—accounting for 10% of emissions in the US—is not only important, but attainable; Gundersen Health Systems is one such example of an organization that generates more energy through solar, wind, and methane than it consumes [8]. By advocating to elected officials, physicians can help encourage the adoption of similar initiatives in other settings, by testifying publicly or meeting with legislators. Connecting with advocacy organizations and climate activism leaders is an important strategy in streamlining efforts, and ensuring physicians' efforts are most optimally directed [3,8]. Likewise, physicians could partner with public health colleagues to engage more deeply in the organization of emergency response facilities to accommodate increased patient volumes following heat waves and floods [3].

III. Individual Action

At an individual level, there are many opportunities for family physicians to contribute to

change through personal lifestyle changes. By participating in eco-friendly behaviours like active transport, they can reduce their own carbon footprint while serving as positive role models [3]. By implementing sustainable practices in their offices (e.g. less printing, reusable cloth gowns, lights on timers, showers and bike storage for employees and colleagues), physicians can normalize positive behaviours for medical trainees to carry forward into their own practice [13].

IV. Collective Action

Collectively, physician associations should become more aware of what resources they invest in. By financially divesting from the fossil fuel industry and allocating investments toward environmentally-responsible organizations, physicians can apply significant financial pressure to promote positive change [8]. In addition, the purchasing power of physicians may allow them to influence medical supply companies to adopt more environmentally friendly options, by preferentially supporting businesses which shift to more responsible practices [15]. Common disposable supplies—gowns, drapes, basins, and so on—can be made to be reusable, saving money in the long term and substantially reducing medical waste [16]. Similarly, family physicians can use their voice to encourage financial divestment at the level of large-scale professional organizations, such as medical schools and hospital networks [8].

CONCLUSION

As climate change and its consequences accelerate, adverse health outcomes will become more prevalent across the globe. Family and emergency physicians will be the first contact for many patients whose health will be affected by disease, poor air quality, extreme weather conditions, and food insecurity. Therefore, physicians must play a role in climate change advocacy, from single-patient interactions to major systems-wide change, in order to ensure the health of both their patients and their communities.

REFERENCES

1. Watts N, Amann M, Ayeb-Karlsson S, Belesova K, Bouley T, Boykoff M, Byass P, Cai W, Campbell-Lendrum D, Chambers J, Cox PM. The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. *The Lancet*. 2018 Feb 10;391(10120):581-630. DOI: 10.1016/S0140-6736(17)32464-9.
2. Abelsohn A, Rachlis V, Vakil C. Climate change: Should family physicians and family medicine organizations pay attention?. *Canadian Family Physician*. 2013 May 1;59(5):462-6.
3. McMichael AJ. Globalization, climate change, and human health. *New England Journal of Medicine*. 2013 Apr 4;368(14):1335-43. DOI: 10.1056/NEJMr1109341.
4. Kishore N, Marqués D, Mahmud A, Kiang MV, Rodriguez I, Fuller A, Ebner P, Sorensen C, Racy F, Lemery J, Maas L. Mortality in Puerto Rico after hurricane maria. *New England Journal of Medicine*. 2018 Jul 12;379(2):162-70.
5. Kearney GD, Jones K, Bell RA, Swinker M, Allen TR. Climate change and public health through the lens of rural, eastern North Carolina. *North Carolina medical journal*. 2018 Sep 1;79(5):270-7.
6. Epstein PR. Climate change and human health. *New England Journal of Medicine*. 2005 Oct 6;353(14):1433-6. DOI: 10.1056/NEJMs1803972.
7. Parks RO, McLaren ME, Toumi RA, Rivett UL. Experiences and lessons in managing water from Cape Town. *Grantham Institute, Imperial College London*. 2019 Feb.
8. Solomon CG, LaRocque RC. Climate change—a health emergency. *New England Journal of Medicine*. 2019 Jan 17;380(3):209-11. DOI: 10.1056/NEJMp1817067.
9. FitzGerald GJ, Capon A, Aitken P. Resilient health systems: preparing for climate disasters and other emergencies. *Med J Aust*. 2019 Apr 15;210:304-5. DOI: 10.5694/mja2.50115.
10. Bourne RR, GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet*. 2016 Oct 6;388(10053):1659-724. DOI: 10.1016/S0140-6736(16)31679-8.
11. World Health Organization. Metrics: Disability-Adjusted Life Year (DALY). Available from: https://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/
12. Forrester JD, Forrester JA, Tennakoon L, Staudenmayer K. Mortality, hospital admission, and healthcare cost due to injury from venomous and non-venomous animal encounters in the USA: 5-year analysis of the National Emergency Department Sample. *Trauma Surgery & Acute Care Open*. 2018 Nov 1;3(1). DOI: 10.1136/tsaco-2018-000250 .

13. Blau E, Asrar FM, Arya N, Schabert I, Abelson A, Price D. Greener medical homes: Environmental responsibility in family medicine. *Canadian Family Physician*. 2016 May;62(5):381.
14. Williams N. The missing climate change policy. *Current Biology*. 2010.
15. Richardson J, Kagawa F, Nichols A. Health, energy vulnerability and climate change: a retrospective thematic analysis of primary care trust policies and practices. *Public Health*. 2009 Dec 1;123(12):765-70. DOI: 10.1016/j.puhe.2009.10.006.
16. Conrardy J, Hillanbrand M, Myers S, Nussbaum GF. Reducing medical waste. *AORN journal*. 2010 Jun 1;91(6):711-21. DOI: 10.1016/j.aorn.2009.12.029