

Carbon emissions and public health: an inverse association?



The link between increasing atmospheric concentrations of greenhouse gases and climate change is well established, as are the effects of climate change on public health. These include heat-related morbidity and mortality,¹ and effects on the transmission of vector-borne and food-borne diseases.² Individuals affected by adverse health outcomes are likely to have encounters with the health sector, which has its own significant carbon footprint as shown in the Article in *The Lancet Planetary Health* by Arunima Malik and colleagues.³

This paper makes an interesting contribution to the climate change literature, highlighting that health care has a carbon footprint in the order of 3–10% of national carbon dioxide equivalent (CO₂e) emissions in countries around the world. The authors calculate that, in Australia, the health-care sector represents 7.2% of Australia's total CO₂e emissions, with more than a third of these emissions contributed by public hospitals, more so if capital expenditure is included.³ Reducing this carbon footprint will be difficult given that Australia has an ageing population and, therefore, an increasing need for health care. A simplistic approach could be to address the carbon footprint of hospitals or aim for a healthier population, requiring less access to health care.

Of all building types, hospitals are the second most intensive users of energy for reasons that include the use of energy-intensive equipment and the need to be well lit, well ventilated, and temperature controlled 24 h per day.⁴ In Adelaide, SA, the largest and most advanced health-care facility in Australia, the Royal Adelaide Hospital has recently opened. This cost AUS\$2.3 billion, and the 800 bed hospital aims to have 50% lower greenhouse gas emissions than its predecessor, with a high reliance on new technologies for energy efficiency; ample use of natural sunlight, gardens, and green spaces; and co-generation of power via waste heat for heating and cooling.⁴ There are also high efficiency water fittings, and captured or recycled water is used for toilet flushing and irrigation. As such, the hospital has been recognised by the Green Building Council of Australia for its commitment to environmentally-sustainable building design,⁵ which sets an example for reducing carbon footprint.

The Royal Adelaide Hospital also features telehealth facilities so that consultations can be done with patients

in regional and remote areas.⁵ Telemedicine and e-health files have been shown to reduce the carbon footprint of health care and a useful climate change mitigation strategy.⁶ A study in Sweden⁶ has shown that because of the reduction in transportation-associated carbon emissions, telemedicine results in a 40–70 times decrease in the amount of carbon emissions produced compared with the traditional model of patients visiting their health-care practitioner.

The second option to reduce the carbon footprint of the health-care sector is to minimise the number of patients. As Malik and colleagues point out, public health can play a major role in preventing hospital admissions.³ In 2011, the Australian Burden of Disease Study⁷ showed that most of the burden of diseases was attributed to chronic diseases including cancers, cardiovascular diseases, mental and substance use disorders, and musculoskeletal conditions and injuries. At least 31% of this burden was preventable. The use of tobacco and alcohol, high body mass, and physical inactivity were among the major risk factors.⁷ Health promotion efforts to encourage healthy lifestyles will help to reduce the need for access to health care and on the reliance for pharmaceuticals, the sectors with the highest direct CO₂e emissions.³ It would therefore appear that improving population health could lower hospital admissions and reduce the carbon footprint of health care; and lowering greenhouse gas emissions will reduce the burden of climate change on population health.

Malik and colleagues³ have calculated the environmental footprint of Australia's health-care system, and the key message is the burden it places on Australia's total emissions. This work highlights the need for further research to investigate additional mitigation strategies in health care. Adaptation measures and risk communication messages are also useful to reduce the increased burden on the health-care system, particularly those as a consequence of extreme weather events that will become more frequent with climate change. Community-based adaptation can help build community resilience and reduce vulnerability to climate stressors⁸ and heat-health warnings to the public have been shown to reduce morbidity during severe heatwaves.⁹ Together with mitigation strategies, adaptation options could also be considered by the health sector. Health practitioners could



Science Photo Library

See [Articles](#) page e27

play a leadership role distributing targeted information at the start of summer to susceptible patients on how to stay healthy in the heat. This information, together with messages on how to maintain a healthy lifestyle, might help to reduce individual and community vulnerability to the health effects of climate change and, ironically, help lower the main contributing factor—carbon emissions.

*Peng Bi, Alana Hansen

School of Public Health, University of Adelaide, Adelaide, SA 5005, Australia

peng.bi@adelaide.edu.au

We declare no competing interests

Copyright © The Author(s). Published by Elsevier Ltd. This is an open access article under the CC-BY-NC-ND 4.0 license.

- 1 Ebi KL, Mills DM, Smith JB, Grambsch A. Climate change and human health impacts in the United States: an update on the results of the US national assessment. *Environ Health Perspect* 2006; **114**: 1318–24.
- 2 Campbell-Lendrum D, Manga L, Bagayoko M, Sommerfeld J. Climate change and vector-borne diseases: what are the implications for public health research and policy? *Philos Trans R Soc Lond B Biol Sci* 2015; **370**: 20130552.
- 3 Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian health care. *Lancet Planet Health* 2018; **2**: e27–35.
- 4 Opray M. Sensors, plants and waste heat: Adelaide hospital's bid to be most energy-efficient. *The Guardian* (London), June 5, 2017. <https://www.theguardian.com/sustainable-business/2017/jun/05/sensors-plants-waste-heat-adelaide-hospitals-bid-to-be-most-energy-efficient> (accessed Dec 8, 2017).
- 5 Government of South Australia. Royal Adelaide Hospital. 2017. <https://www.rah.sa.gov.au/> (accessed Dec 8, 2017).
- 6 Holmner A, Ebi KL, Lazuardi L, Nilsson M. Carbon footprint of telemedicine solutions—unexplored opportunity for reducing carbon emissions in the health sector. *PLoS One* 2014; **9**: e105040.
- 7 AIHW. Australian Burden of Disease study: impact and causes of illness and death in Australia 2011. Canberra: Australian Institute of Health and Welfare, 2016.
- 8 Ebi KL, Semenza JC. Community-based adaptation to the health impacts of climate change. *Am J Prev Med* 2008; **35**: 501–07.
- 9 Nitschke M, Tucker G, Hansen A, Williams S, Zhang Y, Bi P. Evaluation of a heat warning system in Adelaide, South Australia, using case-series analysis. *BMJ Open* 2016; **6**: e012125.