

Environmental impact of bottled water up to 3,500 times higher than tap water

August 6 2021



Credit: Jonathan Chng / Unsplash.

What is the best option for individual water consumption if we take into account both health and environmental impacts? The answer to that question, according to a new study led by the Barcelona Institute for Global Health (ISGlobal), a center supported by the "la Caixa" Foundation, is that, at least in the city of Barcelona, tap water is the option that offers more overall benefits.

The consumption of bottled [water](#) has been increasing sharply in recent

years on a global scale. According to previous research, this trend can be partly explained by subjective factors like risk perception, taste, odor, lack of trust in public tap water quality and marketing by bottled water companies. This new study, published in *Science of the Total Environment*, was aimed at providing objective data about three different water consumption choices: bottled water, tap water and filtered tap water. This scientific work has been carried out in collaboration with the Group of Environmental Engineering and Microbiology (GEMMA) of the Universitat Politècnica de Catalunya BarcelonaTech (UPC).

Environmental and [health impacts](#) are usually assessed separately due to the different methodologies applied and resulting outcomes.

Environmental impacts can be estimated with a methodology called Life Cycle Assessment (LCA), while the consequences in [human health](#) are estimated with an approach called Health Impact Assessment (HIA).

This study has tried to overcome this methodological barrier for the first time by combining LCA and HIA in the same analysis.

Since tap water quality might differ between cities or countries, the research team focused in the city of Barcelona, due to the robustness of available data. The Life Cycle Assessment was conducted using a specific software and a method called ReCiPe, which allowed researchers to estimate the damage to ecosystems and to resource availability as well as indirect impacts in human health derived from the production process of bottled and tap water. The Health Impact Assessment used data on water consumption patterns and on levels of chemical compounds in water supply from the Barcelona Public Health Agency.

Results showed that if the whole population of Barcelona decided to shift to bottled water, the production required would take a toll of 1.43 species lost per year and cost of 83.9 million USD per year due to extraction of raw materials. This is approximately 1,400 times more

impact in ecosystems and 3,500 times higher cost of resource extraction compared to the scenario where the whole population would shift to tap water.

"Tap water quality has increased substantially in Barcelona since the incorporation of advanced treatments over the last years. However, this considerable improvement has not been mirrored by an increase in tap water consumption, which suggests that water consumption could be motivated by subjective factors other than quality," says Cristina Villanueva, ISGlobal researcher and first author of the study.

"One of this subjective factors is the perceived presence of chemical compounds in tap water. While it is true that tap water may contain trihalomethanes (THM) derived from the disinfection process and that THMs are associated with bladder cancer, our study shows that due to the high quality of the tap water in Barcelona, the risk for health is small, especially when we take into account the overall impacts of bottled water," adds Cristina Villanueva.

In this sense, the results estimate that a complete shift to tap water would increase the overall number of years of life lost in the city of Barcelona to 309 (which equals approximately on average two hours of lost life expectancy if borne equally by all residents of Barcelona). Adding domestic filtration to tap water would reduce that risk considerably, lowering the total number of years of life lost to 36.

"Our results show that considering both the environmental and the [health](#) effects, tap water is a better option than bottled water, because bottled water generates a wider range of impacts," says Cathryn Tonne, ISGlobal researcher and last author of the study. "The use of domestic filters, in addition to improving the taste and odor of tap water, can reduce substantially THMs levels in some cases. For this reason, filtered [tap water](#) is a good alternative. Even though we didn't have enough data to

measure its environmental impact fully, we know it is much lower than that of bottled water," she adds. However, the authors acknowledge that domestic filtering devices require an adequate maintenance for a proper performance and to avoid microbial proliferation.

More information: Cristina M. Villanueva et al, Health and environmental impacts of drinking water choices in Barcelona, Spain: A modelling study, *Science of The Total Environment* (2021). [DOI: 10.1016/j.scitotenv.2021.148884](https://doi.org/10.1016/j.scitotenv.2021.148884)

Provided by Barcelona Institute for Global Health

Citation: Environmental impact of bottled water up to 3,500 times higher than tap water (2021, August 6) retrieved 7 May 2024 from <https://phys.org/news/2021-08-environmental-impact-bottled-higher.html>

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