

Response to correspondence by Weisz et al.

Quantifying and interpreting greenhouse gas footprints of health care

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Climate change threatens to undermine the last 50 years of gains in public health, and the health community has an ethical responsibility to lead by example as it mitigates and adapts in response to this challenge. The correspondence from Weisz et al.¹ is very much welcomed, as is their work and expertise in this emerging field,² suggesting that healthcare in OECD countries (excluding Chile) plus China and India contributed approximately 4.4% of global CO₂ emissions in 2014. This overall estimate is similar to the estimate of 4.6% - presented in the 2019 report of the Lancet Countdown,³ which included an expanded set of countries and regions. Moreover, both analyses highlight a profound gap in per capita healthcare emissions between the high and low emitters (for example, the comparison between the USA and India).

The differences Weisz et al. note in country-specific results between the two assessments are important, and stem from the different methods taken to consider temporal changes. Pichler et al. produced results for 2000-2014, for countries where health expenditure data were available, using a dynamic set of environmentally-extended multi-region input-output (EE-MRIO) tables in the EORA model (which captured CO₂ emissions only).⁴ To align with the Lancet Countdown's mandate of monitoring the evolving health profile of climate change, the production of data up to a more recent year (2016), the inclusion of all countries, and full coverage of greenhouse gas emissions were prioritized. Since no suitable EE-MRIO tables include all GHG emissions of interest were available for recent years, this resulted in a trade off, requiring the use of a static form of the EXIOBASE EE-MRIO model and deflating expenditures occurring after the model year. As acknowledged in the appendix,³ this meant that neither changes in economic structure nor emissions intensities occurring between the EE-MRIO model year and the expenditure year would be accounted for. In line with the Lancet Countdown's commitment to continuously improve each indicator, the collaboration is currently working on bridging this gap by updating the EE-MRIO model and incorporating changing emissions intensities in all countries, as suggested.

Weisz et al. also highlight the large disparities in quality of healthcare provision between different countries, which could be reflected on the carbon footprints of national healthcare systems. This important observation has been extensively discussed within the Lancet Countdown in the past. Ideally, results would be normalized to an index capturing healthcare quality, including access, when comparing national health care emissions (or expenditures). However, developing a suitable index to represent the

full range of countries and global healthcare systems is not without challenges, and this work is still in progress.

1. Weisz H, Pichler P-P, Weisz U, Jaccard I. Quantifying and interpreting greenhouse gas footprints of health care. *The Lancet* 2020.
2. Pichler P-P, Jaccard IS, Weisz U, Weisz H. International comparison of health care carbon footprints. *Environmental Research Letters* 2019; **14**(6): 064004.
3. Watts N, Amann M, Arnell N, et al. The 2019 report of The *Lancet* Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. *The Lancet* 2019; **394**(10211): 1836-78.
4. Lenzen M, Moran D, Kanemoto K, Geschke A. Building Eora: a global multi-region input–output database at high country and sector resolution. *Economic Systems Research* 2013; **25**(1): 20-49.