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Health and environmental impacts of drinking water choices in Barcelona, Spain: A modelling study

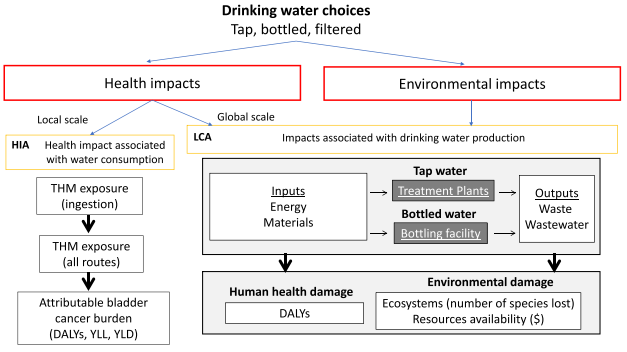
Cristina M. Villanueva [a,b,c,d,*], Marianna Garfí [e], Carles Milà [a,b,c], Sergio Olmos [a,b,c], Ivet Ferrer [e], Cathryn Tonne [a,b,c]

[a] ISGlobal, Barcelona, Spain
[b] CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain
[c] Universitat Pompeu Fabra (UPF), Barcelona, Spain
[d] IMIM (Hospital del Mar Medical Research Institute), Barcelona, Spain
[e] GEMMA-Group of Environmental Engineering and Microbiology, Department of Civil and Environmental Engineering, Universitat Politècnica de Catalunya·BarcelonaTech, Barcelona, Spain

HIGHLIGHTS

- Quantified health and environmental tradeoffs of drinking water choices
- Novel approach integrating health impact and life cycle assessment
- Environmental impact of bottled water 1400–3500 higher than tap water
- Local health burden of tap water consumption equivalent to 2 h of life lost
- Filtered water considerably reduced health and environmental impacts.

GRAPHICAL ABSTRACT



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ABSTRACT

Quantitative evidence of health and environmental tradeoffs between individuals' drinking water choices is needed to inform decision-making. We evaluated health and environmental impacts of drinking water choices using health impact and life cycle assessment (HIA, LCA) methodologies applied to data from Barcelona, Spain. We estimated the health and environmental impacts of four drinking water scenarios for the Barcelona population: 1) currently observed drinking water sources; a complete shift to 2) tap water; 3) bottled water; or 4) filtered tap water. We estimated the local bladder cancer incidence attributable to trihalomethane (THM) exposure, based on survey data on drinking water sources, THM levels, published exposure-response functions, and disability-adjusted life years (DALYs) from the Global Burden of Disease 2017. We estimated the environmental impacts (species lost/year, and resources use) from waste generation and disposal, use of electricity, chemicals, and plastic to produce tap or bottled drinking water using LCA. The scenario where the entire population consumed tap water yielded the lowest environmental impact on ecosystems and resources, while the scenario where the entire population drank bottled water yielded the highest impacts (1400 and 3500 times higher for species lost and resource use, respectively). Meeting drinking water needs using bottled or filtered tap water led to the lowest bladder cancer DALYs (respectively, 140 and 9 times lower than using tap water) in the Barcelona population. Our study provides the first attempt to integrate HIA and LCA to compare health and environmental impacts of individual water consumption choices. Our results suggest that the sustainability gain from consuming water from public supply relative to bottled water may exceed the reduced risk of bladder

Abbreviations: BHS, Barcelona Health Survey; DALYs, disability-adjusted life-years; GBD, Global Burden of Disease; HIA, health impact assessment; LCA, life cycle assessment; OR, odds ratio; PAF, population attributable fraction; THM, trihalomethanes; YLLs, years life lost; YLDs, years lived with disability.

* Corresponding author at: ISGlobal - Institut de Salut Global de Barcelona, Barcelona Biomedical Research Park (PRBB), Doctor Aiguader, 88, 08003 Barcelona, Spain.
E-mail addresses: cristina.villanueva@isglobal.org,
URL: https://www.isglobal.org (C.M. Villanueva).

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